The Great Fiscal Divergence

Alexander Lee* Jack Paine†

April 20, 2018

Abstract

This paper uses a new dataset to document a striking empirical pattern in country-level taxation. In 1900, relative to the rest of the world, Western European and East Asian countries exhibited similar per capita tax intake. However, over the next 70 years, their fiscal extraction grew much more rapidly. The paper then explains this trend by building on existing fiscal capacity research emphasizing that fiscally strong states require either high demand for taxation (e.g., funding wars and redistribution) or an existing supply of high quality bureaucratic and political institutions. A formal model demonstrates that neither supply nor demand shocks on their own will necessarily translate into an effective fiscal state, and demand shocks coupled with low supply may diminish revenue intake in the long-run. Empirically, we show a positive association between the interaction of various supply/demand factors and tax revenues over two centuries.

*Assistant Professor of Political Science, University of Rochester, Harkness Hall, Rochester, NY 14627. Email: alexander.mark.lee@rochester.edu.

†Assistant Professor of Political Science, University of Rochester, Harkness Hall, Rochester, NY 14627. Email: jackpaine@rochester.edu.

In 1900, tax intake in future OECD countries resembled levels of government revenue elsewhere. For example, Denmark collected only 20% more in nominal central government revenue per capita than Egypt, 24% more than Jamaica, and 44% less than Argentina. Despite being poorer than the West, many Latin American countries and Western colonies collected per capita revenue levels commensurate to those collected by Western governments—and, frequently, their intake was higher as a percent of GDP. Although economic historians have argued that Western and non-Western countries experienced a "great divergence" in societal income levels no later than the mid-19th century (Pomeranz, 2009; Broadberry and Gupta, 2006; Jones, 2003), cross-national differences in *government* income remained modest until the 20th century.

However, during the 20th century, central government revenues per capita skyrocketed in Western Europe, the Anglophone settler colonies, and East Asia. This generated a permanent divergence between these regions and the rest of the world. Between 1913 and 1950, nominal per capita revenue in the United Kingdom increased by 560%—compared to increases in nominal per capita revenues of 42% in India and 62% in Jamaica. Within the franc zone during this period, nominal per capita revenue increased by 212% in France compared to more modest increases of 53% in Madagascar and 64% in Tunisia. Divergent economic growth rates or prices cannot explain these large differences. Given existing research on the importance of fiscal capacity for state-building and governance quality (Levi, 1989; Tilly, 1992; Besley and Persson, 2011), understanding the causes of this great *fiscal* divergence is crucial for explaining broader political and economic differences between Western Europe and East Asia compared to the rest of the world.

This paper makes two major contributions to explaining state capacity and fiscal development. First, it empirically documents that Western Europe, its offshoots, and East Asia diverged from the rest of the world in the 20th century. The primary evidence comes from a new panel dataset that includes data on per capita state revenue from the mid-19th century for a sample with broad coverage across global regions. We combined this data with historical exchange rate and gold price data, and population estimates, to estimate nominal per capita state revenue in gold ounces. The major advantage of this dataset relative to existing work is its spatial and temporal breadth, including numerous non-Western countries and colonies. This dataset supplements existing comparative fiscal capacity datasets with narrower country coverage, such as only or mainly European countries (Beramendi, Dincecco and Rogers, 2018; Dincecco, 2011, 2015; Queralt et al., 2015; Scheve and Stasavage, 2016).[1] Other datasets feature less comprehensive temporal coverage, such as only the late

[1] Beramendi, Dincecco and Rogers's (2018) samples contains a small number of non-Western countries.

20th century (International Monetary Fund, 2017; Thies, 2004) or analyze a cross-section of a particular year (Queralt, 2016). This makes our dataset uniquely suitable for analyzing fiscal differences between the West and the rest of the world during the 19th and 20th centuries.

The second contribution is to provide a new theory that explains this great fiscal divergence. Extensive research on origins of fiscal capacity has produced two broad families of explanations. "Demand-side" explanations emphasize that some states face greater revenue extraction needs than others. Many have focused on the importance of wars or international rivalries (Herbst, 2000; Centeno, 2002; Thies, 2004, 2005, 2007; Scheve and Stasavage, 2016), which vastly increase the cost of desired goods and create political conditions needed for increasing taxation. Related research examines greater demands placed on the state in countries with inclusive political institutions (Beramendi, Dincecco and Rogers, 2018; Mares and Queralt, 2015; Andersson, 2017; Saylor and Wheeler, 2017). By contrast, "supply-side" fiscal capacity theories emphasize the historical contingency of constructing effective extractive and information-gathering institutions (Brambor et al., 2016; Lee and Zhang, 2017), the difficulty of producing educated bureaucrats, and the necessity of strong political institutions that constrain the executive (Dincecco, 2011, 2015).

Both families of explanations face empirical and theoretical challenges for explaining the 20th century divergence in fiscal outcomes. Demand theories convincingly explain variation over time: within Western Europe, participation in the two world wars and franchise expansion are reasonably strongly correlated with taxation increases in the 20th century. However, demand theories do not convincingly explain cross-sectional variation. Many states outside Western Europe or East Asia should also have high demand for revenue due to participation in warfare or franchise expansion, but have not exhibited comparable fiscal gains. For example, demand theories predict that Egypt should be a fiscally effective state due to its wars with Israel between the 1940s and 1970s. However, the Egyptian government responded to international competition by promoting large but inefficient state institutions (Waterbury, 1993).

By contrast, supply-side theories can explain the cross-national differences that emerged by the mid-20th century, but cannot explain the exponential increases in Western and East Asian tax revenue over time that occurred during the 20th century. Many prominent accounts of fiscal capacity expansion in Europe focus on institutional changes that occurred prior to the 20th century (Tilly, 1992; Brewer, 1990; Dincecco, 2009), but we show that his pre-dates when this region became exceptional in fiscal terms. For example, the United Kingdom in the mid-19th century possessed the institutional prerequisites for fiscal expansion, yet extracted

roughly the same level of per capita revenues as contemporary colonial Cuba.

A new theory of fiscal extraction better explains the great fiscal divergence by showing why supply and demand factors *interact* to produce fiscal capacity increases. The underlying political economy setup incorporates several substantively relevant premises. States face a generic impediment to raising revenues: citizens can avoid government taxation by exiting the formal economy. However, the viability of exiting the formal economy depends on the structure of market competition in the economy and on the amount of information the state has about production—a function of bureaucratic capacity.[2] Furthermore, governments can choose state-building strategies that shape the structure of the economy. Given these premises, we formally analyze a government that taxes citizens who can produce in either a formal or informal sector. More competitive formal-sector markets exert countervailing effects on government revenue intake. On the one hand, greater competition increases the value of the taxable base and induces more citizens to produce in the formal sector. On the other hand, output from highly competitive markets tends to be more difficult to tax than monopolies or state-owned enterprises. A key preliminary result is that only in countries with efficient bureaucracies will the overall effect of higher market competition increase short-term revenue intake, which affects governments' state-building strategies.

Demand interacts with supply to affect long-term equilibrium fiscal intake because bureaucratic supply determines how a demand shock such as participation in international warfare affects the government's state-building strategy. In a country with a strong bureaucracy, the government will respond to a demand shock by promoting market competition because this choice boosts revenues. However, in countries with low bureaucratic supply, *undermining* market competition yields greater revenues in the short term because competitive markets are more difficult to tax. In these conditions, a demand shock encourages governments to engage in "bad" state-building, as in the Egypt example featuring inefficient state-owned monopolies. Although bad state-building can promote short-term revenue gains, it also undermines fiscal capacity in the long-term by stifling bureaucratic development. This new logic shows that demand shocks do not boost fiscal capacity unless coupled with high bureaucratic supply—a positive interactive effect. The theory departs from, for example, Besley and Persson's (2011) framework in which higher-valued public goods always encourage productive strategies to increase fiscal capacity, as well as existing demand theories that posit supply-independent effects.

[2]Indeed, the word "statistics" derives from "state."

The main theoretical implication from the model—high demand and high supply positively interact to produce fiscal capacity gains—matches intuitive perceptions of which countries experienced huge fiscal expansion and when. Many have discussed Western Europe, its offshoots, and East Asia as having more effective institutional legacies than other parts of the world, and the 20th century also exhibited increasing demand for state spending, driven in particular by two world wars and associated military rivalries. However, rather than rely solely on rough conceptualizations of demand and supply, we present additional associational evidence across a broad sample using plausible empirical measures of these concepts from the literature. Regressing fiscal intake on interactions between various demand (war, majority rule) and supply (civil registration, executive constraints, education) measures provides cross-national evidence consistent with the thesis that the conjunction of supply and demand can help to explain why the West and East Asia exhibited a great fiscal divergence from the rest of the world in the 20th century, but not before.

1 The Great Fiscal Divergence: Trends Over Time

After introducing the data, this section provides graphical and regression evidence of a great fiscal divergence between Western Europe/East Asia and the rest of the world starting around 1914. It then compares the late onset this fiscal divergence with the earlier economic gap that had emerged between the West and the rest of the world, and with existing evidence on state-building in Europe.

1.1 Measuring Fiscal Capacity

This paper uses previously unanalyzed data to generate a new measure of central government revenue. We used data from Mitchell (1998) to construct the main measure, central government revenue per capita in the local currency. Since exact population is generally only available at census years, non-census years were estimated based on interpolating between censuses. For this reason, revenue per capita cannot be estimated before the date of the first census, even when revenue data was available from an earlier date. To put revenue levels on a common scale, we then converted all currency measures to their equivalents in gold. To do this, we constructed a new time series of historical exchange rates into pounds, primarily using Barbieri, Keshk and Pollins (2008), Denzel (2010) and Officer (2016), and then converted pounds into gold using Green (2016). World gold prices have fluctuated violently since gold was delinked from the dollar in 1971. For

this reason, the analysis only uses pre-1971 data. We also excluded country-years with non-convertible currencies. Appendix Section A.1 provides additional information on how we compiled the data.

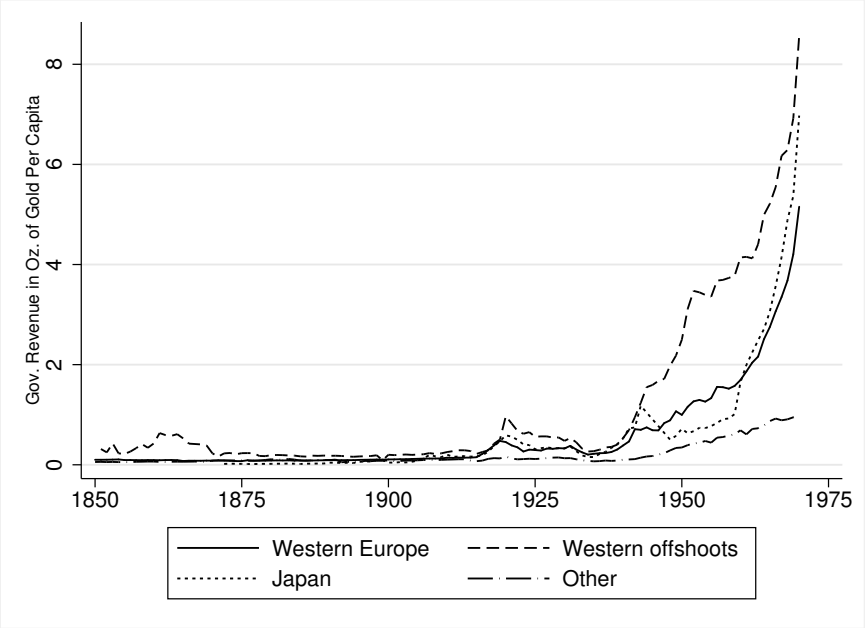
These data advance existing quantitative data on fiscal capacity in both geographical and chronological coverage. The amount of data available is impressive, extending back to the early 19th century in Western Europe, the early 20th century in Africa (including colonial years), and the late 19th century in most of the rest of the world. Specifically, the fiscal data include at least one year for 19 Western countries and 68 non-Western countries. Sixteen of the Western countries have at least one data point in the 19th century, as do 28 of the non-Western countries. Appendix Table B.1 provides summary statistics and Appendix Figure B.1 plots revenues over time for each territory in the dataset. By contrast, existing datasets such as the International Monetary Fund (2017) only provide data since the late 20th century. Dincecco (2015) and Beramendi, Dincecco and Rogers (2018) focus on a narrower range of country-years with high quality historical data, mostly from Western countries and with no observations during colonial rule. For example, Beramendi, Dincecco and Rogers's (2018) replication files have tax-to-GDP ratio data for only 11 non-OECD countries, and only four have any 19th century data. Other authors draw data from similar high-information cases (Saylor and Wheeler, 2017).

Although more expansive data coverage provides a major advantage, it also creates two important limitations. First, most results do not normalize by GDP. Although some existing work expresses revenue in gold (e.g., Dincecco, 2011), most of the literature measures fiscal extraction using tax collection as a percentage of GDP (Thies, 2005; Fauvelle-Aymar, 1999; Beramendi, Dincecco and Rogers, 2018). Normalizing by GDP accounts for variation in wealth and price levels, but also carries an important disadvantage. The set of country-years with reliable GDP data is much smaller than those with reliable fiscal data, and is skewed towards wealthy countries with high state capacity. The statistical analysis following the formal model discusses this problem in more detail, although Appendix Table B.2 and Figures B.3, B.5, and B.7 show that many of the findings are similar when conditioning on GDP. Second, we are unable to directly account for exchange rate effects or for price differentials, although Appendix Sections A.2 and A.3 discuss why these limitations are unlikely to affect the results.

1.2 Graphical Evidence

Figure 1 shows a clear divergence between a subset of nations—Western Europe, its offshoots (United States, Canada, Australia, and New Zealand), and East Asia—and the rest of the world. After 1914, many countries participated in the two world wars, a worldwide depression, geopolitical competition during the Cold War, and spent increased sums on redistributive policies following franchise expansion. Future OECD countries experienced massive expansion in state revenue collection during this period, consistent with existing characterizations that state revenues increased during this time (Lindert, 2004). However, revenue collection in the rest of the world stagnated—despite exposure to these same international events and pressures. The country-by-country plots in Appendix Figure B.1 disaggregate these trends.

Figure 1: The Great Fiscal Divergence



Notes: The lines show estimated central government revenue per capita in ounces of gold, converted at nominal exchange rates.

Appendix Figure B.2 replicates Figure 1 using data from Beramendi, Dincecco and Rogers (2018) on revenue as a percentage of GDP. The rise of the West and of East Asia is even more dramatic than in our data—a reversal of fortune rather than simply a divergence. However, the sample is somewhat less comprehensive in Figure B.2, which illustrates the differences in coverage between our dataset and existing ones. Beramendi, Dincecco and Rogers's (2018) replication data includes only four non-OECD countries before 1920: Argentina, Brazil, Chile, and Uruguay. Relative to GDP, these southern cone countries had *higher* levels of fiscal extraction than Western countries in the late 19th century, but quickly fell behind during the 20th

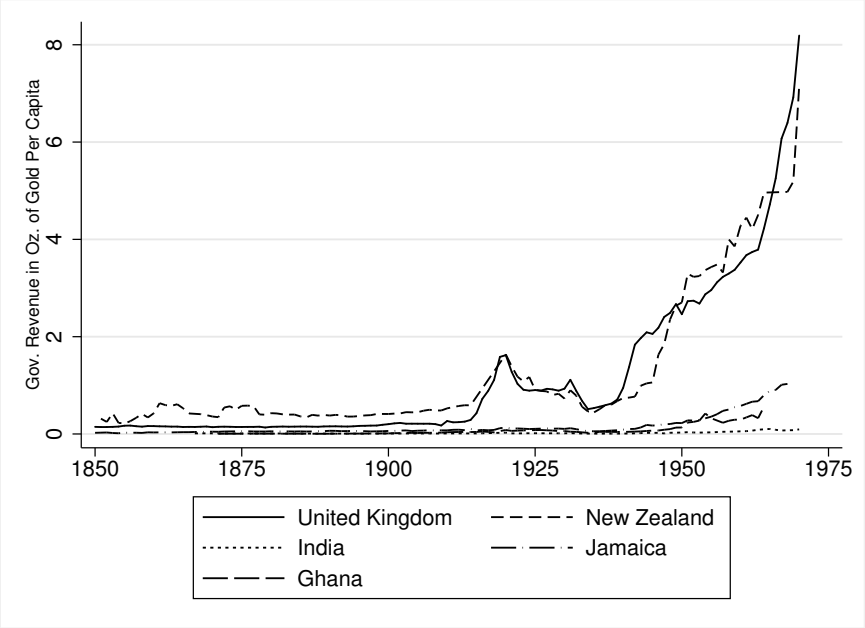
century, and by 1965 took in less than half of Western European levels.

Figure 2 illustrates the growing difference between European countries and their colonies by showing changes in per capita revenue over time across five continents within the British Empire. The figure shows that although New Zealand and the United Kingdom had higher levels of revenue per capita than the other major colonies in 1914, these differences were small by modern standards. Per capita revenue in the United Kingdom was slightly more than three times Jamaica's, and six times the Gold Coast (Ghana). These differences would be even smaller if we were able to account for differences in in purchasing power, which was almost certainly greater in the poorer colonies. For example, in 1990, the purchasing power of a pound was 2.75 times its British figure in Jamaica and 3.66 times its British figure in India.

However, a dramatic change occurred after World War I. Revenues in the self-governing parts of the Empire increased precipitously whereas the colonies were left behind. Between 1913 and 1950, per capita revenues in the United Kingdom increased by 560% compared to much smaller per capita increases of 42% in India and 62% in Jamaica. This divergence accelerated after World War II as colonies moved towards independence. Although many territories experienced large increases in revenue collection, none matched the stark expansion of the state in the United Kingdom and offshoot New Zealand. Between 1913 and 1969, the United Kingdom's per capita revenue increased nearly ten-fold compared to only doubling in India. Economic growth alone cannot account for these differences. Although per capita GDP in India had contracted in this period, by 8%, the British economy only expanded by 41% per capita (Maddison, 2007). Exchange rate fluctuations are also unlikely to account for these differences because most of these countries used currencies linked to sterling before 1947. Instead, the magnitude of the difference yields an unambiguous conclusion: a great fiscal divergence had indeed occurred within the British Empire during the 20th century.

Figure B.3 normalizes the revenue amounts in Figure 2 using per capita GDP and demonstrates a similar pattern. Relative to GDP, the differences between the United Kingdom and the rest of the Empire were not very large in the early 20th century. By these estimates, Jamaica—a small, open economy mainly reliant on customs duties—extracted more resources than the mother country after accounting for wealth differentials. However, starting in 1914, both New Zealand and the United Kingdom began surging ahead of the rest of the Empire, a trend confirmed by a second rise in revenue collection during World War II. By 1969, Jamaica collected a much lower share of GDP as revenue than the United Kingdom. India, despite a surge in state

Figure 2: Revenue Trends in the British Empire



Notes: The lines show estimated central government revenue per capita in ounces of gold, converted at nominal exchange rates.

revenues after independence, was even further behind.

Figures B.4 through B.7 show evidence of fiscal divergence within the French empire and in a select set of other countries. Whereas several high-flying countries like France and Denmark exhibited a spike in revenue collection during and immediately after the two world wars, Brazil, Indonesia, and even Italy stagnated. The increase in Denmark was less pronounced than the United Kingdom during the two world wars—similar to much of Western Europe, which suffered negative direct effects of the war (Harrison, 1998)—but its post-1950 increases were even more dramatic. Whereas Denmark's per capita revenue was only 1.4 times Brazil's in 1913, this figure had ballooned to more that 17 times by 1969. In the decade before 1914, booming customs revenues made Brazil one of the most fiscally successful states in the world. However, by 1969, Brazil collected a share of revenues relative to GDP closer to Madagascar than to Denmark.

Of course, participating in the two world wars—the focus of much existing research (Scheve and Stasavage, 2016)—accounts for a considerable amount of variation in the figures. However, world war participation is neither necessary nor sufficient for a revenue spike. Appendix Figure B.8 shows that every northern European country that stayed neutral in World War I (Sweden, Norway, Denmark, Netherlands, and Switzerland) experienced major revenue increases following the war while undergoing franchise expansion. By contrast, smaller and less enduring increases occurred in some World War I belligerents in southern and eastern Eu-

rope, and especially in combatant nations' colonies. For example, the Italian state expanded during and after the war, as nominal taxation in gold increased by 70% from 1913 to 1930. However, in the same period, neutral Sweden's tax intake increased by 145%, overcoming its slight fiscal deficit relative to Italy in 1913.

1.3 Regression Evidence of Great Fiscal Divergence

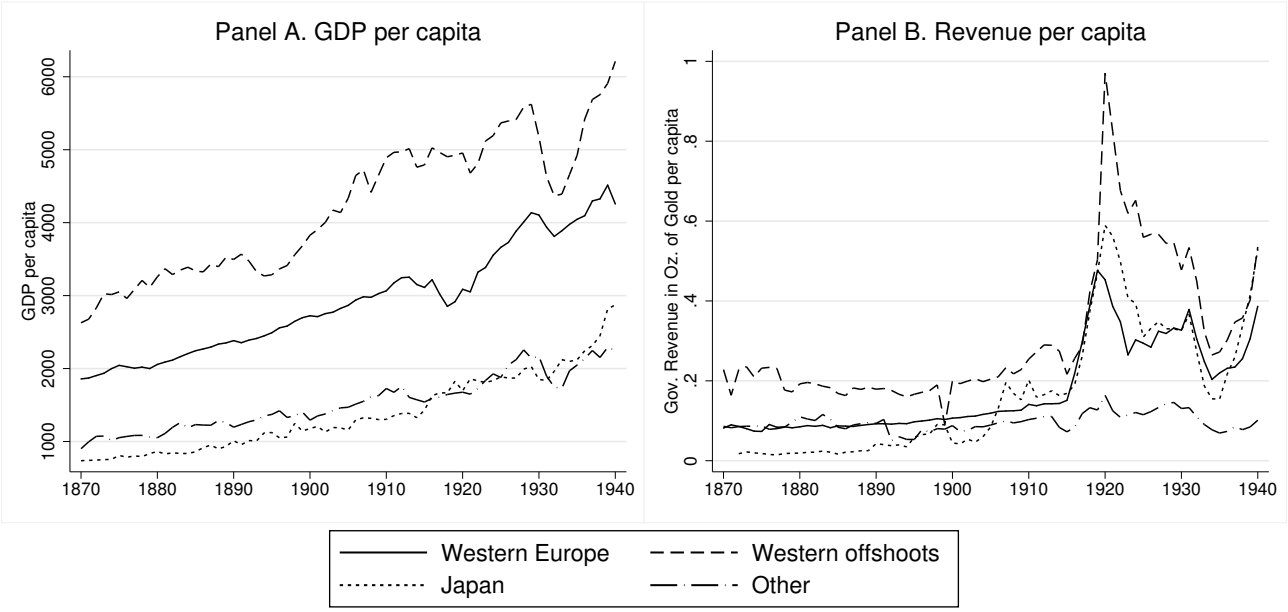
Appendix Table B.2 provides numerical estimates of the pattern shown in Figure 1, presenting a series of panel regression models with logged central government revenue in gold as the dependent variable and country-clustered standard errors. Predictably, both an indicator for countries in Western Europe, the offshoot settler colonies, or East Asia (WE/EA) and an indicator for post-1914 years are each associate positively and statistically significantly with per capita revenue (Columns 1 and 2). Column 3 includes both these variables and their interaction. The interaction term is positive and statistically significant, which shows that being in these areas of the world since 1914 raises expected fiscal capacity above either WE/EA or post-1914 on its own. On average, per capita revenue was 22% higher in WE/EA countries than in the rest of the world before 1914, and 179% higher afterwards. These results are similar when including country fixed effects to account for unit-specific differences in geographical and institutional endowments, and year fixed effects to account for time-specific factors such as changes in the price of gold or changes in military technology, when adding GDP per capita as a control, when normalizing revenue by GDP, and when using revenue growth rather than revenue levels (Columns 4-7).

1.4 The Timing of Divergence

The timing of this great fiscal divergence is surprising relative to (1) the timing of economic divergence and (2) existing discussions of state-building in Europe. When economic historians discuss a "great divergence," they usually refer to the divergence in incomes between Western and non-Western countries. Although the timing and causes of this divergence are fiercely debated (e.g., Pomeranz, 2009; Broadberry and Gupta, 2006; Jones, 2003), scholars agree it began well before 1914 and likely no later than the mid-19th century after the Industrial Revolution had spread across Europe. Figure 3 illustrates this consideration by comparing GDP trends between 1870 and 1940 to revenue trends. Two points are immediately clear. First,

cross-national differences in GDP per capita were clearly present by 1870. Second, although GDP growth trends were fairly similar across regions, government revenues in the West exhibit a sharp change starting around World War I. Therefore, the emergence of large differences in state fiscal capacity post-date the great economic divergence by at least a half century, and probably more.

Figure 3: When Did Divergence Occur? GDP vs. Revenue



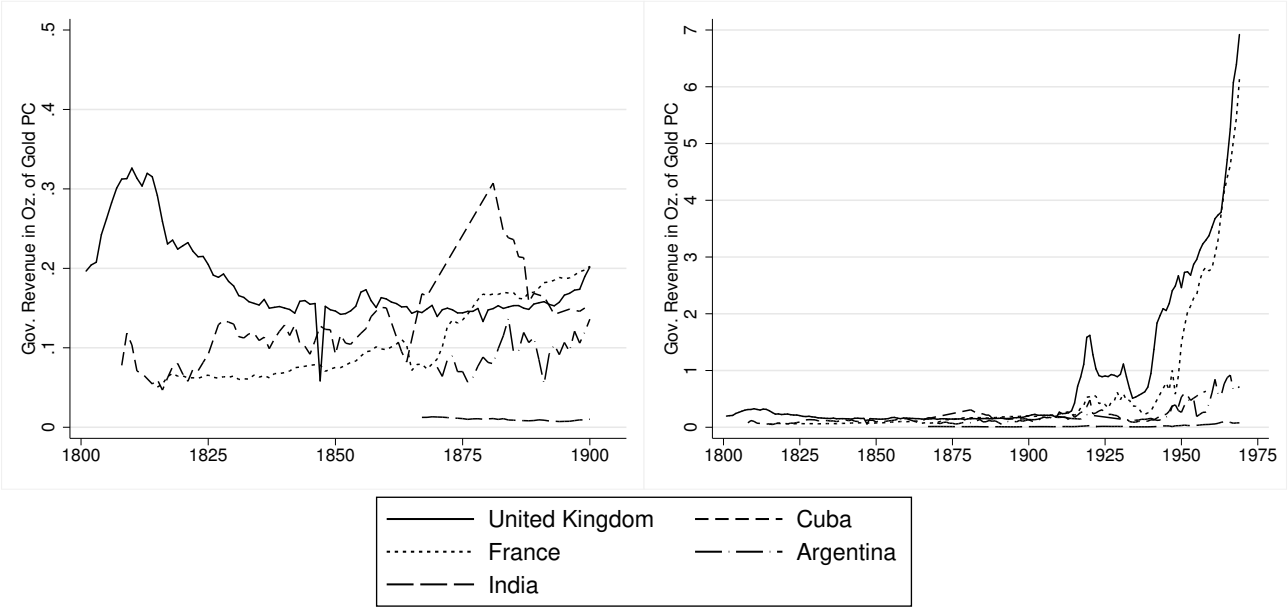
Notes: The figures show estimated central government revenue in ounces of gold (converted at nominal exchange rates) and per capita GDP estimates in constant 1990 dollars from Maddison (2007).

The timing of fiscal divergence documented here also challenges conventional wisdom about state-building in Europe that emphasizes the importance of 18th and 19th century developments, particularly in a few favored countries (Tilly, 1992; Brewer, 1990; Dincecco, 2009). Brewer (1990), for instance, documents how the pressure of wars with France led Britain to develop a highly effective fiscal state. Our data echo one finding from these authors: Britain did indeed see a substantial increase in per capita state revenue during this period, especially during the Napoleonic wars.

However, the very large contemporary differences in revenue between Western and non-Western countries appear to post-date this period. Two trends stand out. First, whereas levels of revenue collection in mid-20th century Europe never reverted to 19th century levels, Britain did not sustain throughout the 19th century the level of fiscal effort it had achieved during the Napoleonic wars. Panel A of Figure 4 plots revenue

data between 1800 and 1900 and shows that although per capita revenue increased by 60% between 1801 and 1814, it declined quickly thereafter—even as the economy grew precipitously and as other territories experienced revenue increases. Britain did not surpass its 1801 revenue levels until 1900, nor did it surpass its 1814 revenue levels until 1915, during World War I. At the turn of the 20th century, Britain enjoyed similar revenue intake as wealthy colonies such as Cuba and primary exporters such as Argentina, although it was ahead of poorer colonies such as India. Second, increases in nominal taxation in the 19th century were tiny in comparison to 20th century increases. Panel B of Figure 4 plots revenue data for the same countries from 1800 through 1970. Commensurate with the difference in magnitude between the 19th and 20th centuries, the maximum value in the scale for Panel B is 14 times larger than that for Panel A. Using scaling appropriate for highlighting the 20th century great divergence, Britain's Napoleonic-era fiscal achievement is barely visible.

Figure 4: When Did Divergence Occur? 19th vs. 20th Century



Notes: The figures show estimated central government revenue in ounces of gold (converted at nominal exchange rates).

2 Existing Theories of Fiscal Capacity

Why did this great fiscal divergence occur? To answer this question, we build upon the rich existing literature on origins of fiscal capacity. These theories can usefully be disaggregated depending on whether they imply high fiscal capacity emerges in countries with high demand for revenues, or in states with a supply of institutions that facilitate revenue collection. Although both perspectives yield important insights, both face empirical problems for explaining the great 20th century fiscal divergence.

2.1 Demand

Demand-based theories of fiscal capacity focus on factors that create stronger preferences for tax revenues. The most important demand hypothesis in the literature is preparation for or participation in warfare. International wars often raise the state's need for revenue and create the political consensus necessary to create institutions, which may persist in a "ratchet effect" after the war is over (Peacock and Wiseman, 1961). Security is a high-demand public good, either because citizens place a high value on not having their country invaded (Besley and Persson, 2011, 58) or because success in conflict is a core goal of rulers (Tilly, 1992). The positive relationship between international wars and state-building is conventional wisdom in explaining the rise of European states (Tilly, 1992; Brewer, 1990; Bean, 1973; Dincecco and Prado, 2012; Queralt, 2016). Other authors have made the converse point, that less intense geopolitical competition in many ex-colonies in Sub-Saharan Africa and Latin America has yielded less effective state-building (Herbst, 2000; Centeno, 2002; Thies, 2004, 2005, 2007).

Besley and Persson (2011) formally present one variant of the demand logic. In their model, a government decides whether to invest to increase future fiscal capacity. This choice is contingent on the likelihood that future governments will choose to provide public goods—as opposed to private transfers—which itself depends on the value of public goods. Factors like war increase the likelihood that public goods will be sufficiently high-valued that the government will optimally invest to increase future fiscal capacity. This distinguishes "cohesive" and "redistributive" states from "weak states" that face low demand and do not invest in fiscal capacity. Scheve and Stasavage (2016) propose a different logic. Wars, especially "mass mobilization" wars, create social conditions that favor creating egalitarian taxation systems and programs of social redistribution—which require high taxes to fund.

Warfare is not the only possible source of demand for fiscal capacity. Where levels of political participation are higher, the set of participants may be more willing to either acquiesce to or to actively demand higher taxation to fund broadly beneficial public goods. Meltzer and Richard (1981) developed the basic logic: The median voter tends to be poorer under more expansive franchises, which causes voters to demand higher taxation to finance redistributive government spending. Acemoglu and Robinson (2006) develop this logic into a more general model of political regime transitions and explain why democracies should redistribute at higher levels than dictatorships. A large empirical literature has argued for a positive association between democracy (and, in particular, franchise expansion) and spending (Stasavage, 2005; Avelino, Brown and Hunter, 2005; Boix, 2001; Aidt, Dutta and Loukoianova, 2006), although there is also dissenting evidence (Ansell and Samuels, 2014). The same political influence logic also implies that political changes that empower social groups favorable to increased public goods spending, such as industrial elites, should lead to increases in taxation (Saylor and Wheeler, 2017; Beramendi, Dincecco and Rogers, 2018; Mares and Queralt, 2015).

2.2 Supply

Demand-side theories implicitly assume that governments can find a way to raise revenues if they are highly desired. However, other perspectives focus on institutional supply, specifically, factors that affect the difficulties governments face to collecting revenues. Although states can take short-term shortcuts to higher revenue levels—indirect taxes, natural resource rents, state run monopolies—in order to collect direct taxes, states must possess *information* about their citizens such as who they are, where they live, and what they earn (Kasara, 2007; Brewer, 1990). This requires bureaucratic institutions that can collect this information and enforce compliance. By contrast, states unable to exert this type of control are vulnerable to burgeoning informal sectors that are difficult to measure or to threaten.

Scholars have recently begun to systematically measure states' information-collection abilities. Brambor et al. (2016) collect data on civil registration systems and state statistical offices—a crucial source of information for the state—while Lee and Zhang (2017) compares the effectiveness of censuses. An older literature examines the bureaucracy directly, arguing that "embedded" rationalized bureaucracies are linked to stronger states and greater economic development (Evans, 1995). Similarly, Dincecco (2009, 2015) shows that centralized bureaucracies were a necessary condition for increased taxation in early modern Europe. By

contrast, many post-colonial countries are thought to suffer from low bureaucratic capacity (Evans, 1995), perhaps because colonial regimes focused on security and short-term revenue extraction at the expense of institution building (Herbst, 2000; Gardner, 2012). Another aspect of bureaucratic quality relates to the pooled of educated individuals that can supply skilled labor to staff bureaucratic institutions. For example, many ex-colonies faced immense hurdles to effectively running the government after independence because of the few number of colonial subjects that received higher education.

Other research examines the quality of political institutions. A strong fiscal state requires constraints on decision-makers because, otherwise, rulers can use taxes for private rather than public purposes (North and Weingast, 1989; Dincecco, 2015). This makes it difficult to induce elites and other citizens to pay taxes, knowing that they might be used for corrupt purposes. In addition to explicitly addressing political obstacles to collecting taxation, this theory also highlights the effects of institutions on tax morale. If citizens believe that tax money will be diverted to rents, then this undermines the ability to collect taxes given their quasi-voluntary nature.

2.3 Shortcomings of Existing Theories

Supply and demand theories of state building each accurately describe conditions in Western Europe, neo-European offshoots, and rapidly growing East Asian states in the 20th century. These countries have tended to experience frequent external warfare and/or strong popular pressure for welfare states, especially since 1914. Similarly, nearly all these countries have capable bureaucracies, strong executive constraints, and highly educated populations. Therefore, unsurprisingly, cross-national quantitative analyses and case studies consistently find evidence for various demand factors and supply factors.

However, experiences outside these regions in the 20th century suggests that high demand or quality supply—in isolation—tends not to promote fiscal capacity. For example, on the demand side, many have argued the Great Depression and World War II elevated demand for state revenue and created high-capacity states in the United States and the United Kingdom (Peacock and Wiseman, 1961; Scheve and Stasavage, 2016). However, many countries outside Western Europe also experienced these demand factors without creating strong states. South America experienced considerable international warfare in the 19th century but most countries failed to build a strong fiscal apparatus (Centeno, 2002). In Egypt, the government focused on

developing inefficient state-owned enterprises to raise revenues to pay for persistent international competition with Israel (Waterbury, 1993). Similarly, colonial rulers throughout Africa and Asia during the two world wars energetically attempted to mobilize colonial subjects to provide resources to the metropole, but achieved far less in fiscal terms than in the metropole. Overall, although we accept Scheve and Stasavage's (2016) argument that mobilization for mass warfare enhances long-term fiscal capacity, we also highlight that the ability to mobilize for mass modern warfare depends on institutional supply.

Supply-side examples highlight similar patterns. For most of the 19th century, Western Europe and the United States outpaced the rest of the world in terms of information about their citizens (Brambor et al., 2016), created competitive representative institutions before the rest of the world, and had more educated citizenries. This reflects the focus of much of the Europe literature on institutional changes that occurred prior to the 20th century to explain fiscal capacity expansion (Tilly, 1992; Brewer, 1990; Dincecco, 2009). However, the great fiscal divergence did not begin until after World War I. Given these institutional advantages, why did the West not achieve clear fiscal ascendancy until the mid-20th century?

3 Theory: Complementary Supply and Demand Effects

These cases suggest that supply and demand factors may interact in previously overlooked ways to affect fiscal capacity building. Our formal theory shows that high demand will only cause rulers to pursue policies that boost long-run fiscal capacity if bureaucratic supply is high—implying a positive interaction effect. If instead supply is low, then rulers may face perverse incentives for "bad" state-building: pursuing economically destructive policies that, although effective at collecting revenues in the short-term, undermine long-term revenue collection.

3.1 How Do Governments Collect Revenue?

In order to theorize how supply and demand factors affect fiscal capacity, it is necessary to first construct an underlying political economy setup that addresses (1) the constraints that governments face to collecting tax revenues, (2) what factors modify these constraints, and (3) state-building strategies that governments can pursue to improve revenue intake. The following provides substantive motivation for the model's key

premises before formalizing them below.

Constraints to collecting tax revenue. Throughout history, one of the greatest difficulties that states have faced to taxing societal output is that producers can escape beyond the state's reach by migrating or by engaging in "informal" economic activities. In pre-colonial Africa and Southeast Asia, areas with low population density or with mountainous terrain facilitated migration outside the reach of nascent states that sought to expand their frontiers (Herbst, 2000; Scott, 2009). de Soto (2000) discusses the prevalence of informal economic activities in the contemporary post-colonial world and estimates that, in 1997, citizens of the Third World and former communist countries held at least $9.3 trillion worth of real estate that they did not legally own. Joshi and Ayee (2008) discuss broader issues involved with taxing informal economic activity.

Although an omniscient government could counteract these constraints by "finding" production by their citizens or subjects, in reality, governments also face constraints to gathering information about economic production. In colonial Africa, European administrators tended to have limited information about their populations, which made it difficult how much to assess different individuals or even regions could afford to pay (Gardner, 2012). This issue continues to plague many developing countries, which lack extensive written or electronic records to monitor activity, or banking intermediaries that reduce the need for government agents to meet in person to collect taxes (Moore, 2008, 40-41). Economic exit coupled with limited information constitute the core impediments to tax collection in the model.

What factors modify these constraints to affect government revenue intake? One important factor discussed in existing research is the structure of the economy. When only one or a handful of firms produce in a market, as opposed to a more competitive market structure, it easier for governments to collect taxes. This premise constitutes Assumption 1 in the model. Restricted market competition generates rents for firms, which the government can tax. Examples include access to import permits or to required licenses (Haber, 2006, 701). This often creates a symbiotic political relationship whereby the government has easier access to information about the firm's production, and the firm gains economic advantages from its political access. The government can also promote state-owned monopolies that further relax monitoring problems. "In cases where the government becomes the primary employer and producer and assumes the role of setting prices, its task is simplified to monitoring the activities of corporations and agencies that it owns and manages" (Chaudhry, 1993, 252).

Bureaucratic capacity also affects the severity of the impediments to tax collection caused by economic exit and limited information. Although no government can perfectly monitor and assess all individuals' economic activity, states with higher-quality bureaucracies are better at collecting information (Assumption 2). For example, Evans (1995, 52) describes the Economic Planning Board in South Korea in the 1960s. The agency coordinated economic policy by controlling the budget process, which enabled "the concentration of talent and expertise and gives economic policy a coherence that it lacks in a less clearly organized state apparatus." By contrast, in Zaire under Mobutu Sese Seko, the bureaucracy followed the dictum to "make the quest for wealth and money an obsession," which encouraged citizens to engage in economic production outside the reach of the state (47).

Better bureaucracies can also mitigate the monitoring challenges created by greater market competition (Assumption 3). Chaudhry (1993, 251-2) discusses how "creating and regulating markets requires myriad financial, legal, and civil institutions, with stable and firm long-term commitments to regulate the actions of producers, importers, and labor; enforce contracts; and ensure the free exchange of information among economic groups." The government can only play this role in regulating market competition by possessing considerable information about the private sector.

What state-building strategies can a government pursue to boost revenue intake? Governments actively shape the structure of economic production rather than take it as fixed, and can choose whether to promote or to restrict market competition. For example, early in U.S. history, federal and state governments promoted the expansion of transportation infrastructure (e.g., the Erie Canal) to enhance market competition over far-flung areas. Engerman and Sokoloff (1997, 284) summarize the view from historians of early U.S. economic history that "broad advances in productivity were induced by the growth in volume and geographic extent of commence, originating in the extension of networks of low-cost transportation and increases in income" amid "the dramatic expansion of markets that characterized the period."

Alternatively, governments can actively seek to limit market competition and to create economic rents by engaging in co-optation arrangements (Haber, 2006, 701). Bates (1981) discusses how many African governments retained government-pricing schemes for agricultural marketing boards after independence—originally created to smooth income from cash crop exports—because they provide an easy source of taxation (15). State-owned enterprises are prevalent across the post-colonial world because they provide a "captive tax base" (Waterbury, 1993, 134). The Soviet Union provides an extreme example of eliminating

all economic competition and forcing individuals to work for the state.[3]

3.2 Setup

To formalize these premises and to show how they affect long-run fiscal capacity, we present a model in which a government G strategically interacts with a continuum of ex ante identical citizens indexed by $i \in [0, 1]$. The interaction occurs across two periods, $t \in \{1, 2\}$. Three main sets of actions occur in the game. First, before period 1, G chooses a state-building strategy. Second, in both periods, each legal producer decides how much to produce. Third, in both periods, G proposes tax rates and each legal producer decides whether to sell in the formal or the informal market.

State-building investment. Citizens may be denied legal ownership rights over their means of production, whereas those with such rights are denoted legal producers. Initially, $l_0 \in (0, 1)$ percent of citizens have legal production rights. To economize notation and without loss of generality, assume that this implies any individual $i \in [0, l_0]$ is a legal producer, whereas individuals $i \in (l_0, 1]$ cannot legally sell their output in the formal market. After seeing the endowed level of l_0, G can pay a state-building cost to either increase or decrease the competitiveness of market production (i.e., the percentage of citizens that can produce legally) for both periods of the game. Formally, G chooses $l_t \in \left\{\underline{l}, l_0, \bar{l}\right\}$, for $0 < \underline{l} < l_0 < \bar{l} \leq 1$ and $t \in \{1, 2\}$. If G chooses $l_t \in \left\{\underline{l}, \bar{l}\right\}$, then it pays a state-building cost $s > 0$, whereas it does not pay this cost if it chooses $l_t = l_0$. The state-building strategy also affects the future supply of bureaucratic quality, $b_2 \in (0, 1)$. If G invests to create high market competition, then bureaucratic capacity increases over time via a learning-by-doing effect. Formally, $b_2 = b_1 + \epsilon$, for an exogenous $\epsilon \in (0, 1 - b_1)$. If instead G invests to decrease market competition or does not pay the state-building cost, then $b_2 = b_1$. Throughout, $b_1 \in (0, 1)$ is exogenous.

Production. After the initial state-building strategy determines the percentage of legal producers in both periods, identical production and taxation choices occur in periods 1 and 2. Each legal producer simultane-

[3] Although states can also affect the quality of their bureaucracy, existing research argues that this occurs only over longer time horizons than are considered in the present model (e.g., creating meritocratic exam systems over centuries in parts of East Asia). However, as the model setup shows, we assume that policy decisions about the structure of the economy endogenously shape bureaucratic capacity.

ously chooses how much to produce of a single homogeneous good, $q_{i,t} \geq 0$. Because there is a continuum of producers without atoms, individual production decisions do not affect the price of the good, which instead is determined by total production among legal producers. Total production equals $Q_t \equiv \int_0^{l_t} q_{i,t} \cdot di$ and the price for the good is determined by a linear demand curve that equals $p(Q_t) = \max\{d_0 - d_m \cdot Q_t, 0\}$, for $d_0 > 0$ and $d_m > 0$. The marginal cost of production equals $c(q_{i,t}) \geq 0$.[4] This yields before-tax profits for each legal producer equal to $\pi_{i,t} \equiv \big[p(Q_t) - c(q_{i,t})\big] \cdot q_{i,t}$.

Taxation and selling decisions. G then proposes an individual-specific tax rate $\tau_{i,t} \in [0, 1]$ to each legal producer, who simultaneously respond by selling their endowment in the formal or the informal sector. Non-legal producers' only choice is to engage in informal economic activities, and are not strategically relevant actors in the game. For any producer, selling in the formal sector yields consumption $(1 - \tau_{i,t}) \cdot \pi_{i,t}$ and selling in the informal sector yields consumption $(1 - T_i) \cdot \pi_{i,t}$. The parameter T_i captures the transaction costs of selling outside the government's reach. This economic exit option is individual-specific and is independently drawn for each citizen from a smooth density function $F(T_i)$ with positive support on $[0, 1]$ and probability density function $f(T_i)$. Correspondingly, citizens' mean transaction cost to selling in the informal sector is:

$$\overline{T} \equiv \int_0^1 T_i \cdot dF\big(T_i\big) \tag{1}$$

G has complete information about the value of the economic exit option for $v(\cdot) \in (0, 1)$ percent of legal producers, and is completely uninformed for the remaining $1 - v$. These two groups of producers are respectively referred to as "visible" and "hidden" citizens.[5] Two parameters affect the percentage of legal producers that are visible and formalize the three assumptions stated in the previous section. Assumption 1 is that v strictly decreases in the percentage of legal producers, $\frac{dv}{dl_t} < 0$, because it is more difficult for governments to monitor production in more competitive markets. Assumption 2 states that v strictly increases in bureaucratic quality b_t, $\frac{dv}{db_t} > 0$, because higher-quality bureaucracies are better at gathering information about production. Assumption 3 is that greater bureaucratic capacity strictly mitigates the negative effect of more legal producers on v, $\frac{d^2v}{dl_t db_t} > 0$, because higher-quality bureaucracies also mitigate the challenge of

[4] Additionally, $c(\cdot)$ is a smooth and bounded function with $c(0) = 0$, $c' > 0$, and $c'' > 0$.

[5] Because T_i is constant across periods, the same citizens are hidden and visible in periods 1 and 2. Following period 1, G does not learn about T_i among hidden citizens.

collecting production information in more competitive markets.[6]

Consumption. In each period, all tax revenue is used to fund a public good valued at $\alpha > 0$ by the government and by all citizens. As a public good, every citizen receives it regardless of whether it produces in the formal or informal sector. To reduce the number of moving pieces in the model, this implicitly assumes the executive is constrained from diverting public revenues to private rents. Additionally, G faces a $p \in (0, 1)$ percent chance of losing power between periods 1 and 2. If it loses power, then an identical governing actor takes power in period 2 and faces the same taxation decisions. Formally, in period 2, an identical actor G_2 makes the strategic decisions for the government in period 2 if the original government G loses power following period 1.

Overall, citizens consume the public good and after-tax profits from private production in each period, and these amounts are unaffected by whether or not G loses power after period 1. This yields total consumption for each citizen of $\sum_t \left\{ \left[1 - \left[\gamma_{i,t} \cdot \tau_{i,t} + (1 - \gamma_{i,t}) \cdot T_i\right]\right] \cdot \pi_{i,t} + R_t \cdot \alpha \right\}$, where $\gamma_{i,t}$ is an indicator variable that equals 1 if citizen i sells in the formal sector in period t and 0 if it instead sells in the informal sector. Revenues in period t are $R_t = \int_{\Gamma_t} \tau_{i,t} \cdot q_{i,t} \cdot di$, where Γ_t is the set of producers that sell in the formal sector in period t. The government's only source of consumption is the public good. Therefore, for the initial government, expected consumption is $\left(R_1 + p \cdot R_2\right) \cdot \alpha - \mu \cdot s$, where μ is an indicator variable that equals 1 if $l_t = \left\{\underline{l}, \bar{l}\right\}$ and 0 if $l_t = l_0$.

Sequence of moves. In sum, the sequence of moves is:

- Before period 1: G chooses a state-building strategy.
- Period 1:
  - Each citizen i chooses how much to produce.
  - G proposes a tax rate for each citizen.
  - Each legal producer decides whether to sell in the formal or informal sector.
- Between periods 1 and 2: G loses power with probability p.
- Period 2: Same sequence of choices as in period 1.

[6]Two Inada-type restrictions are $\lim_{b_t \to 0} \frac{dv(l_t, b_t)}{dl_t} = -\infty$ and $\lim_{b_t \to 1} \frac{dv(l_t, b_t)}{dl_t} = 0$. Furthermore, $v(\cdot)$ is smooth in its arguments.

3.3 Analysis

The key theoretical result is that a demand shock only causes long-run equilibrium revenues to increase if bureaucratic supply is high. If instead supply is low, then demand shocks may cause the government to engage in bad state-building—limiting market competition to boost short-term revenues at the expense of long-term revenues and economic output.[7] The analysis generates this result in five steps. First, it solves for equilibrium revenues. Second, it solves for the unique symmetric equilibrium production decisions. Third, it shows how the level of market competition and bureaucratic supply interact to affect equilibrium revenues. Fourth, it analyzes the government's initial state-building decision. Finally, it examines the effects of demand shocks on the state-building decision. Appendix Section C proves all the formal statements.

Revenues: Taxation and selling decisions. G faces different taxation considerations for visible and hidden producers. For the v percent of visible producers, G optimally sets an individual-specific tax rate $\tau^v_{i,t}$ that makes each producer indifferent between producing in the formal versus informal sector, $(1-\tau^v_{i,t})\cdot q_{i,t} = (1-T_i)\cdot q_{i,t}$. This implies that G extracts the maximum taxes possible from each visible citizen conditional on inducing each visible citizen to sell on the formal market. Therefore, $\tau^{v*}_i = T_i$. As expected, G levies a higher tax rate upon visible citizens with weaker economic exit options, i.e., higher T_i.[8] This also implies that the average tax rate levied upon legal producers is:

$$\overline{\tau}^{v*} \equiv \overline{T}, \tag{2}$$

with $\overline{T}$ defined in Equation 1.

For the $1-v$ percent of citizens that are hidden, G cannot profitably deviate from choosing the constant tax rate τ^h that maximizes expected revenues. Any individual with a low-valued economic exit option, $T_i > \tau^h$, will produce in the formal sector, whereas producers with low transaction costs $T_i < \tau^h$ will sell on the informal market. Therefore, in expectation, $1-F(\tau^h)$ percent of individuals for whom G is uninformed will produce formally. This yields a tradeoff for G: higher τ^h yields more revenues from hidden citizens that sell on the formal market, but will cause more hidden citizens to exit to the informal sector. Solving for

[7] See Queralt et al. (2015) for an example of what one type of "bad" statebuilding might look like—mercantilist economic policies.

[8] This calculus is identical in the two periods, which is why τ^{v*}_i does not contain a time subscript.

the first-order condition of the revenue objective function $\left[1 - F(\tau^h)\right] \cdot \tau^h \cdot Q_t$ implicitly characterizes the optimal tax rate to offer to hidden citizens:

$$\underbrace{1 - F(\tau^{h*})}_{\text{MB: More revenue from tax compliers}} = \underbrace{\tau^{h*} \cdot f(\tau^{h*})}_{\text{MC: Fewer tax compliers}} \tag{3}$$

These considerations yield per-period equilibrium revenues:

$$R_t^* = \left[v(l_t, b_t) \cdot \overline{\tau}^{v*} + \left[1 - v(l_t, b_t)\right] \cdot \left[1 - F(\tau^{h*})\right] \cdot \tau^{h*}\right] \cdot Q_t, \tag{4}$$

Among the v percent of visible producers, everyone complies with the tax by producing in the formal sector. The equilibrium tax differs based on individuals' economic exit option, although the amount of revenue raised can be summarized by the average tax rate $\overline{\tau}^{v*}$ defined in Equation 2. Among the $1 - v$ of hidden producers, there is imperfect compliance with the tax rate—and compliance depends on individuals' economic exit option—and they all pay the same tax rate, τ^{h*}.

Production. The production phase yields similar results as in Cournot production games: more legal producers yield lower profits for each legal producer individually, but higher total production.[9] Lemma 1 states equilibrium production amounts and relates equilibrium production to the extent of market competition. Part b follows because the direct effect of adding a marginal legal producer on increasing equilibrium production dominates the indirect effect in which more legal producers decrease equilibrium production because a lower price for the good decreases the marginal benefit of production for each producer. Notably, production decisions do not depend on expectations about the tax rate because each legal producers' consumption is proportional to its production regardless of whether it sells on the formal or the informal market.

Lemma 1 (Equilibrium production)**.**

Part a. *The unique symmetric production choice by each legal producer is* $q_{i,t} = q^* \in \mathbb{R}_{++}$ *satisfying:*

$$\underbrace{p(l_t \cdot q^*) - c(q^*)}_{\textit{MB: More sales}} = \underbrace{c'(q^*) \cdot q^*}_{\textit{MC: Higher costs}}$$

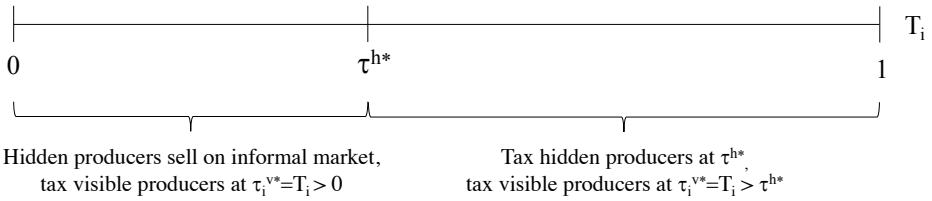
Total production that can potentially be sold in the formal sector is $Q_t = Q^* \equiv l_t \cdot q^*$.

[9] The inability of atomistic producers to affect equilibrium prices motivates several changes from the standard Cournot setup.

Part b. *Each producers' output strictly decreases in l_t, but total output strictly increases in l_t. Formally, $\frac{dq^*}{dl_t} < 0$ and $\frac{d\tilde{Q}^*}{d_t} > 0$.*

Bureaucratic supply, market competition, and their interaction. Given equilibrium production, taxation, and selling decisions, we can analyze how bureaucratic supply and the amount of market competition individually and jointly affect equilibrium revenues. Figure 5 and Lemma 2 examine supply. An increase in bureaucratic capacity increases equilibrium revenues by increasing the percentage of visible producers (Assumption 2). For a given T_i, the government accrues more tax revenues from each visible producer than from each hidden producer because it can price-discriminate in its tax rate. Among producers that would comply with τ^{h*} (i.e., sell in the formal rather than informal market) because they have low-valued economic exit options, the government collects more from each visible than each hidden producer because it can tax at $\tau_{i,t} > \tau^{h*}$. Among producers that would not comply with τ^{h*}, the government accrues more from visible rather than from hidden producers because it can set $\tau_{i,t} < \tau^{h*}$ low enough to induce visible producers to sell formally, whereas hidden producers with high-valued economic exit options will choose informal production.

Figure 5: Revenue Difference Between Visible and Hidden Producers



Lemma 2 (Supply effect)**.** *An increase in bureaucratic supply b_t strictly raises equilibrium revenues in period t, R_t^*, because G collects more revenue from each visible producer than from each hidden producer.*

Lemma 3 shows that an increase in market competition, i.e., the percentage of citizens that have the option to produce legally in the formal sector, exerts two countervailing effects on equilibrium revenues. On the one hand, market competition raises equilibrium revenues by increasing taxable output. On the other hand, an increase in legal producers decreases the percentage of visible citizens (Assumption 1) because greater market competition tends to be harder to tax.

Lemma 3 (Market competition effects)**.** *An increase in market competition l_t affects equilib-*

rium revenues in period t, R_t^*, through two effects:

1. ***Part a.*** *Strictly raises R_t^* by increasing taxable output.*
2. ***Part b.*** *Strictly lowers R_t^* by decreasing the percentage of visible producers.*

Lemma 4 shows that bureaucratic supply positively interacts with both effects of market competition. First, the direct effect of higher l_t (Lemma 3, part a) raises equilibrium tax revenues by increasing taxable output. This revenue-enhancing effect is larger for visible producers, whose percentage increases in b_t. As described for Lemma 2, the government can price-discriminate for visible producers and therefore reaps greater tax gains from formal-sector production by visible compared to hidden producers. Second, greater bureaucratic capacity diminishes the magnitude of the market competition effect that decreases the percentage of visible producers (Lemma 3, part b). Higher b_t is assumed to mitigate the negative effect of l_t on v. Greater market competition creates taxation difficulties for all governments, but governments with better bureaucracies are better equipped to handle the challenge (Assumption 3).

This logic also establishes the overall effect of market competition on equilibrium revenues in a given period t. If bureaucratic capacity is weak, then the negative effect of higher l_t dominates and more competitive economies yield lower tax revenues in period t. If bureaucratic capacity is strong, then the positive effects of higher l_t dominate and more competitive economies yield higher tax revenues in period t.

> **Lemma 4** (Interactive effects)**.** *If supply is high in period t, then equilibrium revenues in period t strictly increase in the extent of market competition. If supply is low in period t, then equilibrium revenues in period t strictly decrease in the extent of market competition. Formally, there exists a unique threshold $\tilde{b} \in \mathbb{R}$ such that $\frac{dR_t^*}{dl_t}\Big|_{b_t>\tilde{b}} > 0$ and $\frac{dR_t^*}{dl_t}\Big|_{b_t<\tilde{b}} < 0$.*

State-building investment. Lemma 4 highlights two possible scenarios that G may face when choosing its state-building strategy. First, increasing market competition will raise equilibrium revenues in each of the two periods. This occurs if initial bureaucratic capacity b_1 is high. Formally, if $b_1 > \tilde{b}$ and G chooses $l_t = \bar{l}$, then $b_2 = b_1 + \epsilon > \tilde{b}$. Therefore, in both periods, bureaucratic capacity is in the range for which higher market competition raises equilibrium revenues in that period.

The second possibility is that *decreasing* market competition will raise equilibrium revenues in period 1. Given Lemma 4, if $b_1 < \tilde{b}$, then period 1 revenues are maximized by decreasing market competition (short-term effect). However, to load the dice in favor of G preferring to increase market competition, we assume that the bureaucratic learning effects ϵ from promoting high market competition are large (Assumption B.1).

Specifically, regardless of the value of b_1—choosing high market competition $\big($i.e., $l_t = \bar{l}\big)$ maximizes total revenue between periods 1 and 2 (long-term effect).

Lemma 5. *For any initial level of bureaucratic capacity b_1, total revenues are maximized by choosing the high level of market competition. Formally, for any b_1 :*

$$\frac{R_1^*\big(\bar{l}, b_1\big) + R_2^*\big(\bar{l}, b_1 + \epsilon\big)}{2} > \max\Big\{R_1^*\big(\underline{l}, b_1\big), R_1^*\big(l_0, b_1\big)\Big\}.$$

Ambiguous effects of demand shocks. How does the value of public goods, α, affect this initial state-building decision? Higher α increases the value of revenues, and therefore increases the likelihood that G will be willing to pay s to alter the structure of the economy—which will in turn impact revenue collection. However, an increase in α does not determine the *direction* in which G will move market competition. This is the crucial difference in results between our model and existing theories. If initial bureaucratic capacity, b_1, and the probability of retaining office in period 2, p, are both low, then it will be optimal for G to engage in bad state-building: distorting market competition, which lowers the welfare of its citizens and decreases long-run revenues. The reason is that G weighs period 1 revenues more highly than period 2 revenues, given the possibility of losing office. Therefore, in countries that inherit low supply of bureaucratic monitoring ability, the lure of a short-term revenue boost can undermine fiscal capacity in the long term. Table 1 summarizes these implications.

Table 1: How Demand Shocks Affect State-Building Strategy

	Low b and low p	**High b and/or high p**
Low α	Do not alter economic structure	
High α	Reduce market competition	Raise market competition

Equilibrium and summary of implications. Proposition 1 summarizes the formal discussion by presenting the unique subgame perfect Nash equilibrium strategy profile with symmetric production strategies.

Proposition 1 (Equilibrium strategy profile)**.**

- ***State-building at outset of game:***
  - *G chooses to raise market competition ($l_t = \bar{l}$) if:*
    - *Bureaucratic capacity is high ($b > \tilde{b}$) and there is high demand for public goods ($\alpha > \overline{\alpha}$, for $\overline{\alpha} > 0$ defined in the proof).*
    - *Bureaucratic capacity is low ($b < \tilde{b}$), the probability of losing power is low ($p > \tilde{p}$), and there is high demand for public goods ($\alpha > \overline{\alpha}$).*

- *G chooses to lower market competition ($l_t = \underline{l}$) if bureaucratic capacity is low ($b < \tilde{b}$), the probability of losing power is high ($p < \tilde{p}$), and there is high demand for public goods ($\alpha > \underline{\alpha}$, for $\underline{\alpha} > 0$ defined in the proof).*
- *G chooses not to affect market competition ($l_t = l_0$) otherwise.*

- ***Production in both periods:*** *Each legal producer chooses $q_{i,t} = q^*$, for q^* defined in Lemma 1.*
- ***Taxation in both periods:***
  - *G offers $\tau_{i,t} = T_i$ to each visible citizen.*
  - *G offers $\tau_{i,t} = \tau^{h*}$ to each hidden citizen, for τ^{h*} defined in Equation 3.*
- ***Selling in both periods:***
  - *If $\tau_{i,t} \leq T_i$, then sell on formal market.*
  - *If $\tau_{i,t} > T_i$, then sell on informal market.*

In sum, the key model implication challenges the conventional wisdom linking higher demand to state-building posited by Besley and Persson (2011) and many others: economic gains and fiscal capacity go hand-in-hand. This argument is true in the context of high bureaucratic capacity. However, given the difficulties of taxing market-based activity, rulers may respond to demand shocks by engaging in bad state-building in circumstances of low bureaucratic capacity. Economically inefficient policies can promote short-term revenues at the expense of long-term fiscal capacity improvements.

4 Measuring Demand and Supply

The main theoretical implication from the model—high demand and high supply positively interact to produce fiscal capacity gains—matches intuitive perceptions of which countries experienced huge fiscal expansion and when. Many have discussed Western Europe, its offshoots, and East Asia as having more effective institutional legacies than other parts of the world, and the 20th century also exhibited increasing demand for state spending, driven in particular by two world wars and associated military rivalries. However, rather than rely solely on rough conceptualizations of demand and supply, we present additional associational evidence across a broad sample using plausible empirical measures of these concepts from the literature. Regressing fiscal intake on interactions between various demand (war, majority rule) and supply (civil registration, executive constraints, education) measures provides cross-national evidence consistent with the thesis that the

conjunction of supply and demand can help to explain why the West and East Asia exhibited a great fiscal divergence from the rest of the world in the 20th century, but not before. Although standard causal inference concerns apply, as demand and supply are themselves endogenous to many historical factors for which data are scarce, we control for country and year fixed effects to guard against many generic confounding concerns when presenting the associational patterns.

4.1 Data

Dependent variable and sample. The dependent variable is the same as used in Section 1: central government revenues per capita in gold ounces. We log the variable because it is right-skewed. The unit of analysis is country-years. The core sample includes 87 countries and consists of all country-years prior to 1971 with available fiscal data (including colonies with data), although missing data on other variables reduces the number of observations in some specifications. Appendix Table B.1 provides summary statistics.

Supply and demand measures. Measuring macro factors such as institutional supply and demand for revenues is complicated by the lack of consensus in the literature regarding which factors are most important, and by questions of operationalization and data availability (Besley and Persson, 2009; Lee, 2017). Table 2 examines three demand measures and three supply measures that, in addition to corresponding with the conceptualizations of demand and supply from the literature, each meet two criteria: reasonably wide coverage for our sample of countries and time period, and are time-varying. The contribution of our fiscal data that it has broad country and time coverage relative to the existing literature, and choosing supply and demand measures with limited spatial or temporal coverage would mitigate that advantage. We also focus only on time-varying factors because we predict not only divergence among countries, but also at specific periods of time. Future research may find it beneficial to assess other possible measures of supply and demand, but the six that we analyze best match these conceptual, practical, and theoretical considerations.

For supply, to measure state information capacity, we use a count measure of the number of years since a country/colony introduced a mandatory civil registration system for births, marriages, and deaths. Having a civil registration system is essentially a precondition for direct taxation because otherwise bureaucrats face difficulties simply identifying the citizenry. Brambor et al. (2016) provide most data points, which we supplement for some countries with missing data. Broadly, the measure accords with intuitive conceptions

regarding cross-country and temporal variance in the history of institutional capacity. Whereas Sweden, the United Kingdom, and France all had registration systems before 1800, Yemen and Haiti only implemented mandatory systems in the 1990s. To measure constraint on political leaders, we use the liberal democracy index from the Varieties of Democracy dataset (V-Dem; Coppedge, 2016), which corresponds to the extent of constraints on the executive. We prefer this measure to the similar executive constraint variable from Polity IV (Polity, 2012) because Polity does not include colonies. The third supply measure is the level of education within a society. We use van Leeuwen and Li's (2014) data on average years of educational attainment.

Following the focus in existing research on international wars, one demand measure is an indicator for whether or not the country participated in international warfare in the previous year using the Correlates of War dataset (Sarkees and Wayman, 2010). The literature also posits that revenue increases in wartime tend to be sustained afterwards, leading to state growth through a "ratchet" effect (Peacock and Wiseman, 1961). For example, Scheve and Stasavage (2016) argue that the world wars provided the consensus needed in Western European countries to construct welfare states, which have lasted long since the wars ended. The second demand measure captures this ratchet effect by using a count measure of cumulative years a state participated in an interstate war since 1815. Finally, to capture arguments about political participation and demand for tax revenue, we analyze an indicator variable for whether a majority of adult males are legally enfranchised. V-Dem provides data on legal enfranchisement since 1900. For pre-1900 years, we code country-years as majority rule based on Boix, Miller and Rosato's (2013) democracy data.

Statistical models. We present results from OLS models that include country and year fixed effects and cluster standard errors by country. Indexing countries by i and years by t, Table 2 estimates:

$$ln(Revenue/pop.)_{i,t} = \beta_S \cdot Supply_{i,t} + \beta_D \cdot Demand_{i,t} + \beta_{SD} \cdot Supply_{i,t} * Demand_{i,t} + \beta_i + \beta_t + \epsilon_{i,t}, \quad (5)$$

where the supply and demand measures vary by column using the variables described above, β_{SD} is the coefficient estimate for the interaction term and provides the main parameter of interest, β_i are country fixed effects, β_t are year fixed effects, and $\epsilon_{i,t}$ is a random error term. The year fixed effects account for secular changes in revenue collection over time. The territory fixed effects account for unit-specific sources of heterogeneity. Appendix Table C.3 estimates similar models but that include several time-varying covariates

that account for various country-year-specific sources of heterogeneity.

4.2 Core Results

Table 2 provides the main results by interacting each demand measure with each supply measure, for a total of nine specifications. Among the measures that meet the criteria outlined above, we are agnostic regarding which constitute the "main" measure of each concept, which is why we present all combinations. In six of the nine specifications, the estimate for the variable that interacts the supply and demand measure is positive and statistically significant at 5%, with an additional column significant at 10%. Furthermore, in no specification is either the lower-order supply or demand term positive and statistically significant, which suggests that high levels of either supply or demand only generate high revenues when interacted with each other. Appendix Tables C.1 and C.2 show this in a different way by analyzing each supply and demand term independently. Only the war variables consistently covary positively and significantly with revenues, although Table 2 suggests this relationship may simply be an artifact of countries with high supply being more likely to fight wars during our time sample.

To illustrate the magnitude of the coefficient estimates, Column 1 shows that the expected revenue intake for a territory-year with a war in the previous year (high demand) and 100 years of a civil registration system (high supply) is 2.8 times higher than a territory year lacking either of these factors. By contrast, the corresponding figure is 1.1 for high demand with low supply and 2.5 times for high supply with low demand.

Although controlling for territory and year fixed effects guards against many common confounding considerations, there may still be concern that the results are driven by country-specific time trends. Three possibilities are that our findings are simply tracking increases in GDP over time—despite the fact that income spiked in Western Europe at least a half century before the great fiscal divergence occurred (Figure 3)—that they reflect demographic changes, or that they are an artifact of including colonies in the sample. Appendix Table C.3 addresses these considerations by adding three covariates to every specification in Table 2: logged income per capita and logged population (Maddison, 2007), and an indicator for whether the territory was under colonial rule. The results from Table C.3 are consistent with our argument, although somewhat less supportive that Table 2 because only five of the interaction terms attain any level of statistical

significance. Unreported results show that these differences from Table 2 only arise when including the GDP per capita covariate in the specifications, whereas controlling for population and/or independence minimally affects the estimates.

Table 2: Assessing Supply and Demand Interaction Effects

	DV: Logged central gov. revenue per capita in gold oz.								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
War*Reg. years	0.00211***								
	(0.000652)								
War*Lib. demo.		0.250							
		(0.186)							
War*Education			0.0670***						
			(0.0161)						
War stock*Reg. years				0.00215***					
				(0.000738)					
War stock*Lib. demo					0.327*				
					(0.188)				
War stock*Education						0.0698***			
						(0.0163)			
Maj. rule*Reg. years							0.00539***		
							(0.00201)		
Maj. rule*Lib. demo								1.200	
								(0.813)	
Maj. rule*Education									0.172***
									(0.0377)
War	0.0970	0.0637	-0.0553						
	(0.115)	(0.105)	(0.105)						
War stock				0.120	0.0665	-0.0430			
				(0.120)	(0.103)	(0.106)			
Majority rule							-0.287	-0.152	-0.538***
							(0.182)	(0.207)	(0.194)
Reg. system years	0.00928			0.00921			0.00314		
	(0.00639)			(0.00642)			(0.00732)		
Liberal democracy index		0.311			0.312			-1.118	
		(0.513)			(0.512)			(1.139)	
Avg. years of education			0.127			0.126			-0.0410
			(0.0876)			(0.0873)			(0.0915)
Territory-years	4,632	3,886	4,993	4,632	3,886	4,993	4,388	3,657	4,749
Territories	68	87	81	68	87	81	65	83	78
R-squared	0.745	0.756	0.758	0.746	0.757	0.759	0.761	0.768	0.779
Territory FE?	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE?	YES	YES	YES	YES	YES	YES	YES	YES	YES

Notes: Table 2 presents OLS regression estimates with standard errors clustered by territory, and territory and year fixed effects in every specification. *** p<0.01, ** p<0.05, * p<0.1.

However, closer data inspection shows that the differences between Tables 2 and C.3 are likely not driven by GDP per capita itself, and instead by the vast amount of missing GDP data that drastically alters the sample. Of the 3,642 country-years with revenue data before 1971 among countries outside of Western Europe, offshoots, or East Asia, 55% are missing GDP data. By contrast, missingness is limited among WE/EA: less than 2% of the 1,850 country-years. Therefore, given the limited data coverage of historical GDP data, controlling for this factor eliminates considerable relevant variation in our explanatory factors by dropping so many observations outside of WE/EA. Appendix Table C.4 shows this in a different way by omitting the GDP control but using the same sample as in Table C.3. The similarity of the findings between Tables C.3

and C.4 suggest that the differences from Table 2 arise because of missing data problems rather than because changes in GDP per capita drive the results. Unfortunately, however, the limitations of historical GDP data make it impossible to more definitively rule out this alternative explanation.[10]

Finally, one important limitation of the main revenues variable is that it uses nominal rather than real exchange rates that adjust for differences in purchasing power. Although this affects the precision of the estimates in Table 2, Appendix Sections A.2 and A.3 discuss why this factor is unlikely to overturn the results.

5 Discussion and Conclusion

The early 20th century was a time of considerable, and at times disruptive, political change. A series of mass-mobilization wars affected much of the world and the spread of democracy created new expectations about the role of the state and the appropriate level of redistribution. These changes expanded the demands that governments made of their citizens and empowered political constituencies that supported those demands. However, using previously unanalyzed data, we document that these demands yielded massive fiscal expansion only in Western Europe, offshoots, and East Asia, beginning roughly around World War I. This created a historically important—and unprecedented—divergence in fiscal intake between these countries and the rest of the world. These results partly support various "demand" and "supply" hypotheses from existing fiscal capacity research. Demand measures such as conflict and political participation are positively associated with increases in fiscal extraction, as are increases in supply measures such as bureaucratic knowledge gathering, education, and political constraints. However, these effects appear to operate only under previously unacknowledged scope conditions.

This analysis generates important implications for historical research on both Western Europe and the rest of the world. Within Europe, the results suggest an alternative interpretation of why the world wars and associated franchise expansion were significant. Although these demand shocks coincided with historically unprecedented mobilization of social resources, it is difficult to claim that fundamental subsequent changes

[10]Other GDP datasets exhibit greater limitations in historical coverage (especially outside Western Europe) than Maddison (2007), such as Penn World Table (Feenstra, Inklaar and Timmer, 2015) and the World Inequality Database (Alvaredo et al., 2018) that draws primarily from Thomas Piketty's research.

in the West occurred mainly because these demand shocks were so large. Instead, mass mobilization resulted these shocks occurring in societies with a specific set of institutions that enabled responding to these crises via high taxation and spending. Conversely, our theory also casts doubt on the usefulness of applying Eurocentric models—such as Tilly's (1992) thesis that war contributes to state-building—to explaining state-building outside of Europe. For example, Herbst (2000) discusses how African states collectively decided after independence to accept European-drawn boundaries, avoiding wars to redraw the borders. Using terms from our model, this eliminated the type of conditions that led to high demand in earlier periods of European history in which "the near-constant threat of war prompted most states to become stronger in order to survive" (Herbst, 2000, 113). Problematically, however, this argument implies that more frequent warfare would have contributed to fiscal capacity building. Our results instead show that high demand in the context of low supply will tend not to promote fiscally effective states. The general absence of high bureaucratic supply makes the European model based on warfare generating high demand inapplicable for most of the non-European world.

The empirical analysis also offers new directions for future research. Our empirics rely heavily on factors identified in the existing literature, as our measures of supply and demand are taken (directly or indirectly) from existing studies. Future work could potentially examine the state formation process in light of the interactive relationship, identifying new factors that have not been stressed in existing studies. More broadly, detailed historical analysis is necessary to fully understand the complicated process by which demand shocks can transform existing institutions.

References

Acemoglu, Daron and James A. Robinson. 2006. *Economic origins of dictatorship and democracy*. Cambridge University Press.

Aidt, Toke S, Jayasri Dutta and Elena Loukoianova. 2006. "Democracy comes to Europe: franchise extension and fiscal outcomes 1830–1938." *European Economic Review* 50(2):249–283.

Alvaredo, Facundo, Lucas Chancel, Thomas Piketty, Emmanuel Saez and Gabriel Zucman. 2018. "World Inequality Database." Available at http://wid.world. Accessed 4/19/18.

Andersson, Per F. 2017. "Democracy, Urbanization, and Tax Revenue." *Studies in Comparative International Development* pp. 1–40.

Ansell, Ben W and David J Samuels. 2014. *Inequality and Democratization*. Cambridge University Press.

Avelino, George, David S Brown and Wendy Hunter. 2005. "The effects of capital mobility, trade openness, and democracy on social spending in Latin America, 1980–1999." *American Journal of Political Science* 49(3):625–641.

Barbieri, Katherine, Omar Keshk and Brian Pollins. 2008. "Correlates of war project trade data set codebook." *Codebook Version* 2.

Bates, Robert H. 1981. *Markets and States in Tropical Africa*. Berkeley: University of California Press.

Bean, Richard. 1973. "War and the Birth of the Nation State." *The Journal of Economic History* 33(01):203–221.

Beramendi, Pablo, Mark Dincecco and Melissa Rogers. 2018. "Intra-Elite Competition and Long-Run Fiscal Development." *Journal of Politics* .

Besley, Timothy and Torsten Persson. 2009. "The Origins of State Capacity: Property Rights, Taxation, and Politics." *The American Economic Review* 99(4):1218–1244.

Besley, Timothy and Torsten Persson. 2011. *Pillars of Prosperity: The Political Economics of Development Clusters*. Princeton University Press.

Boix, Carles. 2001. "Democracy, development, and the public sector." *American Journal of Political Science* pp. 1–17.

Boix, Carles, Michael Miller and Sebastian Rosato. 2013. "A Complete Data Set of Political Regimes, 1800–2007." *Comparative Political Studies* 46(12):1523–1554.

Brambor, Thomas, Agustín Goenaga, Johannes Lindvall and Jan Teorell. 2016. "The Lay of the Land: Information Capacity and the Modern State." *STANCE Working Paper Series* 2016(2).

Brewer, John. 1990. *The sinews of power: War, money, and the English state, 1688-1783*. Harvard University Press.

Broadberry, Stephen and Bishnupriya Gupta. 2006. "The early modern great divergence: wages, prices and economic development in Europe and Asia, 1500–1800." *The Economic History Review* 59(1):2–31.

Centeno, Miguel Angel. 2002. *Blood and debt: War and the nation-state in Latin America*. Penn State Press.

Chaudhry, Kiren Aziz. 1993. "The myths of the market and the common history of late developers." *Politics & Society* 21(3):245–274.

Coppedge, Michael, et. al. 2016. "V-Dem [Country-Year/Country-Date] Dataset v6. Varieties of Democracy (V-Dem) Project.".

de Soto, Hernando. 2000. *The Mystery of Capital: Why Capitalism Triumphs in the West and Fails Everywhere Else*. New York: Basic Books.

Denzel, Markus A. 2010. *Handbook of world exchange rates, 1590-1914*. Ashgate Publishing, Ltd.

Dincecco, Mark. 2009. "Fiscal centralization, limited government, and public revenues in Europe, 1650–1913." *The Journal of Economic History* 69(01):48–103.

Dincecco, Mark. 2011. *Political transformations and public finances: Europe, 1650–1913*. Cambridge University Press.

Dincecco, Mark. 2015. "The rise of effective states in Europe." *The Journal of Economic History* 75(03):901–918.

Dincecco, Mark and Mauricio Prado. 2012. "Warfare, fiscal capacity, and performance." *Journal of Economic Growth* 17(3):171–203.

Engerman, Stanley L and Kenneth L Sokoloff. 1997. "Factor Endowments, Institutions, and Differential paths of growth among new world economies." *How Latin America Fell Behind* pp. 260–304.

Evans, Peter B. 1995. *Embedded autonomy: states and industrial transformation*. Cambridge Univ Press.

Fauvelle-Aymar, Christine. 1999. "The political and tax capacity of government in developing countries." *Kyklos* 52(3):391–413.

Feenstra, Robert C., Robert Inklaar Inklaar and Marcel P. Timmer. 2015. "The Next Generation of the Penn World Table." *American Economic Review* 105(10):3150–3182.

Gardner, Leigh. 2012. *Taxing colonial Africa: the political economy of British imperialism*. Oxford University Press.

Green, Timothy. 2016. "Historical Gold Price Table." World Gold Council.

Haber, Stephen. 2006. Authoritarian Government. In *The Oxford Handbook of Political Economy*.

Harrison, Mark. 1998. "The economics of World War II: an overview." *The economics of world war II: Six great powers in international comparison* pp. 1–42.

Herbst, Jeffrey. 2000. *States and Power in Africa: Comparative Lessons in Authority and Control*. Princeton, NJ: Princeton University Press.

International Monetary Fund. 2017. "IMF Data." Available at http://www.imf.org/en/Data. Accessed 12/5/17.

Jones, Eric. 2003. *The European miracle: environments, economies and geopolitics in the history of Europe and Asia*. Cambridge University Press.

Joshi, Anuradha and Joseph Ayee. 2008. Associational Taxation: A Pathway into the Informal Sector? In *Taxation and State-Building in Developing Countries*. Cambridge University Press pp. 183–211.

Kasara, Kimuli. 2007. "Tax me if you can: Ethnic geography, democracy, and the taxation of agriculture in Africa." *American Political Science Review* 101(1):159–172.

Lee, Alexander. 2017. "Land, State Capacity and Colonialism: Evidence from India." *Comparative Political Studies* .

Lee, Melissa M and Nan Zhang. 2017. "Legibility and the informational foundations of state capacity." *The Journal of Politics* 79(1):118–132.

Levi, Margaret. 1989. *Of rule and revenue*. Univ of California Press.

Lindert, Peter H. 2004. *Growing public: Volume 1, the story: Social spending and economic growth since the eighteenth century*. Vol. 1 Cambridge University Press.

Maddison, Angus. 2007. *The world economy volume 1: A millennial perspective volume 2: Historical statistics*. Academic Foundation.

Mares, Isabela and Didac Queralt. 2015. "The non-democratic origins of income taxation." *Comparative Political Studies* 48(14):1974–2009.

Meltzer, Allan H and Scott F Richard. 1981. "A rational theory of the size of government." *Journal of political Economy* 89(5):914–927.

Mitchell, Brian. 1998. *International historical statistics: Europe 1750-1993*. Springer.

Moore, Mick. 2008. Between Coercion and Contract: Competing Narratives on Taxation and Governance. In *Taxation and State-Building in Developing Countries*. Cambridge University Press pp. 34–63.

North, Douglass C and Barry R Weingast. 1989. "Constitutions and commitment: the evolution of institutions governing public choice in seventeenth-century England." *The journal of economic history* 49(04):803–832.

Officer, Lawrence H. 2016. "Exchange Rates Between the United States Dollar and Forty-one Currencies." MeasuringWorth.

Peacock, Alan T and Jack Wiseman. 1961. Front matter, The Growth of Public Expenditure in the United Kingdom. In *The growth of public expenditure in the United Kingdom*. Princeton University Press pp. 32–0.

Polity, IV. 2012. "Polity iv project: Political regime characteristics and transitions, 1800-2012." *On-line (http://www. systemicpeace. org/polity/polity4. htm)* .

Pomeranz, Kenneth. 2009. *The great divergence: China, Europe, and the making of the modern world economy*. Princeton University Press.

Queralt, Didac. 2016. The Legacy of War on Fiscal Capacity. Technical report Working Paper.

Queralt, Didac et al. 2015. "From Mercantilism to Free Trade: A History of Fiscal Capacity Building." *Quarterly Journal of Political Science* 10(2):221–273.

Sarkees, Meredith Reid and Frank Whelon Wayman. 2010. *Resort to War: 1816-2007*. Washington DC: CQ Press.

Saylor, Ryan and Nicholas C Wheeler. 2017. "Paying for War and Building States: The Coalitional Politics of Debt Servicing and Tax Institutions." *World Politics* 69(2):366–408.

Scheve, Kenneth and David Stasavage. 2016. *Taxing the Rich: A History of Fiscal Fairness in the United States and Europe*. Princeton University Press.

Scott, James C. 2009. *The art of not being governed: An anarchist history of upland Southeast Asia*. Yale University Press New Haven, CT.

Stasavage, David. 2005. "Democracy and education spending in Africa." *American journal of political science* 49(2):343–358.

Summers, Robert and Alan Heston. 1991. "The Penn World Table (Mark 5): an expanded set of international comparisons, 1950–1988." *The Quarterly Journal of Economics* 106(2):327–368.

Thies, Cameron G. 2004. "State Building, Interstate and Intrastate Rivalry: A Study of Post-Colonial Developing Country Extractive Efforts, 1975–2000." *International Studies Quarterly* 48(1):53–72.

Thies, Cameron G. 2005. "War, rivalry, and state building in Latin America." *American Journal of Political Science* 49(3):451–465.

Thies, Cameron G. 2007. "The Political Economy of State Building in Sub-Saharan Africa." *Journal of Politics* 69(3):716–731.

Tilly, Charles. 1992. *Coercion, capital, and European states, AD 990-1992*. Blackwell Oxford.

van Leeuwen, Bas and Jieli Li. 2014. Education since 1820. In *How Was Life? Global Well-Being Since 1820*, ed. Jan Luiten van Zanden. OECD Publishing pp. pp. 87 – 100.

Waterbury, John. 1993. *Exposed to Innumerable Delusions*. Cambridge University Press.

Online Appendix

Contents

List of Tables

List of Figures

A Data Appendix

A.1 Collecting the Data

The main source of data for this paper is the International Historical Statistics Database, and in particular their data central government revenue in local currency for each ear. Countries where data was given for fiscal years was associated with the calendar for which the fiscal year ended. We consolidated this data into a single file with thousands of currency units as the scale.

The local currency units were then converted into contemporary pounds. Our basic measure of historical exchange rates was the COW trade data (Barbieri, Keshk and Pollins, 2008). However, the COW data does not include data from before 1870, and data from colonizes (though of course many colonies used the mother country's currency). Since the COW data is based on market quotes, its availability is sometime patchy for smaller countries. To reduce this problem, we interpolated rates within cases in cases where there was no more than a five year gap and the difference between the rates known rates on either site of the gap was no more than 5%. Where the local currency was quoted in dollars, we converted the rate into pounds using the current dollar pound exchange rate

We further supplemented the supplemented the COW data using Denzel (2010) and Officer (2016). In addition to these sources, we used published sources such as CITE to identify periods where exchange rates were fixed. In cases cases, the fixed rate is used for the entire period. The pound revenue figures were then converted pounds into gold using the gold prices quoted in Green (2016).

The gold revenue factor data were then converted into per capita measures using the IHS population. While the IHS provides annual population data in most cases, in cases where it only provides data for census years we extrapolated data between census years, provided the gap was less than twenty years. Note that since the IHS data is all based on censuses, our measure is missing for all country years before the first census

A.2 Exchange Rate Effects?

We intend our measure to capture variation in the fiscal effort and fiscal capacity of governments, rather than changes in prices, exchange rates, or economic productivity. The use of gold equivalents puts all the per capita revenue figures on the same scale, but the use of nominal exchange rates raises the possibility that over time changes in revenue per capita may reflect changes in the foreign exchange market rather than changes in real revenue. In the short term, the data shows many sharp short term changes that clearly reflect currency revaluations.

We took three steps to palliate this problem. First, we focus only on effects before 1970, when the Nixon shock caused many currencies to float (and caused the price of gold to float as well. Due to the stability of many exchange rates for much of the pre 1969 period under the Gold Standard and Bretton Woods regimes, year to year fluctuations in exchange rates are less of a concern than at many other historical periods.

Second, we have also excluded currencies where the published exchange rate was grossly manipulated (e.g. the Soviet ruble). We did not exclude all currencies with fixed exchange rates and capital exchange rates, but rather focused on currencies where we had some evidence published exchange rates bore no relation to market supply and demand, or where the exchange differed considerably from long term trends within the country. In many cases, this meant excluding periods of instability when a country's link to gold or the dollar was changed. Note that, since our main models use country fixed effects, it is not necessary (though it would certainly be desirable) that currencies or perfectly valued. Rather, we require than any distortion caused by exchange rates remains constant over time.

Third, many of our informal comparisons focus on comparisons within colonial empires, which used the same currency or highly stable pegs. In these cases, there is no question that exchange rate fluctuations are influencing the results, since the exchange rates remains constant over time.

A.3 Prices

Even within-empire comparisons do not capture differences in prices. The ideal solution to this problem would be to normalize currencies using some index of purchasing power. Ideally, this would mean using a measure of state revenue at purchasing power parity. However, due to the rarity of reliable price data (let alone price data comparable across nations) before the late 20th century, such an approach would severely constrict the sample, and make impossible many of the historical comparisons made below.

Are these results the result of differences in purchasing power? This is impossible to test directly, since cross national purchasing power data is available only since 1950 (Summers and Heston, 1991), and after 1950 there is virtually no variation in the major supply factors identified in the literature (conflict and the franchise) within western Europe and East Asia, and the great divergence we identify had already occured. However, the differences in purchasing power are unlikely to lead to the pattern we observe. Firstly, differences in purchasing power in 1950 were modest compared to the differences in revenue that we observe. While purchasing power in South Africa was 73% more than in the UK in 1955, per capita revenue was over 400% more. In fact it unclear if there were systematic differences in purchasing power across categories of countries. Overall in 1950, average GDP purchasing power conversion factors were actually similar in Western Europe-East Asia and the rest of the world (.102 vs. .91).

In addition, static cross national differences in purchasing power are captured by the country fixed effects. To confound the divergence trend, we would have to observe divergence in purchasing power over time, with nominal revenue in Western Europe and East Asia remaining constant even as the real purchasing power of

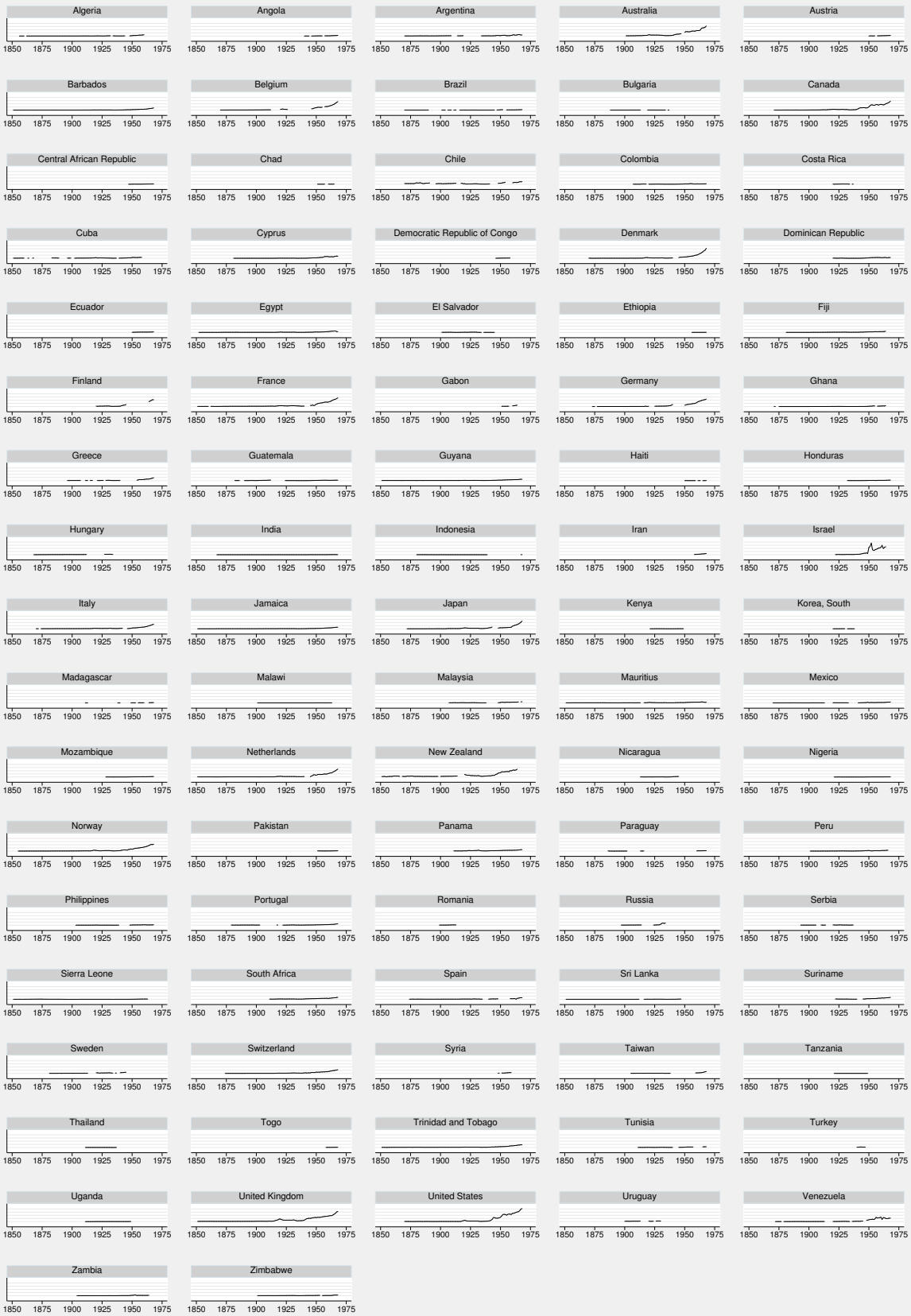
that revenue remained static. Overall, while there was divergence in purchasing power during the period for which we have data, it appears to have been modest relative to changes in revenue. While the GDP conversion factor increased by 71% in Western Europe and East Asia between 1950 and 1968, it increased by 20% in the rest of the world. In the same time period, revenue increased by 294% in Western European and East Asia and 18% in the rest of the world. (These figures include only countries with PPP data in 1950 in the Penn World Tables dataset.)

B Additional Tables and Figures for Section 1

Table B.1: Summary Statistics

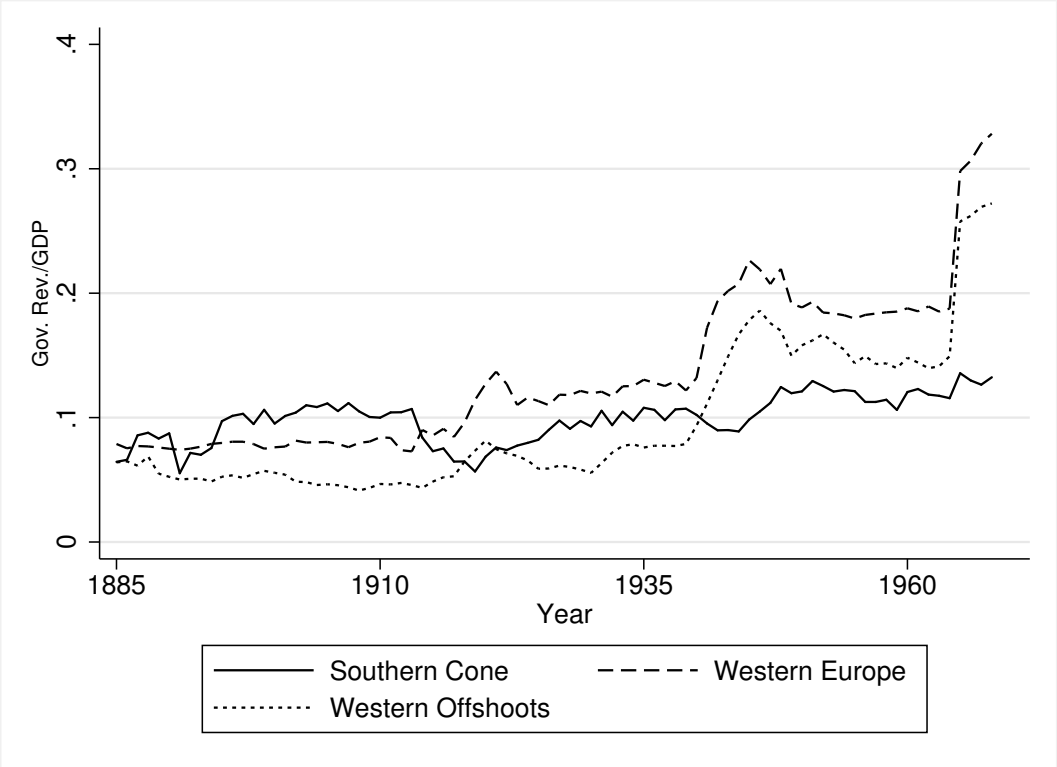
Variable	Mean	Std. Dev.	N
Log revenues/capita in gold	-2.136	1.385	5280
W. Eu. and E. Asia	0.329	0.47	5280
Post-1914	0.611	0.488	5280
War	0.112	0.315	5280
War Stock	0.111	0.314	5280
Majority legally enfranchised	0.43	0.495	5033
Reg. System Years	61.831	56.908	4432
Liberal democracy index	0.262	0.222	3832
Avg. years of education	3.287	2.708	4839
Log GDP/capita	7.714	0.757	3337
Log Population	8.346	1.798	5280
Independent	0.593	0.491	5280

Figure B.1: Revenues per Capita in Gold by Territory, 1850–1969



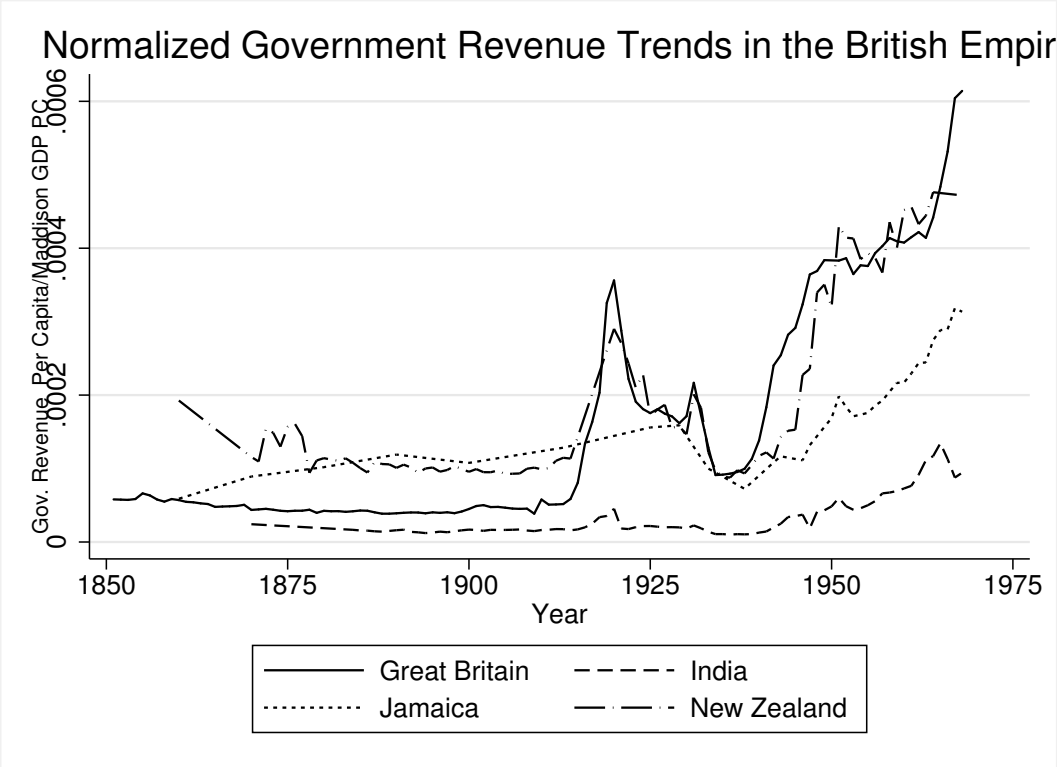
Graphs by cname

Figure B.2: Revenues/GDP from Beramendi et al., 1885–1969



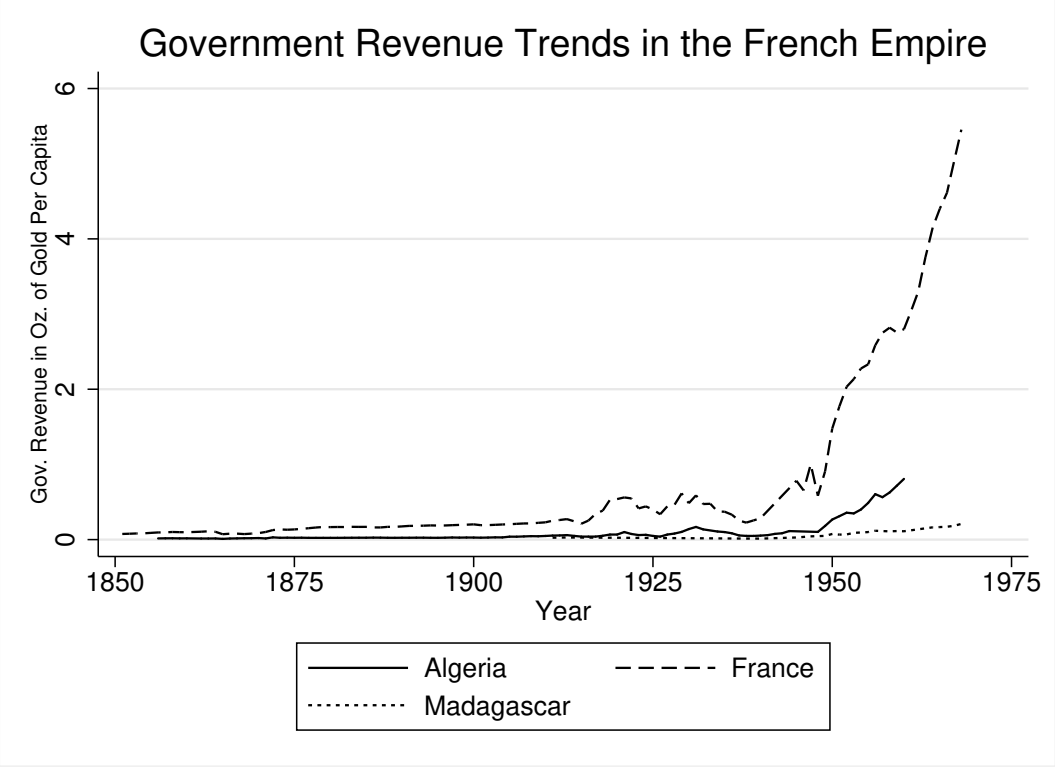
Note: The lines show estimated central government revenue in ounces of gold (converted at nominal exchange rates) divided by per capita GDP estimates in constant 1990 dollars from Beramendi, Dincecco and Rogers (2018).

Figure B.3: Per Capita Revenue in Selected British Empire Countries Relative to GDP, 1850–1969



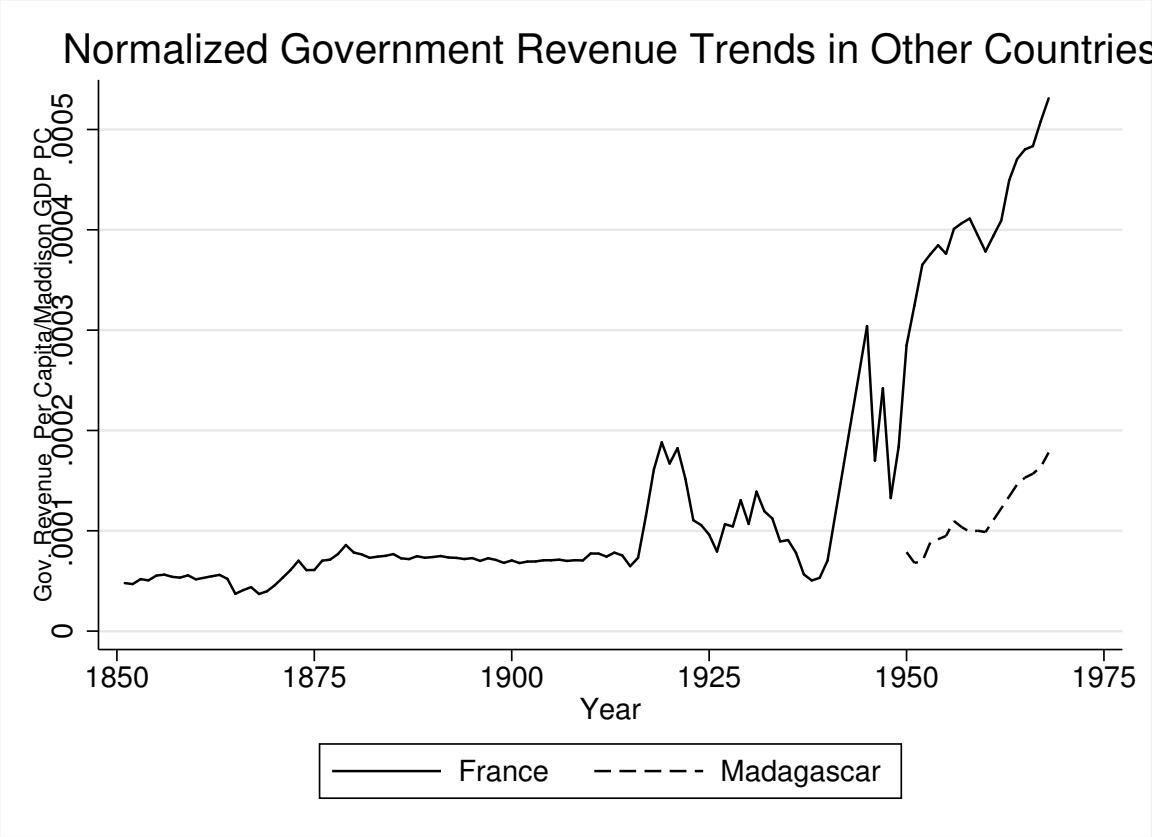
Note: The lines show estimated central government revenue in ounces of gold (converted at nominal exchange rates) divided by per capita GDP estimates in constant 1990 dollars from Maddison (2007).

Figure B.4: Per Capita Revenue in the French Empire, 1850-1969



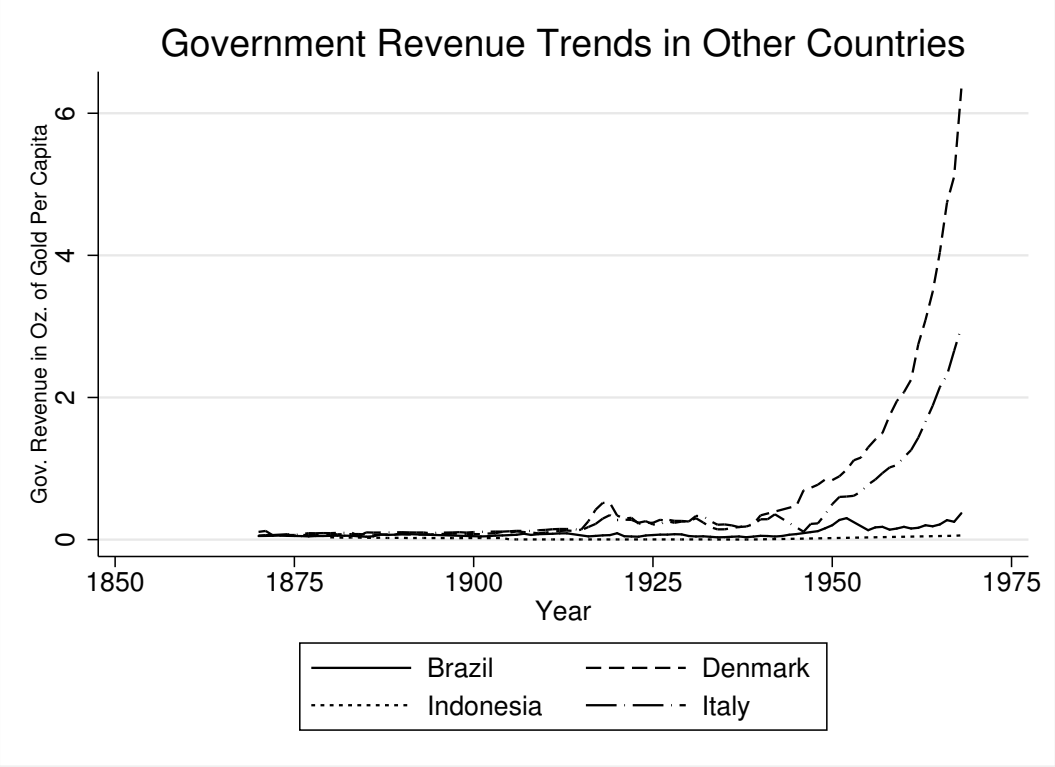
Note: The lines show estimated central government revenue per capita in ounces of gold, converted at nominal exchange rates.

Figure B.5: Per Capita Revenue in the French Empire Relative to GDP, 1850-1969



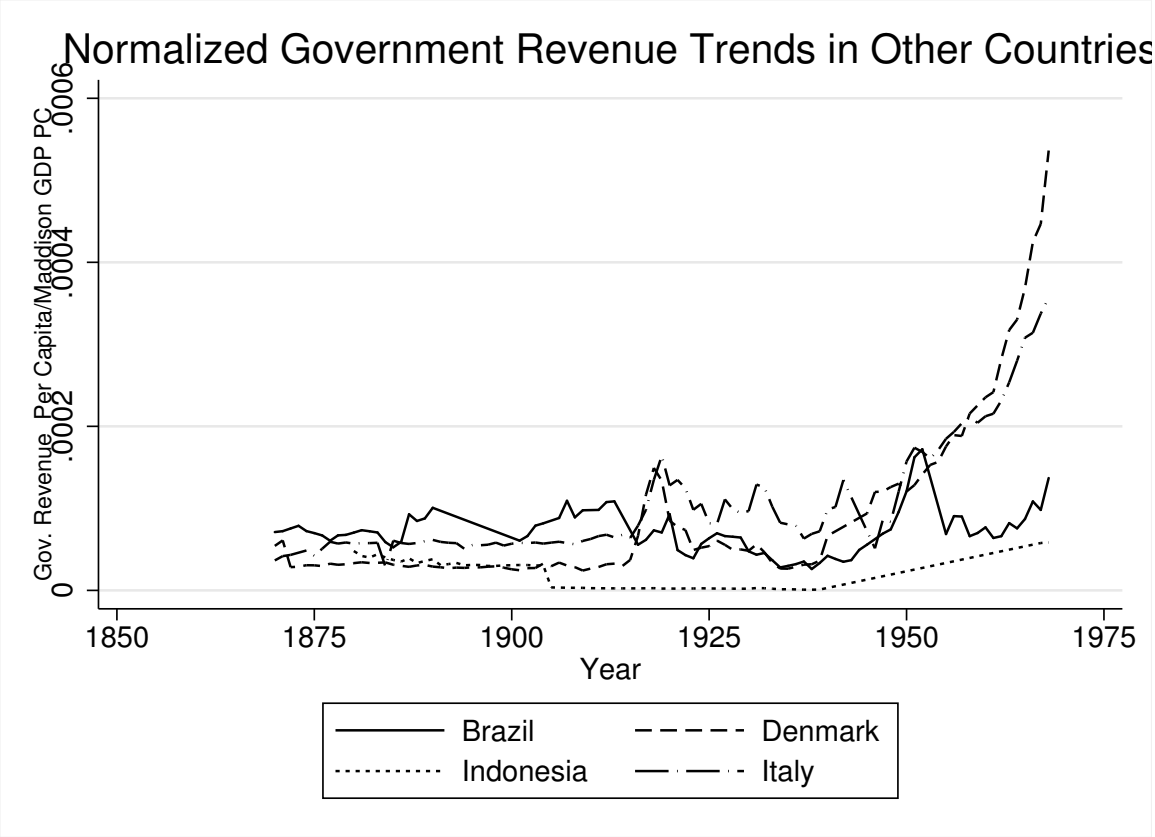
Note: The lines show estimated central government revenue in ounces of gold (converted at nominal exchange rates) divided by per capita income estimates from Maddison (2007).

Figure B.6: Per Capita Revenue in Other Countries, 1850-1969



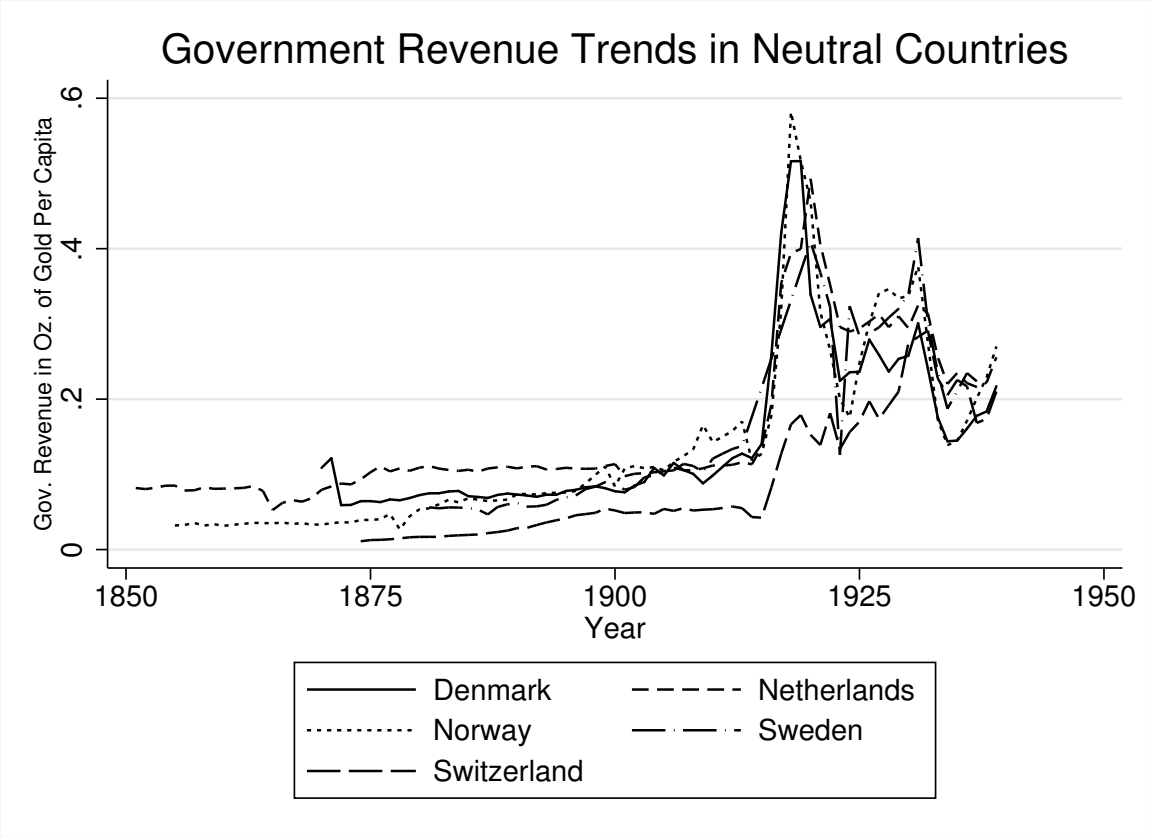
Note: The lines show estimated central government revenue per capita in ounces of gold, converted at nominal exchange rates.

Figure B.7: Per Capita Revenue in Other Countries Relative to GDP, 1850-1969



Note: The lines show estimated central government revenue in ounces of gold (converted at nominal exchange rates) divided by per capita income estimates from Maddison (2007).

Figure B.8: Per Capita Revenue in WW1 Neutrals, 1850-1940



Note: The lines show estimated central government revenue in ounces of gold (converted at nominal exchange rates) divided by per capita income estimates from Maddison (2007).

Table B.2: Predicting State Revenue: Basic Models

DV:	Revenue	Revenue	Revenue	Revenue	Revenue	Norm. Rev.	Rev. Growth
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
W. Eur. & E. Asia	0.922***		0.456*				
	(0.183)		(0.242)				
Post-1914		1.381***	0.996***				
		(0.120)	(0.131)				
WE/EA*Post-1914			0.987***	1.988***	1.001***	1.039***	0.609***
			(0.188)	(0.135)	(0.275)	(0.265)	(0.174)
Log GDP per capita					0.820***		
					(0.260)		
Log lagged revenue							-0.175**
							(0.0689)
Observations	5,492	5,492	5,492	5,492	3,384	3,478	3,429
R-squared				0.288	0.803	0.712	0.173
Number of colonynum	87	87	87	87	76	76	87
Country FE	NO	NO	NO	YES	YES	YES	YES
Year FE	NO	NO	NO	YES	YES	YES	YES

Notes: Table B.2 summarizes a series of OLS regressions with country-clustered standard errors. The dependent variable is logged central government revenue per thousand people in troy ounces of gold in Columns 1 through 5, logged central government revenue in troy ounces of gold divided by estimated GDP in Column 6, and growth of logged central government revenue per thousand people over the previous year in Column 7. Columns 1 through 3 include country-level random effects and do not include year fixed effects. Columns 4 through 7 include country and year fixed effects. $^{***}p < 0.01,^{**}p < 0.05,^{*}p < 0.1$.

C Supporting Information for Section 3

Proof of Lemma 1.

Part a. The first-order condition for the pre-tax profit function is:

$$\frac{d\pi_{i,t}}{dq_{i,t}} = d_0 - d_m \cdot Q_t - c(q_{i,t}) - c'(q_{i,t}) \cdot q_{i,t} = 0$$

The second derivative is $-2c'(q_{i,t}) - c''(q_{i,t}) \cdot q_{i,t} < 0$, where strict negativity follows from assuming $c' > 0$, $c'' > 0$, and $q_{i,t} \geq 0$. Therefore, the unique interior symmetric maximizer q^* satisfies:

$$\frac{d\pi_{i,t}}{dq_{i,t}} = d_0 - d_m \cdot l_t \cdot q^* - c(q^*) - c'(q^*) \cdot q^* = 0$$

The strict positivity of q^* follows from $d_0 > 0$ and $c(0) = 0$. That q^* is finite follows because $c(\cdot)$ is bounded and $c' > 0$.

Part b. Applying the implicit function theorem yields:

$$\frac{dq^*}{dl_t} = \frac{d_m \cdot q^*}{-d_m \cdot l_t + 2 \cdot c'(q^*) + c''(q^*) \cdot q^*} < 0$$

The imposed assumptions on the functions imply that the numerator is strictly negative and the denominator is strictly positive, and therefore the entire term is strictly negative. A similar calculation yields:

$$\frac{d(l_t \cdot q^*)}{dl_t} = q^* + l_t \cdot \frac{dq^*}{dl_t} = \left[1 + \frac{d_m \cdot l_t}{-d_m \cdot l_t + 2 \cdot c'(q^*) + c''(q^*) \cdot q^*}\right] \cdot q^* > 0$$

Slight additional algebraic rearranging shows that the strict positivity of the term in brackets follows from $c' > 0$ and $c'' > 0$. ■

Proof of Lemma 2. Substituting total equilibrium production into Equation 4 yields:

$$R_t^* = \left[v(l_t, b_t) \cdot \overline{\tau}^{v*} + \big(1 - v(l_t, b_t)\big) \cdot F\big(\tau^{h*}\big) \cdot \tau^{h*}\right] \cdot Q^* \tag{B.1}$$

Writing out $\overline{T}$ defined in Equation 1 enables expressing:

$$\frac{dR_t^*}{db_t} = \left\{ \int_0^1 \tau_i^{v*} \cdot dF\big(T_i\big) - F\big(\tau^{h*}\big) \cdot \tau^{h*} \right\} \cdot \frac{dv}{db_t} \cdot Q^*$$

Using the definition of a cumulative density function, the additivity of integrals, and substituting $\tau_i^{v*} = T_i$ enables rewriting this as:

$$\left[\int_0^{\tau^{h*}} T_i \cdot dF(T_i) + \int_{\tau^{h*}}^1 \big(T_i - \tau^{h*}\big) \cdot dF(T_i) \right] \cdot \frac{dv}{db_t} \cdot Q^* > 0$$

The bounds of the second integral assume $T_i > \tau^{h*}$. Therefore, assuming $\frac{dv}{db_t} > 0$ (Assumption 2) implies the overall term is strictly positive. ■

Proof of Lemma 3. The derivative of Equation B.1 with respect to l_t can be decomposed into two components:

$$\frac{dR_t^*}{dl_t} = \underbrace{\left[v(l_t, b_t) \cdot \overline{\tau}^{v*} + \big(1 - v(l_t, b_t)\big) \cdot F(\tau^{h*}) \cdot \tau^{h*}\right] \cdot \left(q^* + l_t \cdot \frac{dq^*}{dl_t}\right)}_{\text{Part a. Output effect}}$$

$$+ \underbrace{\left[\overline{\tau}^{v*} - F(\tau^{h*}) \cdot \tau^{h*}\right] \cdot \frac{dv}{dl_t} \cdot l_t \cdot q^*}_{\text{Part b. Bureaucracy effect}} \tag{B.2}$$

For the output effect, the proof of Lemma 1, part b shows that $q^* + l_t \cdot \frac{dq^*}{dl_t} > 0$. Therefore, the entire part a term is strictly positive. The strict negativity of the bureaucracy effect in Part b follows from assuming $\frac{dv}{dl_t} < 0$ (Assumption 1). ■

Proof of Lemma 4. Applying the implicit function theorem demonstrates the existence of at least one $\tilde{b}(l_t) \in (0, 1)$ such that $\frac{dR_t^*(\tilde{b}(l_t), l_t)}{dl_t} = 0$, for $\frac{dR_t^*}{dl_t}$ defined in Equation B.2. Assuming $\lim_{b_t \to 0} \frac{dv(l_t, b_t)}{dl_t} = -\infty$ implies that $\frac{dR_t^*(l_t, 0)}{dl_t} < 0$ because the part a term in Equation B.2 is bounded. Assuming $\lim_{b_t \to 1} \frac{dv(l_t, b_t)}{dl_t} = 0$ implies that $\frac{dR_t^*(l_t, 1)}{dl_t} > 0$ because the part a term in Equation B.2 is strictly positive. Finally, $v(\cdot)$ is assumed to be smooth in l_t. Showing that $\frac{d^2 R_t^*}{dl_t db_t} > 0$ generates the unique threshold claim. The derivative of Equation B.2 with respect to b_t can be decomposed into two components:

$$\frac{d^2 R_t^*}{dl_t db_t} = \overbrace{\left[\overline{\tau}^{v*} - F(\tau^{h*}) \cdot \tau^{h*}\right]}^{①} \cdot \left\{ \underbrace{\overbrace{\left[q^* + l_t \cdot \frac{dq^*}{dl_t}\right]}^{②} \cdot \frac{dv}{db_t}}_{\text{Conditional output effect}} + \underbrace{\frac{d^2 v}{dl_t db_t} \cdot l_t \cdot q^*}_{\text{Conditional bureaucracy effect}} \right\}$$

The proof of Lemma 2 shows that ① is strictly positive. The proof of Lemma 1, part b shows that ② is strictly positive. Therefore, assuming $\frac{dv}{db_t} > 0$ (Assumption 2) implies that the conditional output effect is strictly positive. Assuming $\frac{d^2 v}{dl_t db_t} > 0$ (Assumption 3) implies that the conditional bureaucracy effect is strictly positive. ■

Assumption B.1 presents two assumptions. Part b states that the bureaucratic learning effect from governing a highly competitive market is large. However, to ensure there exists a "large enough" learning effect for all parameter values, it is necessary to make an assumption about ordering for the percentage of visible citizens for different values of market competitiveness and bureaucratic quality. In words, part a states that the increase in monitoring capacity that results from having high market competition and a perfectly competent

bureaucracy relative to low market competition and a completely incompetent bureaucracy is greater than the increase in monitoring capacity that results from decreasing market competition if the bureaucracy is completely incompetent.

Assumption B.1.

Part a. $v(\bar{l},1) - v(\underline{l},0) > v(\underline{l},0) - v(\bar{l},0)$.

Part b. $\epsilon > \tilde{\epsilon}$, *for* $\tilde{\epsilon}$ *defined in the proof for Lemma 5.*

Proof of Lemma 5. First show that $l_t = l_0$ cannot maximize revenues. If $b < \tilde{b}$, then applying Lemma 4 implies that $R_1^*(\underline{l}, b_1) > R_1^*(l_0, b_1)$. If $b > \tilde{b}$, then applying Lemma 4 implies that $R_1^*(\bar{l}, b_1) > R_1^*(l_0, b_1)$, and we also know that $b_1 > \tilde{b}$ implies $R_1^*(\bar{l}, b_1 + \epsilon) > R_1^*(\bar{l}, b_1)$.

To demonstrate $\frac{R_1^*(\bar{l},b_1)+R_2^*(\bar{l},b_1+\epsilon)}{2} > R_1^*\big(\underline{l}, b_1\big)$, substituting equilibrium terms into the expression from Lemma 5 and rearranging yields:

$$\Delta R \equiv \underbrace{\left[\frac{v(\bar{l},b_1) + v(\bar{l},b_1+\epsilon)}{2} \cdot \bar{l} \cdot q^*(\bar{l}) - v(\underline{l},b_1) \cdot \underline{l} \cdot q^*(\underline{l})\right]}_{①} \cdot \underbrace{\left[\overline{\tau}^{v*} - F\big(\tau^{h*}\big) \cdot \tau^{h*}\right]}_{②}$$

$$+ \underbrace{\left[\bar{l} \cdot q^*(\bar{l}) - \underline{l} \cdot q^*(\underline{l})\right]}_{③} \cdot F\big(\tau^{h*}\big) \cdot \tau^{h*} > 0$$

The proof for Lemma 2 shows that ② is strictly positive. The proof for Lemma 1, part b shows that ③ is strictly positive, and $F\big(\tau^{h*}\big) \cdot \tau^{h*}$ is strictly positive by construction. Therefore, it remains to demonstrate the strict positivity of ①.

- If $b > \tilde{b}$, then $\frac{v(\bar{l},b_1)+v(\bar{l},b_1+\epsilon)}{2} > v(\underline{l},b_1)$ for any $\epsilon > 0$. Combining this with $\bar{l} \cdot q^*(\bar{l}) > \underline{l} \cdot q^*(\underline{l})$ proves the claim for $b > \tilde{b}$.
- The proof if $b < \tilde{b}$ proceeds in two steps.
  1. Show that $\Delta R(\epsilon = 0)$ achieves its lower bound at $b_1 = 0$. Suffices to prove that $\Delta R(\epsilon = 0)$ strictly increases in b_1:

     $$\frac{\Delta R(\epsilon = 0)}{db_1} = \left[\frac{dv(\bar{l},b_1)}{db_1} \cdot \bar{l} \cdot q^*(\bar{l}) - \frac{dv(\underline{l},b_1)}{db_1} \cdot \underline{l} \cdot q^*(\underline{l})\right] \cdot \left[\overline{\tau}^{v*} - F\big(\tau^{h*}\big) \cdot \tau^{h*}\right]$$

     We know $\bar{l} \cdot q^*(\bar{l}) > \underline{l} \cdot q^*(\underline{l})$. Assuming $\frac{d^2v}{dl_t db_t} > 0$ (Assumption 3) implies that $\frac{dv(\bar{l},b_1)}{db_1} > \frac{dv(\underline{l},b_1)}{db_1}$, which establishes the claim.
  2. Need to show that there exists a large enough ϵ such that $\Delta R(b_1 = 0) > 0$. Set $\epsilon = 1$. Because $\bar{l} \cdot q^*(\bar{l}) > \underline{l} \cdot q^*(\underline{l})$, Assumption B.1, part a is sufficient to establish the claim.

Therefore, for all b_1, there exists $\tilde{\epsilon} \in [0, 1 - b_1)$ such that $\Delta R > 0$ for any $\epsilon > \tilde{\epsilon}$. Assumption B.1, part b assumes this range for ϵ values. ■

Proof of Proposition 1. The only part of Proposition 1 not covered by the preceding results is G's optimal state-building decision. G can obtain the following expected consumption amounts under its three state-building choices:

- $E\big[U_G(l_t = l_0)\big] = (1 + p) \cdot R_1^*(l_0, b_1) \cdot \alpha$
- $E\big[U_G(l_t = \underline{l})\big] = (1 + p) \cdot R_1^*(\underline{l}, b_1) \cdot \alpha - s$
- $E\big[U_G(l_t = \bar{l})\big] = \big[R_1^*(\bar{l}, b_1) + p \cdot R_2^*(\bar{l}, b_1 + \epsilon)\big] \cdot \alpha - s$

The proof begins by comparing $E\big[U_G(l_t = \underline{l})\big]$ to $E\big[U_G(l_t = \bar{l})\big]$. Three critical values can be used to characterize the possibilities.

1. If $b > \tilde{b}$, then $R_1^*(\bar{l}, b_1) > R_1^*(\underline{l}, b_1)$ and $R_2^*(\bar{l}, b_1 + \epsilon) > R_2^*(\underline{l}, b_1)$, which implies $E\big[U_G(l_t = \bar{l})\big] > E\big[U_G(l_t = \underline{l})\big]$.
2. If $b < \tilde{b}$ and $p = 1$, then Assumption B.1 and Lemma 5 implies $E\big[U_G(l_t = \bar{l})\big] > E\big[U_G(l_t = \underline{l})\big]$.
3. If $p = 0$, then $b < \tilde{b}$ implies $R_1^*(\underline{l}, b_1) > R_1^*(\bar{l}, b_1)$ and that $E\big[U_G(l_t = \bar{l})\big] < E\big[U_G(l_t = \underline{l})\big]$.

Given the second and third claims, showing that $E\big[U_G(l_t = \bar{l})\big] - E\big[U_G(l_t = \underline{l})\big]$ strictly increases in p proves the existence of a unique $\tilde{p} \in (0, 1)$ such that for all $b_1 < \tilde{b}$, $E\big[U_G(l_t = \bar{l})\big] > E\big[U_G(l_t = \underline{l})\big]$ if $p > \tilde{p}$ and $E\big[U_G(l_t = \bar{l})\big] < E\big[U_G(l_t = \underline{l})\big]$ if $p < \tilde{p}$. This strict monotonicity claim follows directly from $R_2^*(\bar{l}, b_1 + \epsilon) > R_2^*(\underline{l}, b_1)$.

The next part of the proof compares each of $E\big[U_G(l_t = \underline{l})\big]$ and $E\big[U_G(l_t = \bar{l})\big]$ to $E\big[U_G(l_t = l_0)\big]$ in the different parameter ranges just characterized:

1. If $b > \tilde{b}$, then need to compare $E\big[U_G(l_t = \bar{l})\big]$ to $E\big[U_G(l_t = l_0)\big]$. The difference equals $\overline{\Theta}(\alpha) \equiv \big[R_1^*(\bar{l}, b_1) + p \cdot R_2^*(\bar{l}, b_1 + \epsilon) - (1 + p) \cdot R_1^*(l_0, b_1)\big] \cdot \alpha - s$ and the derivative with respect to α is:
$$\frac{d\overline{\Theta}}{d\alpha} = R_1^*(\bar{l}, b_1) + p \cdot R_2^*(\bar{l}, b_1 + \epsilon) - (1 + p) \cdot R_1^*(l_0, b_1) \tag{B.3}$$
Lemma 5 implies that this term is strictly positive. Therefore, to demonstrate the existence of the unique threshold $\overline{\alpha} > 0$ stated in the proposition, it suffices to demonstrate that $\overline{\Theta}(0) < 0$ and $\lim_{\alpha \to \infty} \overline{\Theta}(\alpha) > 0$. These two claims follow immediately from the statement of $\overline{\Theta}(\alpha)$ and from Equation B.3.
2. If $b < \tilde{b}$ and $p > \tilde{p}$, then need to compare $E\big[U_G(l_t = \bar{l})\big]$ to $E\big[U_G(l_t = l_0)\big]$. Same proof as just presented.
3. If $b < \tilde{b}$ and $p < \tilde{p}$, then need to compare $E\big[U_G(l_t = \underline{l})\big]$ to $E\big[U_G(l_t = l_0)\big]$. After defining $\underline{\Theta}(\alpha) \equiv (1 + p) \cdot \big[R_1^*(\underline{l}, b_1) - R_1^*(l_0, b_1)\big] \cdot \alpha - s$, the same proof structure as for part 1 generates the existence of the unique threshold $\underline{\alpha} > 0$ stated in the proposition. ■

D Supporting Information for Section 4

D.1 Additional Tables

Table C.1: Assessing Demand Factors

VARIABLES	logrev	logrev	logrev	logrev	logrev	logrev
	(1)	(2)	(3)	(4)	(5)	(6)
War	0.250***	0.321***				
	(0.0945)	(0.104)				
War Stock			0.274***	0.334***		
			(0.0941)	(0.100)		
Majority legally enfranchised					0.128	0.0925
					(0.0988)	(0.0941)
Log GDP PC		0.919***		0.922***		0.966***
		(0.204)		(0.204)		(0.206)
Log Population		-0.868***		-0.866***		-0.860***
		(0.238)		(0.237)		(0.247)
Independent		0.229**		0.224*		0.238**
		(0.113)		(0.114)		(0.117)
Observations	5,492	3,478	5,492	3,478	5,241	3,294
R-squared	0.735	0.796	0.736	0.796	0.741	0.792
Number of colonynum	87	76	87	76	84	72
Territory FE?	YES	YES	YES	YES	YES	YES
Year FE?	YES	YES	YES	YES	YES	YES

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

Table C.2: Assessing Supply Factors

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	logrev	logrev	logrev	logrev	logrev	logrev
Reg. System Years	0.0101	0.0271***				
	(0.00637)	(0.00901)				
Liberal democracy index			0.302	-0.360		
			(0.518)	(0.573)		
Avg. years of education					0.142	-0.0804
					(0.0893)	(0.0961)
Log GDP PC		0.696***		0.652**		0.872***
		(0.223)		(0.258)		(0.179)
Log Population		-0.774***		-0.910***		-0.745***
		(0.221)		(0.264)		(0.214)
Independent		0.346**		0.252**		0.128
		(0.155)		(0.112)		(0.106)
Observations	4,632	3,181	3,886	2,683	4,993	3,310
R-squared	0.741	0.807	0.755	0.768	0.753	0.817
Number of colonynum	68	61	87	76	81	73
Territory FE?	YES	YES	YES	YES	YES	YES
Year FE?	YES	YES	YES	YES	YES	YES

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

Table C.3: Assessing Interaction Effects, with Covariates

VARIABLES	(1) logrev	(2) logrev	(3) logrev	(4) logrev	(5) logrev	(6) logrev	(7) logrev	(8) logrev	(9) logrev
1.colwar#c.regstock	0.000626								
	(0.000835)								
1.colwar#c.v2x_libdem		-0.0248							
		(0.193)							
1.colwar#c.education_impute			0.0455**						
			(0.0177)						
c.colwarstock#c.regstock				0.000645					
				(0.000955)					
c.colwarstock#c.v2x_libdem					0.0849				
					(0.176)				
c.colwarstock#c.education_impute						0.0468***			
						(0.0173)			
1.majority#c.regstock							0.00427*		
							(0.00231)		
1.majority#c.v2x_libdem								1.545*	
								(0.783)	
1.majority#c.education_impute									0.154***
									(0.0445)
War = 1	0.252*	0.210*	0.0450						
	(0.142)	(0.117)	(0.127)						
War Stock				0.265*	0.177*	0.0505			
				(0.153)	(0.106)	(0.128)			
Majority legally enfranchised = 1							-0.244	-0.144	-0.556***
							(0.218)	(0.210)	(0.209)
Reg. System Years	0.0262***			0.0263***			0.0194		
	(0.00890)			(0.00895)			(0.0123)		
Liberal democracy index		-0.298			-0.311			-2.156*	
		(0.569)			(0.570)			(1.104)	
Avg. years of education			-0.0857			-0.0850			-0.210***
			(0.0900)			(0.0899)			(0.0791)
Log GDP PC	0.719***	0.665**	0.876***	0.721***	0.668**	0.878***	0.746***	0.770***	0.900***
	(0.224)	(0.261)	(0.178)	(0.223)	(0.261)	(0.178)	(0.229)	(0.270)	(0.169)
Log Population	-0.774***	-0.919***	-0.748***	-0.770***	-0.917***	-0.745***	-0.665***	-0.904***	-0.592***
	(0.219)	(0.260)	(0.211)	(0.218)	(0.261)	(0.211)	(0.235)	(0.284)	(0.183)
Independent	0.312**	0.239**	0.104	0.309**	0.234**	0.103	0.302	0.317***	0.125
	(0.148)	(0.110)	(0.101)	(0.147)	(0.111)	(0.102)	(0.203)	(0.116)	(0.101)
Observations	3,181	2,683	3,310	3,181	2,683	3,310	2,997	2,501	3,126
R-squared	0.811	0.771	0.822	0.811	0.771	0.822	0.812	0.773	0.831
Number of colonynum	61	76	73	61	76	73	57	72	69
Territory FE?	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE?	YES	YES	YES	YES	YES	YES	YES	YES	YES

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

Table C.4: Assessing Interaction Effects in Sample with GDP Data (Excluding GDP Control)

VARIABLES	(1) logrev	(2) logrev	(3) logrev	(4) logrev	(5) logrev	(6) logrev	(7) logrev	(8) logrev	(9) logrev
1.colwar#c.regstock	0.000803								
	(0.00103)								
1.colwar#c.v2x_libdem		-0.0142							
		(0.211)							
1.colwar#c.education_impute			0.0575***						
			(0.0209)						
c.colwarstock#c.regstock				0.000777					
				(0.00120)					
c.colwarstock#c.v2x_libdem					0.0935				
					(0.196)				
c.colwarstock#c.education_impute						0.0585***			
						(0.0216)			
1.majority#c.regstock							0.00440*		
							(0.00253)		
1.majority#c.v2x_libdem								1.231	
								(1.174)	
1.majority#c.education_impute									0.166***
									(0.0533)
War = 1	0.203	0.184	-0.0515						
	(0.163)	(0.120)	(0.144)						
War Stock				0.218	0.147	-0.0482			
				(0.181)	(0.110)	(0.152)			
Majority legally enfranchised = 1							-0.247	-0.0708	-0.598**
							(0.246)	(0.328)	(0.260)
Reg. System Years	0.0326***			0.0327***			0.0262**		
	(0.00834)			(0.00838)			(0.0117)		
Liberal democracy index		-0.0699			-0.0835			-1.555	
		(0.642)			(0.640)			(1.602)	
Avg. years of education			-0.0602			-0.0595			-0.191**
			(0.0974)			(0.0974)			(0.0832)
Log Population	-0.720***	-0.785**	-0.699***	-0.716***	-0.782**	-0.696***	-0.604**	-0.762**	-0.529**
	(0.242)	(0.331)	(0.251)	(0.241)	(0.331)	(0.250)	(0.259)	(0.349)	(0.228)
Independent	0.240	0.0537	-0.0275	0.237	0.0493	-0.0275	0.252	0.0983	0.0204
	(0.165)	(0.166)	(0.162)	(0.165)	(0.167)	(0.162)	(0.202)	(0.214)	(0.122)
Observations	3,181	2,683	3,310	3,181	2,683	3,310	2,997	2,501	3,126
R-squared	0.799	0.758	0.802	0.799	0.758	0.802	0.799	0.757	0.811
Number of colonynum	61	76	73	61	76	73	57	72	69
Territory FE?	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE?	YES	YES	YES	YES	YES	YES	YES	YES	YES

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