

State Capacity and Military Conflict

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Abstract

In 1500, Europe was composed of hundreds of statelets and principalities, with weak central authority, no monopoly over the legitimate use of violence, and multiple, overlapping levels of jurisdiction. By 1800, Europe had consolidated into a handful of powerful, centralized nation states. We build a model that simultaneously explains both the emergence of capable states and growing divergence between European powers. In our model, the impact of war on the European state system depends on: i) the importance of money for determining the war outcome (which stands for the cost of war), and ii) a country's initial level of domestic political fragmentation. We emphasize the role of the "Military Revolution", which raised the cost of war. Initially, this caused more internally cohesive states to invest more in state capacity, while other (more divided) states rationally dropped out of the competition. This mechanism leads to both increasing divergence between European states, and greater average investments in state building on the continent overall.

1 Introduction

Capable states cannot be taken for granted. A new research program on state capacity argues that creating an effective tax system is a costly and uncertain investment (Besley and Persson 2011). States with a centralized career bureaucracy, controlling a significant share of national output, are a recent innovation. For most of mankind’s history, there was no highly centralized apparatus that could assert a monopoly over the legitimate use of violence, collecting vast revenues, administering justice, and employing huge numbers of civil servants and armed men. Most scholars agree that states as we know them today begin to appear after 1500 in Europe. Then, the continent was divided into more than 500 “states, would-be states, statelets, and state-like organizations” (Tilly 1990). Rulers possessed limited tax powers; there was no professional bureaucracy; hiring mercenaries was the principal way to obtain armed force; and powerful elites were often above the law. And yet, within three short centuries European powers managed to pull ahead of the rest of the world.

The leading explanation for this development emphasizes the role of warfare. As Charles Tilly (1990) argued, “states made war, and war made states”. War gave monarchs the incentive to create an effective fiscal infrastructure – in a belligerent environment, the ability to finance war is key to survival. Besley and Persson (2009) build a model of the government’s decision to invest in fiscal capacity. They find that such investment is more pronounced when a common interest (rather than a distributive) public good has to be financed. Their model therefore provides a link between war and state capacity precisely when warmaking is perceived as a common interest public good.

This perspective helps to explain the coexistence of frequent warfare and growing state capacity in some European states after 1600. At the same time, four important issues remain. First, warfare is not unique to either Europe or the early modern period. States mostly failed to develop much before 1600 despite frequent warfare, contradicting the view that war will necessarily translate into state building. For example, hunter-gatherer communities registered high rates of violent death (Clark 2007), but did not engage in state building on any significant scale. Why do modern states emerge in a small corner of the Eurasian landmass after 1500? Second, the growth in state capacity was highly uneven, with some powers such as Britain or France building stronger and bigger states, others such as Spain or Austria falling behind, and some, like Poland, disappearing altogether. If war boosted state building in some countries, it must have had a smaller (or even the opposite effect) in others. Currently, the literature on state capacity is silent on growing divergence in the cross-section. Third, warfare during the period of initial state building (1500-1800) was rarely a

common-interest public good. Instead, the “sport of kings” was often a private good for princes in pursuit of glory and personal power, with financing often met with heavy resistance by domestic taxpayers. Fourth, and crucially, wars are not exogenous events. Instead, rulers deliberately decide to go to war. They do so partly in response to a country’s existing ability to wage the war successfully. Thus, having a strong state may be the cause, and not the consequence, of war.

This paper addresses these issues by building a model of military conflict and state building. In the model, which is presented in Section 2, two contending rulers choose the centralization of their tax system by taking the prospect of military conflict into account. Centralization is our measure of state capacity, and captures the extent to which the ruler - as opposed to local powerholders - controls taxes and their collection. Military conflict is a costly mechanism (financed with taxes) that redistributes future fiscal revenues from the loser to the winner. In this setup, greater centralization: i) allows a ruler to collect more fiscal revenues (and win wars more often), but it also ii) requires the ruler to spend resources to sideline domestic powerholders, who lose under centralization. In this sense, state building entails a domestic political cost. We first study this tradeoff in the simplest case where war is an exogenous event. Section 5 considers the case where, after having centralized, each ruler chooses whether or not to go to war.

Sections 3 and 4 study the model, showing that the impact of war on state building depends on two parameters. The first one is the importance of money for determining military might. When the creation of an effective military apparatus depends on large financial investments, wars are costly and the ability to raise fiscal revenues is a key strategic asset. The second parameter is the relative political fragmentation of war contenders. *Ceteris paribus*, state building will be more costly for the rulers of internally more divided states.

When the importance of money (and thus the cost of war) is low we find that - contrary to Tilly’s hypothesis - the presence of military conflict dampens state building compared to a peaceful world. The intuition is that in this case both contenders are similarly likely to win the war regardless of their fiscal revenues. As a result, war only creates the risk for a ruler of losing fiscal revenues, reducing his gains from building a more effective tax apparatus. Additionally, given that the odds of victory are even, weak rulers have a relatively larger incentive to go to war against strong ones in a bid to grab the fiscal revenues of the latter. Due to these effects, when war is cheap, frequent warfare and the presence of weak states endogenously reinforce each other.

When instead the importance of money (and thus the cost of war) is high, the possibility of military conflict boosts state capacity in cohesive countries but hinders it in divided countries.

This causes strong divergence in state building. Indeed, given the importance of money, the odds of winning the war are stacked in favour of the stronger state. As a result, divided states that find it costly to centralize rationally drop out of the competition – their chances of success are too low. In contrast, cohesive states do not only engage in state building but they also aggressively attack (and conquer) divided ones. Warfare is still frequent, but now it coexists with the consolidation of strong, cohesive states while weak, divided ones gradually lose out.

Historically, the growth of state capacity was often associated with the emergence of institutions limiting the prerogatives of central rulers, particularly with respect to taxation (Dincecco 2009). To shed light on these patterns, Section 5 endogenizes a ruler’s incentive to let such institutions develop. We find that in our model, institutional constraints act as a means of reducing a ruler’s domestic opposition and thus the cost of state building. In the presence of institutions constraining the ruler, state building becomes a common interest public good. As a result, we find that institutional constraints will emerge if a ruler aggressively engages in state building but not otherwise. This finding underlines the conditions under which different aspects of state effectiveness tend to complement each other (Besley and Persson 2011).

In Section 6 we use our model to examine why state-building took off in Europe after 1500. Our model predicts that frequent warfare is not sufficient for powerful states to emerge. Military conflict had to become costly, and internal cohesion of some of the competing powers needed to be relatively high. Our analysis therefore supports the view that the “military revolution” dramatically reshaped Europe’s political landscape (Downing 1992). The term “military revolution” is used to capture a set of interrelated technological and organizational changes occurring between the 16th and 17th century that made wars more costly and protracted (e.g., Roberts 1956). Our analysis suggests that this technological change played a crucial role by raising the cost of warfare, changing the benefits of state building. Before the 16th century the relatively low cost of war may have been responsible for the lack of state building; thereafter, the military revolution created a “race to the top” for those powers starting with low levels of domestic fragmentation, while it stifled the state building of divided countries as their chances of success dwindled. The growing divergence in state capacity in turn accentuated the incentive of stronger powers to go to war, offering an explanation for why growing differences in state capacity went hand-in-hand with ever more frequent military conflict. States such as Britain or France succeeded in this highly competitive environment, and came to command resources and centralized administrative control on an impressive scale. Divided and weak states such as Poland failed to do so, and disappeared from the map.

There is a vast literature studying the origins of growth-promoting institutions. Important contributions include Acemoglu (2005), Acemoglu, Johnson and Robinson (2001, 2004, 2005); North (1989); Greif (1993). This literature does not explicitly consider the role of external conflict, but it sometimes argues that that war can overcome domestic agency problems that stand in the way of better institutions (e.g. Acemoglu and Robinson 2006). There is also a growing literature studying the causes and consequences of interstate conflict (Martin, Mayer, and Thoenig 2008, Morelli and Jackson 2007, Spolaore and Wacziarg 2010, Yared 2010). This literature studies who fights whom, how often, and with what intensity. A typical question considered is: “Do democracies fight each other less often?” Intra-state conflict is the explicandum, but the institutional features that determine the results are treated as exogenous. Our work unifies these literatures by examining the joint determinants of military conflicts and institutional structure and how they co-evolve. Lagerlof (2011) analyzes the role of the military revolution in allowing Europe to catch up and overtake China, technologically, but he does not analyze state building patterns.

We also relate to the large literature on taxation and the growth of the state in Europe after 1500 (Tilly 1990, Brewer 1988, Bonney). Countries with parliamentary representation typically had higher tax rates than those governed by princes (Hoffman and Norberg 1994, Mathias and O’Brien 1976, Hoffman and Rosenthal 1997). The statistical evidence is analysed inter alia by Dincecco (2009). Stasavage (2003, 2005) analyses coalition formation within countries that may favor the development of public credit. These studies generally show that representative assemblies were better at taxing themselves, as reflected in lower interest rates. Dincecco (2009) also finds that centralization and representation enabled the highest rates of taxation, while the combination of fragmentation and unconstrained rulers was associated with low tax collection. The arrangements that allowed representative assemblies and the ruler to struck a bargain is explored in Hoffman and Rosenthal (1997). Our work rationalizes these findings but also points out that taxation, institutions and military conflict cannot be separately analyzed because they are jointly endogenously determined.

2 Historical Background and Context

How did Europe after 1500 create the predecessors of modern-day states? The leading explanation emphasizes the role of war and the need to build more capable structures in a bid for survival (Tilly 1990). Wars were indeed frequent in early modern Europe (table 1). The data collected by

Levy (1983) show that in Europe between 1500 to 1700, a Great Power war was underway in 95% of all years (Table 1). Up to 70% of the European population was affected by war at any one point in time.

Table 1 here

We argue that this is more of a puzzle than an answer. In Table 1, the frequency of wars was if anything higher in the 16th century than in the 17th centuries, when state consolidation started. Numerous, extended wars were also fought during the medieval period, from the reconquista in Spain to the Hundred Years War between England and France and to innumerable wars between Italian city states. War is also not unique to Europe. China, for example, experienced prolonged conflict during the “warring states period”, between 475BC and 221BC (Hui 2005). In neither medieval Europe nor early China did frequent warfare coincide with the creation of highly capable and centralized governance structures.

If take the number of major battles fought in Europe between the 7th and the 18th century as an indicator of the intensity of warfare, there is a strong upward trend since the early Middle Ages, but there is no major discontinuity in the 16th century that would justify a sudden acceleration of state building [see Figure 1, built from Jacque (2007)].

Figure 1 here

Our answer to the puzzle is that aggressive state building was due to a unique synergy between military conflict and exogenous changes in the military technology, the so-called “military revolution”. Before spelling out how this mechanism works, this section briefly describes our explanandum – the rise in state capacity in early modern Europe – and our explanatory factor, the military revolution.

2.1 The building of state capacity in Europe after 1500

Two facts are striking about the rise of state capacity in Europe after 1500. One is the sheer magnitude of the increase in state centralization, tax capacity, and military ability over time. The second is the growing degree of divergence between European states.

Figure 2 gives an overview of a simple indicator of state capacity (Besley and Persson 2011) – total tax revenue of the major European powers, in tons of silver per year. We plot change over

time, to capture the speed of the increase. All the major European powers for which we have data in 1500 generated combined revenue of 214 tons p.a. Some 280 years later, this had increased by a factor of twenty, to 4,400 tons p.a. Part of the total increase reflected growing population numbers, but an important part reflects higher tax pressure. Measured in grams of silver per head and year, average fiscal revenue increased eight-fold between 1500 and 1780.¹ The second aspect that clearly emerges from Figure 2 is growing difference between European powers. In 1500, Poland's total revenue was half of England's. In 1780, it was equivalent to 5%. Some powers only increased their tax revenue by a small margin, others by a lot. Venetian tax receipts doubled during the course of the early modern period, while those of England surged by a factor of 78.

Figure 2 here

The vast increase in revenue was facilitated by a different administrative structure. Medieval rulers had largely been expected to 'live on their own', i.e. to finance themselves from their domain income (Landers 2003). After 1500, this became impossible. To raise large amounts of tax, states needed to centralize, professionalize, and bureaucratize their administration. Overall, states by the late 18th century had succeeded in this task. By 1780, Britain had centralized, bureaucratized collection of excise and customs taxes, and was about to introduce the first successful income tax in history. France, on the other hand, still used tax farming for both direct and indirect taxes. There, vast tax exemptions for the nobility and the clergy hamstrung the monarchy's attempts to raise revenue.

Changes in tax collection were part of a broader pattern of administrative reforms. Ancient legal privileges in many composite states were being reduced. At the same time, the pace at which states succeeded in pushing through administrative and political reforms varied greatly. Spain, for example, had scant success in reducing the fragmentation of its internal market; reforms in Poland foundered on the unanimity principle in the sejm, the assembly of nobles.

Armies were, on the whole, no longer provided by mercenary entrepreneurs, as they had been at the beginning of the period. Instead, they were centrally and uniformly equipped from state arsenals, and officered by professional soldiers receiving a regular salary. Military capacity also grew over time, but diverged sharply. By 1780, European armies (excluding Russia and the Ottoman Empire) had more than a million men under arms. The equivalent figure for 1550 was only 300,000.

¹The value of silver declined, but only gradually. The real increase was still by a factor of more than 3.

Figure 3 puts these changes in long-term perspective. Compared to the armies of Rome and Byzantium, early modern armies were large (measured as percentage of the population under arms). Indeed, Sweden in 1700 already reached levels of mobilization similar to those in Europe during World War I and II.

Figure 3 here

Some powers succeeded in mobilizing resources more than others (see Table 2 below). At one end of the spectrum, England after 1700 quickly conquered vast parts of the globe. Its armed forces tripled in size between 1550 and 1780. France's army increased by a factor of five, and Austria's, by a factor of 28. In contrast, Poland was partitioned out of existence as a result of military impotence caused by internal strife and fiscal weakness.

Table 2 here

2.2 The “military revolution”

During the early modern period, war became much more costly. Changes in military technology and tactics - referred to by historians as the "Military Revolution" (Roberts 1956; Parker 1996) – resulted in a rise in costs. As a result, fiscal attrition rather than battlefield prowess became the main determinant of success in war. As a Spanish 16th century military commander put it, “victory will go to whoever possesses the last *escudo*” (Parker 1996).

Three changes were responsible for the growing importance of fiscal revenue for military success – gunpowder, new fortifications, and the rise of standing armies. The spread of (mobile) cannon after 1400 meant that medieval walls could be destroyed quickly. Fortresses that had withstood year-long sieges in the Middle Ages could fall within hours.² In response, Italian military engineers devised a new type of fortification -- the *trace italienne*. It consisted of large earthen bulwarks, clad with brick, which could withstand cannonfire. These new fortifications were immensely costly to build.³ The existence of numerous strongpoints meant that wars often dragged on even longer – winning a battle was no longer enough to control a territory. Roger Boyle, the British soldier and statesman observed in the 1670s (Parker 1996):

²The Neapolitan fortress of Monte San Giovanni had withstood medieval sieges for up to seven years; Charles VIII's artillery breached its walls in a matter of hours (Duffy 1996).

³The fortress of Besancon was so expensive that when informed of the total cost, Louis XIV asked if the walls had been made of gold (Parker 1996).

Battells do not now decide national quarrels, and expose countries to the pillage of conquerors, as formerly. For we make war more like foxes, more than lyons; and you will have 20 sieges for one battell.

The introduction and growth of standing armies is the third main element of the “military revolution” (Roberts 1956; Parker 1996). Due to the needs for firearms training, states began to organize, equip, and drill soldiers, investing in their human capital. Starting with reforms introduced by William of Nassau during the Dutch rebellion, soldiers were garrisoned and trained continuously.

At the same time, states began to organize permanent navies. While the English had beaten the Spanish Armada in 1588 with an assortment of refitted merchant vessels, navies now became highly professionalized, with large numbers of warships kept in readiness for the next conflict. Investments in naval dockyards, victualling yards, and ships were costly. Even smaller ships in the English navy of the 18th century cost more than the largest industrial companies had in capital (Brewer 1988).

Fortifications, artillery, and ever-larger, better-equipped, and professional standing armies and navies made war an increasingly costly pursuit. The expenses of medieval campaigns had often been met by requisitioning and through the feudal service obligations of medieval knights. After 1500, the business of war was increasingly transacted in cash and credit, and not in feudal dues.⁴ The late Middle Ages and the early modern period saw the increasing use of debt financing. During wartime, 80% and more of government expenditure would regularly be devoted to military costs. Military spending could exceed the sum of all tax revenues in a single year – by 50% in some extreme cases, such as Habsburg Spain during the 1570s (Bean 1973).

3 The Basic Model

We now present a model shedding light on the link between state building and the military revolution. Sections 2.1 and 2.2 illustrate the role of centralization. Sections 2.3 and 2.4 describe the tradeoff faced by a ruler in deciding whether to centralize or not when there is no external war threat and when such threat is present.

⁴ Landers (2003). Some have argued that the true increase in the cost of war after 1500 was correspondingly less (Thompson 1995). This is unlikely – indirect social costs probably grew in line with war frequency and army size.

3.1 Production

There are three dates $t = 0, 1, 2$. A country consists of a measure 1 of identical districts, each of which is inhabited by a density 1 of agents who are risk neutral and do not discount the future. They obtain utility by consuming the only (perishable) good produced in the economy. In each period, an agent can undertake either local (l) or market (m) production. Local production yields output A_l and occurs in an agent's own district. Market production is more profitable but requires an agent to carry out some steps of the production process (e.g. input purchases) in a neighboring district.⁵ If agent j undertakes market production he obtains $A_m > A_l$. Agents may also engage in home production (h), the least profitable activity ($A_h < A_l$). If a share n_x of agents undertakes activity $x = l, m, h$, where $n_m + n_l + n_h = 1$, the country's total output is equal to:

$$Y = n_m A_m + n_l A_l + n_h A_h. \quad (1)$$

Output is maximized when all agents engage in market production (i.e. $n_m = 1$).

3.2 State Building, Taxation and Output

A self-interested ruler finances his expenditures by taxing local and market production. There are no financial markets, so the ruler cannot borrow or lend.⁶ Home production cannot be taxed, and tax collection depends on the degree of centralization.

Consider first a fully *centralized* country. The ruler optimally sets country-wide taxes (τ_l, τ_m) where τ_x is the tax on activity $x = l, m$. Since market production yields greater surplus than local production, the optimal tax rates (τ_l^*, τ_m^*) : i) discourage local and home production, and ii) extract the full surplus of market production over home production. This is attained by setting:

$$\tau_l^* \geq \frac{A_l - A_h}{A_l} \quad (2)$$

$$\tau_m^* = \frac{A_m - A_h}{A_m}, \quad (3)$$

⁵We assume that districts $i \in [0, 1]$ are located around a circle and that market production is spatially ordered: each agent undertaking market production in a district i must carry out one step of production in the immediately left-adjacent district. This assumption simplifies the analysis of taxation under partial centralization.

⁶Our results go through even if the ruler can access financial markets provided these markets are imperfect.

The ruler's revenue is then equal to:

$$R_c = A_m - A_h. \quad (4)$$

In this equilibrium, everybody produces for the market (i.e., $n_m = 1$) and the ruler extracts the resulting surplus $A_m - A_h$.

Consider now the opposite benchmark of a fully *decentralized* country. The administration of each district i is delegated to a local power holder (e.g., a nobleman) who sets taxes $(\tau_{l,i}, \tau_{m,i})$ on local and market production. There are two key differences with respect to centralization. First, market production initiated in district i is now taxed also in the other district i' where it occurs (see footnote 5). As a result, the total tax rate levied on a producer operating in districts i and i' is equal to $(\tau_{m,i} + \tau_{m,i'})$ and the producer's net income is $(1 - \tau_{m,i} - \tau_{m,i'})A_m$. Second, we assume that control over taxation allows each local power holder to keep a share ρ of tax revenues for himself, while handing the remaining share $(1 - \rho)$ of taxes to the central ruler.

The appendix proves that in a symmetric equilibrium where each power holder non-cooperatively sets optimal taxes $(\tau_{l,d}, \tau_{m,d})$ we have:

Lemma 1 *There always exist symmetric Nash equilibria where all decentralized districts set $\tau_{l,d} = (A_l - A_h)/A_h$ and $\tau_{m,d} > (A_l - A_h)/2A_h$. In these equilibria, everybody engages in local production.*

Decentralized districts over-tax and thus discourage market production. The problem is that taxation of market production by competing power-holders creates a negative “overgrazing” externality: local power holders try to steal revenue from each other by setting a large a tax on market production in their district. The resulting volume of market activity is too low. Decentralization distorts production and tax revenues below the first best. In the remainder, we take the inefficient equilibrium of Lemma 1 as the decentralization benchmark.⁷ In such equilibrium, in each decentralized district total production is $Y_d = A_l$, the ruler's revenues are $R_d = (1 - \rho)(A_l - A_h)$, and the revenue P_d remaining with the local power holder is equal to:

$$P_d = \rho \cdot (A_l - A_h). \quad (5)$$

Decentralization reduces the ruler's revenues both by reducing output (as $Y_d < Y_c$) and by allowing

⁷The logic of Lemma 1 is that the ruler of each district may prefer to overtax and thus discourage market production (by setting a high $\tau_{m,d}$) so as to encourage local production and appropriate all the surplus it generates. In principle, there is also an equilibrium where all decentralized power holders magically coordinate to tax market production at $\tau_{m,d} = (A_m - A_h)/2A_h$ so that output and tax revenues are first best. One can rule out such equilibrium by assuming that the return to market production is heterogeneous among agents.

local power holders to keep a fraction of taxes for themselves (as $\rho > 0$). This latter effect shapes the political resistance of power holders to the ruler's centralizing efforts.

Having studied full centralization and decentralization, consider the intermediate case of a partially centralized country where only a measure $\kappa \in (0, 1]$ of districts are centralized. Much as in a fully centralized country, the ruler internalizes the surpluses generated across the κ centralized districts, setting the uniform tax rates (τ_l^*, τ_m^*) in all of them and collecting the resulting fiscal revenues. The centralized part of the country is equivalent to a fully centralized country consisting of $\kappa < 1$ districts.⁸ As a result, in each centralized district output and tax revenues are respectively equal to $Y_c = A_m$ and R_c . By contrast, in the $(1 - \kappa)$ decentralized districts local power holders continue to control tax collection. As in the previous analysis, these power holders fail to internalize the surplus produced across districts. As a result, they overtax market production, each setting the tax rates $(\tau_{l,d}, \tau_{m,d})$ of Lemma 1.

The combination of centralized and decentralized districts implies that in our model total output and the ruler's tax revenues as a function of centralization κ are equal to:

$$Y(\kappa) = Y_d \cdot (1 - \kappa) + Y_c \cdot \kappa, \quad (6)$$

$$R(\kappa) = R_d \cdot (1 - \kappa) + R_c \cdot \kappa. \quad (7)$$

In the rest of the analysis we make the following parametric assumption:

A.1: Under decentralization, local power holders keep all tax revenues, i.e. $\rho = 1$ (or $R_d = 0$),

This assumption simplifies the analysis because now the ruler's total revenue is equal to:

$$R(\kappa) = R_c \cdot \kappa, \quad (8)$$

which is the revenue R_c obtained by the ruler in each centralized district times the measure of districts that are centralized. This is a convenient expression, but it is important to bear in mind how R_c , as well as output and the power holders' rents P_d depend on exogenous parameters.

⁸Formally, this requires the additional assumption that the κ centralized districts form a neighborhood around the ruler's own original district $i = 1/2$. Given the spatial pattern of market production described in footnote 6, all market production occurs within centralized districts and only a zero-measure (negligible) amount of market production occurs between centralized and decentralized districts. We simplify the analysis even further by posing that no economic activity occurs between centralized and decentralized districts. As a result, a partially centralized country can be split into a fully centralized and a fully decentralized region.

This setup seeks to capture the reality of early modern Europe where, before the formation of strong nation states, tax collection often relied on local representative bodies or noblemen. These operated through a system of fixed-sum payments, regional monopolies and overlapping tax schemes which stifled factor mobility and innovation. In this context, centralization allowed for less distortionary taxation, which generated additional revenues for the monarch while facilitating the growth of commerce. Using this setup we now endogenize centralization as a function of domestic and external conflicts.

3.3 State Building and Domestic Conflict

At the outset, which we denote $t = 0$, the ruler chooses the measure κ of districts to centralize (initially centralization is zero, i.e. $\kappa_0 = 0$). To do so, he must overcome domestic opposition by local power holders, because under centralization they lose the “control rent” P_d in (5). This amounts to a total loss of $2P_d$ over the two remaining periods $t = 1, 2$. Although as we saw above centralization increases total tax collection, potentially creating more rents for both the ruler and power holders, at $t = 0$ the ruler cannot commit to compensate power holders for losing control of tax collection (and the resulting rent). This creates opposition to centralization by power holders. In Section 4, we show how institutions can be precisely viewed as a mechanism alleviating the ruler’s commitment problem and thus power holders’ opposition to reform.

To overcome the opposition to centralization, the ruler needs to spend money. In particular, he can crush the power holder of district i (or buy him off) by spending an amount $\beta_i (2P_d)$ of resources. Parameter $\beta_i \geq 0$ proxies for the ability and willingness of power holder i to oppose the ruler, and is distributed across districts according to c.d.f $F(\beta)$, which captures the intensity of domestic conflicts in the country.⁹ In countries with greater levels of urbanization or religious/linguistic heterogeneity $F(\beta)$ is concentrated on higher values of β so that domestic conflict is more intense. This admittedly reduced-form formalization of internal conflicts allows us to keep the analysis of external wars tractable.

Given this heterogeneity, the ruler begins to centralize districts with low conflict β and then

⁹Cost $\beta_i (2P_d)$ can be microfounded by assuming that power holder i : a) can commit to spend in a revolt against the central ruler up to share z_i of the control rent $2P_d$ and that b) this translates into “defensive power” $d_i \cdot (z_i 2P_d)$, where d_i is the productivity of the power holder’s defense. By contrast, if the ruler spends an amount I_i , he generates “offensive power” $r_i I_i$, where r_i is the effectiveness of the ruler’s repression in district i . Here z_i may capture the power holder’s distaste for the central ruler while d_i/r_i proxies his relative strength. If the party with greater (offensive or defensive) power wins, the central ruler must spend $I_i^* = z_i \cdot (d_i/r_i) \cdot (2P_d)$ to centralize (either by using the resources in a conflict or by bribing the local power holder, who is assumed to have all the bargaining power). By denoting $\beta_i = z_i \cdot (d_i/r_i)$ this microfoundation maps into our model.

moves to more hostile districts. The cost of centralizing a measure κ of districts is then equal to:

$$C(\kappa) = (2P_d) \cdot \int_0^{\beta(\kappa)} \beta dF(\beta), \quad (9)$$

where threshold $\beta(\kappa)$ defines the resistance faced by the ruler in the marginal district, formally fulfilling $F[\beta(\kappa)] = \kappa$. In the remainder we assume:

A.2: β is uniformly distributed in $[0, B]$.

This assumption implies that Equation (9) takes the convenient form:

$$C(\kappa) = \kappa^2 (B \cdot P_d). \quad (10)$$

The cost of reform is convex because marginal districts are increasingly opposed to reform. The cost of reform grows with parameter B , which captures the strength of domestic conflict.

Consider the extent of centralization undertaken at $t = 0$ by the ruler absent any external threat. We call this regime “autarky.” At $t = 0$, the ruler sets κ to maximize his utility over $t = 0, 1, 2$. Since there is no borrowing, the ruler finances the reform cost out of a domain income $D > 0$ that he receives at $t = 0$. As a result, the ruler’s consumption at $t = 0$ is equal to $D - C(\kappa)$. The ruler’s consumption at $t = 1$ and $t = 2$ is instead equal to the fiscal revenues generated in these periods.¹⁰

It is convenient to view the ruler as choosing the fiscal revenue R that he can collect at $t = 1, 2$ rather than a level of centralization κ . Given Equation (8), the ruler’s revenue R uniquely pins down the underlying level of centralization as $\kappa = R/R_c$. That is the degree of centralization is equal to the ratio between the revenue R endogenously chosen by the ruler and the maximal revenue R_c that the ruler could attain by centralizing fully. By plugging $\kappa = R/R_c$ into the cost function (10), we can see that the ruler solves:

$$\arg \max_R 2R - \left(\frac{R}{R_c}\right)^2 (B \cdot P_d). \quad (11)$$

The optimal degree of centralization trades off the benefit for the ruler of obtaining fiscal revenues

¹⁰We are implicitly assuming that domain income D is only received at $t = 0$ and it is sufficient to pay for the reform cost, i.e. $D > C(1)$. This assumption simplifies the analysis of state building when external war is present. Not much would change if the ruler receives D also at $t = 1$ and at $t = 2$. In particular, the marginal impact of centralization on the ruler’s fiscal revenues does not change with D .

$2R$ over $t = 1, 2$ with the cost of curtailing domestic opposition at $t = 0$. By exploiting (4) and (5), the optimal reform R_{aut} prevailing under autarky is equal to:

$$R_{aut} = R_c \cdot \min \left[\frac{R_c}{B \cdot P_d}, 1 \right]. \quad (12)$$

If $BP_d \leq R_c$, domestic divisions B or power holders' rents P_d are so low relative to the ruler's revenue gain R_c that the ruler centralizes fully, setting $R_{aut} = R_c$ (i.e., $\kappa = 1$). If instead $BP_d > R_c$, domestic opposition is strong enough that the ruler centralizes only partially, setting $R_{aut} < R_c$.

Equation (12) says that stronger domestic political conflicts (i.e., higher B) reduce the ruler's ability to extend his power into peripheral areas. This stifles state building. By contrast, state building increases when centralization generates a larger gain in district-level revenue R_c/P_d , due for instance to a higher productivity A_m/A_l of market production. As in early-modern Europe, the pattern of state formation is shaped by the tension between reaping the benefits from the creation of a national market (proxied by A_m/A_l) and the opposition against central rulers by a myriad of local princes, cities, principalities, and estates (proxied by B). The next section studies how this basic conflict changes in the presence of external wars.

Before moving on, notice that when $B > R_c/P_d$ - which we assume throughout - Equation (12) allows us to rewrite the ruler's cost of centralization in the following intuitive way:

$$C(R) = c \cdot R^2 \quad \text{where} \quad c \equiv \frac{1}{R_{aut}}, \quad (13)$$

with R_{aut} being identified by (12). The marginal cost of reform c plays a key role in our analysis, capturing the domestic political cost of state building. A higher c proxies for more severe domestic divisions B or a lower benefit of centralization R_c/P_d , which both reduce autarky revenues R_{aut} in (12). Depending on analytical convenience we will use the marginal cost c or to the (inverse of the) autarky reform level R_{aut} as proxies for the domestic cost of state building.

3.4 External Conflict and Incentives to Reform

There are two-countries, "home" H and "foreign" F . At $t = 1$ they exogenously enter armed conflict with probability θ , where θ captures the belligerence of the environment. If $\theta = 0$, we are back to autarky; if $\theta = 1$, war occurs with certainty. Parameter θ captures factors leading to war that are unrelated to rulers' economic payoffs, such as empire-building motives, religious conflict, dynastic struggles, and inter-ruler rivalry. Here we assume that these exogenous war triggers always lead to

conflict. Section 5.2 allows rulers to endogenously choose whether or not to go to war conditional on the realization of a trigger.

War is costly. It absorbs the fiscal revenues of both rulers while it is fought, and redistributes fiscal revenues from the losing to the winning ruler thereafter.¹¹ Denote by R_J the fiscal revenues available at $t = 1, 2$ to the ruler of country $J = H, F$. If at $t = 1$ there is a war, each ruler spends R_J to wage it. Thus, greater centralization at $t = 0$ allows the ruler to have more resources to wage the war at $t = 1$. At $t = 2$, then, the winner is “awarded” the entire revenue $R_H + R_F$. The loser obtains nothing. Due to these assumptions, at $t = 0$ the consumption of ruler J is equal to $D - C_J(R_J)$, where $C_J(R_J)$ is the cost of his reform. If at $t = 1$ war does not arise, this ruler consumes $2R_J$ over $t = 1, 2$, just as in autarky. If instead at $t = 1$ war erupts, the ruler of country J uses his $t = 1$ revenues to wage the war; at $t = 2$ then, he consumes nothing if he loses while he consumes $R_H + R_F$ if he wins it.

The war outcome is stochastic. Ruler H wins the war with probability $p(R_H, R_F)$, ruler F wins with probability $1 - p(R_H, R_F)$. We assume that: i) a ruler is more likely to win if his tax revenues are higher, for this allows him to finance a larger or better army, but ii) the marginal return of a ruler’s war spending is decreasing. Formally, the contest success function $p(R_H, R_F)$ is continuous, differentiable and features $p_H > 0$, $p_F < 0$, $p_{HH} \leq 0$ and $p_{FF} \geq 0$, where p_J and $p_{J,K}$ ($J, K = H, F$) denote the function’s first and second derivatives with respect to R_H and R_F .

The sensitivity of the war outcome to fiscal revenues, measured by $|p_J|$, is a key determinant of centralization. A high value of $|p_J|$ captures a belligerent environment where money is very important to win the war. This is for instance the case if creating military strength requires a ruler to undertake large ex-ante investments to build powerful fortifications, acquire sophisticated and costly equipment (e.g. gunpowder, portable firearms), and to create an expensive organization to run a larger and more sophisticated military. Money is less important for success if the “war technology” mainly relies on cheap, standard, technologies and unskilled labour inputs such that - controlling for the size of the contending countries - fiscal revenues have a limited impact on the outcome of conflict. As we will see, in the model we capture the “military revolution” precisely as an increase in the sensitivity $|p_J|$ of the war outcome to fiscal revenues.

The timing of the model is as follows:

¹¹The assumption that at $t = 1$ the ruler spends all fiscal revenues in the war is realistic. During the war there are few opportunities for the king to spend resources in personal consumption. We have studied the case in which at $t = 1$ rulers optimally choose how much to spend in the war and our main results continue to hold, particularly with the linear contest success function of Section 4.2. The results are available upon request.

Figure 4 here

Given these preliminaries, in each country the ruler optimally chooses fiscal revenues R_J by implementing centralization $\kappa_J = R_J/R_c$. The ruler of country H chooses R_H so as to solve:

$$\max_{R_H} \theta \cdot \{p(R_H, R_F)(R_H + R_F) - 2R_H\} + 2R_H - c_H \cdot R_H^2, \quad (14)$$

while the ruler of country F chooses R_F so as to solve:

$$\max_{R_F} \theta \cdot \{[1 - p(R_H, R_F)](R_H + R_F) - 2R_F\} + 2R_F - c_F \cdot R_F^2. \quad (15)$$

In Equations (14) and (15), the war threat ($\theta > 0$) affects the benefit of centralization relative to autarky [see Equation (11)] by changing the impact of higher fiscal revenues on the ruler's utility at $t = 1, 2$. There are two effects. First, war creates the risk for rulers of losing their fiscal revenues $2R_J$ both in financing and losing the war. This discourages state building. Second, war creates the opportunity for rulers to enjoy $(R_F + R_H)$ in case of victory. This encourages state building.

The marginal cost c_J of centralization does not change with war.¹² Crucially, c_J potentially differs across countries, owing for instance to differences in domestic divisions B_J among contestants (this is in fact the source of heterogeneity that we will focus on) or to differences in the relative efficiency of market production $A_{m,J}/A_{l,J}$. We now study how these forces shape reform.

4 War and State Building

4.1 The Basic Strategic Effects

Equilibrium reforms constitute a Nash equilibrium of the game where rulers choose R_H and R_F according to (14) and (15). When the rulers' objective functions are concave (we focus on parameter ranges where this is the case), an equilibrium is identified by the first order conditions:

$$c_H \cdot R_H = 1 + (\theta/2) [p_H(R_H + R_F) - (1 - p) - 1], \quad (16)$$

¹²There are two reasons for this. First, the war outcome reallocates fiscal revenues across rulers but does not affect the centralization of specific districts. Second, and most important, the powerholders of decentralized districts are atomistic, which implies that their opposition to centralization does not affect the outcome of war. Both reasons imply that individual power-holders have no incentive to change their opposition to centralization in a belligerent environment, leaving the cost of state building unaffected. We can relax these assumptions and show that in this case the external war threat may affect the cost of reform without however changing our main results.

for country H , and:

$$c_F \cdot R_F = 1 + (\theta/2) [-p_F(R_H + R_F) - p - 1], \quad (17)$$

for country F . The war threat ($\theta > 0$) exerts three *direct* effects, which are all included in square brackets in the above equations. First, it boosts the incentive to centralize because, by increasing fiscal revenues, centralization enhances the probability of winning the war. This effect is captured by the first term in square brackets (as $p_H > 0$, and $p_F < 0$). Second, war lowers the benefit of centralization by creating the risk that the extra revenues created by reform are lost in the war. This effect is captured by the second (negative) term in square brackets and reduces the benefit of reform. Finally, the resource cost of war, which absorbs fiscal revenues at $t = 1$, also reduces the ruler's return from centralization. This is the third (negative) term in square brackets. Overall, war boosts a ruler's incentive to centralize when the sum of the terms in square brackets above is positive while dampens it otherwise.

Equations (16) and (17) identify two reaction functions $R_H(R_F | \theta, c_H)$ and $R_F(R_H | \theta, c_F)$ that link state building in the two countries. These reaction functions depend on the severity of the external war threat θ and on a country's cost of reform c_J , where the latter summarizes political as well as economic domestic conditions. An equilibrium (R_H^*, R_F^*) occurs where the two reaction curves intersect. In the appendix we prove:

Proposition 1 *If an equilibrium (R_H^*, R_F^*) exists, it is unique. Furthermore:*

a) *A more severe war threat (i.e. higher θ) boosts reform incentives in country $J = H, F$ if and only if war is sufficiently sensitive to fiscal revenues, namely:*

$$\frac{dR_J(R_{-J} | \theta, c_J)}{d\theta} > 0 \quad \text{if and only if } |p_J| \text{ is sufficiently large.} \quad (18)$$

b) *A higher marginal cost of reform c_J dampens reform incentives in $J = H, F$, namely:*

$$\frac{dR_J(R_{-J} | \theta, c_J)}{dc_J} < 0. \quad (19)$$

c) *The reaction functions of countries $J = H, F$ and $-J \neq J$ always have opposite slopes, namely:*

$$\frac{dR_J(R_{-J} | \theta, c_J)}{dR_{-J}} > 0 \quad \text{if and only if} \quad \frac{dR_{-J}(R_J | \theta, c_{-J})}{dR_J} < 0. \quad (20)$$

These results stress, for a general contest success function, what factors shape centralization.

According to a), the war technology plays a critical role. A more bellicose environment (i.e., a higher θ), boosts a ruler's incentive to reform if and only if the war outcome is highly sensitive to fiscal revenues. This occurs when effective war-making requires large technological and organizational investments. When instead these investments are less important at the margin, a higher probability of war *dampens* a ruler's incentive to centralize. In the latter case, the ruler realizes that - besides having a relatively modest impact on the war outcome - the revenue gain created by state building may be lost in war. This effect blunts his incentive to centralize.

Property b) says that the incentive to centralize is high when c_J is low. In this case, domestic conflict is mild and/or market production is very efficient. If instead c_J is high, the incentive to centralize is small. These effects arise also in autarky but here they crucially imply that in our model external war does not automatically transform state building into a common interest public good. Because atomistic power holders do not have a personal interest in centralization, they oppose the latter even if external conflict is possible. As a result, external threats can differentially affect state building across countries. The ruler of a divided country may be unable to respond to external war as much as a more cohesive opponent, reducing the former's incentive to centralize.

Finally, property c) illustrates that strategic effects introduce yet another source of divergence in state building. The ruler with a positively sloped reaction function always reacts to stronger reform abroad by increasing his own reform stance. We call this ruler an "aggressive reformer". By contrast, the ruler with a negatively sloped reaction function reduces his own reform efforts when reform abroad gets stronger. We call this ruler a "timid reformer". This asymmetry in the rulers' reaction functions is due to the zero-sum nature of war: the ruler that is, for whatever reason, more effective at war will undermine the other ruler's investment in state building. As a result, when facing a strong contestant a weak ruler "gives up", deliberately moderating his own reform stance. To gain intuition on this effect, consider Figure 5, which plots the reaction functions of ruler H and F (together with a shift in one of them).

Figure 5 here

This effect contributes to creating diverging patterns of state building across countries. Indeed, suppose that - as in Figure 5 above - the marginal cost of reform falls in the aggressive reformer H , perhaps because the latter country becomes more cohesive or economically more advanced. Then, not only does ruler H reform more aggressively but, owing to strategic effects, ruler F reduces his reform stance! Here external conflict hinders state building by F and boosts the

advantage of country H in state building.¹³ These effects imply that the presence of a war threat creates *centripetal* forces that dampen the effect of domestic conflict in the aggressive reformer and *centrifugal* forces that boost the effect of domestic conflict in the weak reformer.

To study in detail how the war technology and differences between countries affect state building, we now consider the tractable cases of a linear and a power specification of the contest success function $p(R_H, R_F)$.

4.2 Linear Contest Success Function

Consider the contest success function:

$$p(R_H, R_F) = \frac{1}{2} + \lambda(R_H - \gamma R_F). \quad (21)$$

Parameter λ captures the extent to which “money makes might”, i.e. the sensitivity of war outcomes to fiscal revenues. As λ goes up $|p_J|$ goes up for all $J = H, F$. In addition, $\gamma \leq 1$ captures the military disadvantage of country F with respect to country H (i.e. $|p_F| \leq |p_H|$). Here γ is exogenous, capturing factors such as smaller size (F 's army size may be constrained by the number of men of military age) or worse geography.

We assume $\theta\lambda \max[R_{H,aut}, \gamma R_{F,aut}] < 1$, which ensures that the rulers' objectives are concave. Then, an interior equilibrium occurs at the intersection of the reaction functions:

$$R_H(R_F | \theta, c_H) = \left(\frac{1 - 3\theta/4}{1 - \theta\lambda/c_H} \right) \cdot R_{H,aut} + \frac{\theta(1 - \gamma)\lambda/c_H}{1 - \theta\lambda/c_H} \cdot R_F, \quad (22)$$

$$R_F(R_H | \theta, c_F) = \left(\frac{1 - 3\theta/4}{1 - \theta\lambda\gamma/c_F} \right) \cdot R_{F,aut} - \frac{\theta(1 - \gamma)\lambda/c_F}{1 - \theta\lambda\gamma/c_F} \cdot R_H. \quad (23)$$

The intercept captures the reform chosen by a ruler when his opponent does not reform at all (i.e., when $R_{-J} = 0$), the second term captures a ruler's reaction to state building abroad. Note that H , the country having a military advantage, is the aggressive reformer while F is the timid reformer. Because the war outcome is more sensitive to fiscal revenues in H , the latter country can always undo the effect of reforms in F by boosting its own reform stance, while the reverse is not true.

We first study the equilibrium prevailing when both countries are equally effective at war-making, namely when $\gamma = 1$. In this case there is no strategic interaction between reforms in

¹³Accordingly, if the marginal cost of reform c_F falls in the timid reformer, this will not only induce the latter to centralize more, but it will also boost the state building effort of the aggressive reformer. Corollary 0 in the appendix formally proves this statement.

different countries, and we can study the role of properties a) and b) of Proposition 1, abstracting from property c). In the appendix we prove the following result.

Proposition 2 *Under some technical conditions, if $\gamma = 1$ in equilibrium we have:*

$$R_J^* = \min \left[\frac{1 - 3\theta/4}{1 - \lambda\theta/c_J} R_{J,aut}, R_c \right] \quad \text{for } J = H, F. \quad (24)$$

The equilibrium (R_H^*, R_F^*) displays the following properties:

i) Centralization $\kappa_J^* = R_J^*/R_c$ increases in the sensitivity of the war outcome to fiscal revenues λ for all $J = H, F$. In country J , centralization increases with the frequency of external conflict θ if and only if λ is large relative to the marginal cost of reform, namely provided

$$\lambda > 3 \cdot c_J/4.$$

ii) If centralization is partial in all countries, namely $\kappa_J^* < 1$ for $J = H, F$, we have that:

$$\frac{R_H^*}{R_F^*} = \frac{R_{H,aut}}{R_{F,aut}} \cdot \frac{1 - \lambda\theta/c_F}{1 - \lambda\theta/c_H}, \quad (25)$$

so that $R_H^*/R_F^* > R_{H,aut}/R_{F,aut}$ if and only if $c_H < c_F$.

Centralization and the importance of fiscal resources for war-making are closely related. The extent of centralization κ_J^* pursued by rulers increases with λ , the sensitivity of war outcomes to fiscal revenues. The higher is λ , the more state building boosts the probability of winning the war, and the higher is the benefit of reform. If $\lambda > 3 \cdot c_J/4$, the benefit of reform is so large relative to its cost that the war threat boosts centralization relative to autarky. If instead $\lambda < 3 \cdot c_J/4$, the sensitivity of the war outcome to fiscal revenues is low relative to the cost of reform and thus centralization is below the autarky level. In this case, external conflict is more of a risk than an opportunity: the danger that a ruler loses revenues from reform outweighs the potential gain in income. This undermines his incentive to centralize.

Crucially, result ii) shows that regardless of whether centralization is above or below its autarky level, the presence of a war threat *amplifies* inequality in state building relative to autarky. If $\theta > 0$, the country where centralization is cheaper (perhaps due to lower domestic divisions and/or higher productivity of market production) centralizes disproportionately more than its opponent. A higher θ greatly boosts the incentive to centralize in the low-cost country because such country is little

afraid of losing revenues generated by reforms. The opposite is true in the country where the cost of reform is high. These effects become stronger as λ goes up.

To see the link between domestic conflict, external conflict and reform, suppose that countries H and F only differ because domestic divisions B_J are higher in F than in H , i.e. $B_H < B_F$. Denote by R_{aut} the autarky reform $R_{H,aut}$ in H . Then, the autarky reform in F is equal to $R_{F,aut} = (B_H/B_F)R_{aut}$. Figure 6 illustrates the pattern of state building in the two countries.

Figure 6 here

The horizontal axis measures the common component of autarky revenue. A higher R_{aut} can capture a global boost in the efficiency of market production, due to increasing commercialization, which reduces the marginal cost of centralization $c_J = 1/R_{J,aut}$ in all countries. The vertical axis measures the sensitivity of war to fiscal revenues. When $\lambda < 3/4R_{aut}$, the military gains from increasing fiscal revenue are so low relative to the cost of reform that a race to the bottom prevails: state building declines in all countries. As λ increases above $3/4R_{aut}$, the ruler of the less divided country H can tilt the war outcome in his favour by engaging in state building. In contrast, the ruler of country F will be reluctant to do because he faces strong domestic opposition. In this range, the external war threat creates pervasive inequality in state building across countries. As the sensitivity of war to fiscal revenues becomes very large, so that $\lambda > 3/4(B_H/B_F)R_{aut}$, the war threat boosts centralization even in country F . Eventually, as λ increases, both countries centralize fully, i.e. $\kappa_H^* = \kappa_F^* = 1$.

These results show that - contrary to conventional wisdom - an external war threat does not necessarily boost state building by increasing competition among rulers. If fiscal revenues only change the likely outcome of war by a little (i.e. λ is low), external conflict dampens state building in all countries. But even if external conflict boosts state building (either due to high λ and/or high R_{aut}), it may do so in an asymmetric way, depending on the severity of domestic political divisions in the two countries. Cohesive countries will have a comparative advantage both in state building and in war fighting. The rulers of divided countries then give up any attempt to centralize. Only when λ and/or R_{aut} are very large will a more bellicose world produce convergence in state building across countries.

The case where $\gamma = 1$ leaves out the strategic effects of Proposition 1 (property c) and of Corollary 1. To gauge these effects, consider the following result:

Proposition 3 *When $\gamma \leq 1$ equilibrium reforms fulfill:*

$$\frac{R_H^*}{R_F^*} = \frac{R_{H,out}}{R_{F,out}} \cdot \frac{1 + \theta\lambda(1 - 2\gamma)/c_F}{1 - \theta\lambda(2 - \gamma)/c_H}. \quad (26)$$

As a result, $R_H/R_F \geq R_{H,out}/R_{F,out}$ if and only if $c_F/c_H \geq (2\gamma - 1)/(2 - \gamma)$. Also R_H/R_F increases in λ if and only if $c_F/c_H \geq (2\gamma - 1)/(2 - \gamma)$.

If country F is both more domestically divided and weaker in the battlefield than country H (i.e., $c_F > c_H$ and $\gamma < 1$), divergence in state building is very strong. Now, not only does the asymmetry in reform costs induce H to disproportionately centralize relative to F , but reform in the more cohesive country H directly dampens reform in F via strategic effects. This is because, when $\gamma < 1$, the ruler of country F expects to lose the war with high probability even if he undertakes an extensive reform, thereby hindering his incentive to centralize. Conversely, if country F is highly efficient at war-fighting ($\gamma > 1$), it may overcome some of the disincentive effects coming from having greater internal divisions. The general point of Proposition 3 is that war creates inequality in state building not only via its interaction with domestic conflict but also via a strategic effect due to inequality in the countries' military prowess. In the previous analysis, such inequality γ was exogenous. Now we show that with a power specification of the contest success function, such inequality, and thus strategic effects, are endogenously shaped by domestic political divisions in the two countries.

4.3 Power Contest Success Function

Consider the following contest success function:

$$p(R_H, R_F) = \frac{R_H^\lambda}{R_H^\lambda + R_F^\lambda}. \quad (27)$$

As before, $\lambda \geq 0$ captures the sensitivity of the war outcome to fiscal revenues. When $\lambda = 0$ the war outcome is determined by a coin toss, i.e. $p = 1/2$. In the intermediate case $\lambda = 1$ a country wins the war with odds equal to its relative fiscal revenue. When $\lambda \rightarrow \infty$ the richer country wins with probability one. Even though the above contest success function is symmetric [i.e., $p(R_H, R_F) = p(R_F, R_H)$], the incentive to increase fiscal revenues can be unequal across countries because of the nonlinearity of (27). By plugging $|p_J| = \lambda \cdot p(1 - p)/R_J$ and (27) into Equations (16) and (17) it is easy to find:

Lemma 2 *When countries are symmetric, $R_{F,aut} = R_{H,aut} = R_{aut}$, the equilibrium features:*

$$R_H^* = R_F^* = R_{aut} \left[1 + \frac{\theta}{4}(\lambda - 3) \right]. \quad (28)$$

Higher θ boosts state building if and only if the sensitivity of the war outcome to fiscal revenues is sufficiently high, namely $\lambda > 3$. When instead countries are asymmetric $R_{H,aut} \neq R_{F,aut}$ (and thus $c_H \neq c_F$), the unique equilibrium features:

- 1) $R_H^* > R_F^*$ if and only if $c_H < c_F$
- 2) H is the aggressive and F the timid reformer if and only if $c_H < c_F$. If, starting from $c_H = c_F$ (and thus $R_{H,aut} = R_{F,aut}$) the marginal cost of reform c_H in H drops sufficiently, reform in F falls below the autarky level, namely $R_F^* < R_{F,aut}$.

The main findings obtained under the linear specification are preserved under the exponential contest success function (27). In particular, the war threat ($\theta > 0$) boosts centralization if and only if λ is sufficiently large. Equation (28) formally proves this for the case where the two countries are identical, but the result holds more generally (it surely holds for $\lambda = 0$), even though we cannot explicitly solve for the equilibrium when $\lambda > 0$. It also continues to be the case that the external war threat exerts an asymmetric effect across countries, favouring the country with lower domestic cost of reform, H .

The novel result here is that the country characterized by low domestic conflicts does not only disproportionately reform because it faces a lower cost, but also because - from a strategic standpoint - such a country is the aggressive reformer. As a result, its reforms cause a reduction of state building in its divided opponent, which is a weak reformer. To illustrate this possibility, the figure below graphically represents result 2) of Lemma 2.

Figure 7 here

The left panel displays the symmetric equilibrium arising when the cost of reform is identical in H and F . Here λ is assumed to be so high that both countries centralize more than in autarky. As country H becomes much less divided than country F (see the left panel), H boosts its centralization. The resulting negative externality is so strong that in F centralization falls below the autarky level. Thus, strategic effects magnify the link between cross country differences in domestic conflict and divergence in state building.

4.4 Comment

Our model shows that the presence of an external war threat boosts state building only if fiscal revenue has a decisive effect on success in war. Furthermore, cross country differences in the level of domestic conflict may cause divergent patterns of state building, with one country aggressively centralizing and another being reluctant to do so.

Figure 6 provides one useful way to visualize these effects. As political entities consolidate and the world becomes belligerent, three subsequent patterns of state consolidation should occur as a function of the costliness of military technology. In the first phase, the sensitivity of war to fiscal revenues is low relative to the cost of reform, so that relative to autarky the risk of entering a war discourages state building in all countries. This regime captures a highly fragmented state system where the balance of power within political entities is unstable and does not lead to the emergence of a strong centralized power. As the sensitivity of war to fiscal revenues increases, rulers become more hungry for fiscal revenues in order to respond to external threats. They thus increasingly centralize their power, by reducing rent extraction by local magnates and streamlining tax administration. As a result, taxation becomes less distortionary, which may spur growth and commerce. As the tax base expands, so do the stakes involved in warmaking, further boosting state building. That is, the increase in the sensitivity of the war outcome to fiscal revenues creates a positive feedback mechanism whereby improvements in the efficiency of tax collection reduce tax distortions, foster growth, thereby begetting wars and further state building.

As the role of money in deciding wars reaches intermediate levels, state building exceeds the autarky level at least in some of the countries. However, a strong asymmetry emerges whereby the monarchs of less divided and more developed countries have a disproportionately large incentive to centralize, which creates strong divergence in state building. This effect may even encourage rulers of less powerful countries to drop out of the competition and restrain their state building efforts. Now the international system consists of politically strong and economically developed centralized countries and weaker, poorer, less centralized countries. These laggard countries are unlikely to survive as they increasingly fall prey to the strong ones. Finally, as the sensitivity of the war outcome to fiscal revenues becomes very large, all rulers maximally boost their state building efforts and countries converge to the full centralization benchmark where tax distortions are lowest and productions is highest.

As we show next, this link between state building and the military technology becomes even

stronger once one accounts for the rulers' decision to create institutional constraints limiting their own prerogatives as well as for the endogenous choice of whether or not to go to war.

5 Institutions and the Decision to Go to War

We now extend our basic setup to analyze: the role of institutions and of institutional change as well as the endogenous decision by rulers of whether or not to go to war.

5.1 Institutions and Centralization

We view institutions as constraints on the executive (Acemoglu, Johnson and Robinson 2001), and we capture them by a ruler's ability to extract resources from power holders. In country $J = H, F$ institutions set the share $(1 - \pi_J) \in [0, 1]$ of tax revenues that the ruler can grab in a *centralized* district. The remaining share π_J of revenue R_c goes to the local power holder. As before, fiscal revenues in decentralized districts are retained completely by the power holder. Our previous analysis boils down to the case of $\pi_J = 0$ in which the ruler is unconstrained. If $\pi_J = 1$, we are at the opposite extreme where all tax revenues collected in centralized districts go to local power holders. When π_J is higher, institutions are stronger, owing to the presence of stricter checks and balances on the ruler, to the greater power of legislative assemblies, constitutional review, and so forth.¹⁴ We now study the effect of institutions on state building. Section 5.1.2 instead endogenizes the link between external wars and institutional development.

5.1.1 Institutions and the Ruler's Decision to Centralize

Out of a quantity R_J of fiscal revenues collected, the ruler can only grab $\tilde{R}_J = (1 - \pi_J) \cdot R_J$ for himself. Over two periods then, the power holder of a centralized district obtains $2\pi_J R_c$. This implies that his loss from decentralization is equal to $2(P_d - \pi_J R_c)$, which falls in the strength of

¹⁴We solved the model also under the alternative assumption that institutions also contemplate the creation of a representative assembly of centralized powerholder who can vote to decide whether to give all of their fiscal revenues to the central ruler. To implement this case we slightly changed the model (with no consequences for our previous results) by assuming that local powerholders lose the fixed amount $L > 0$ when their country is defeated. In such case, for a linear specification of the contest success function it is easy to show that if a war threat materializes the assembly will hand all fiscal revenues to the ruler provided $\lambda L > 1$. In this specific sense, the war becomes a common public good. If this is the case, the ruler will grab a share $(1 - \pi_J)$ of fiscal revenues in normal times but with probability θ he will grab all fiscal revenues and invest them in the war. This more nuanced portrayal of institutions renders the analysis more complicated but does not change our main results.

institutions π_J . If

$$\pi_J \geq \hat{\pi}_J \equiv \frac{P_d}{R_c}, \quad (29)$$

institutions are so strong that local power holders actually gain from centralization! When (29) holds, there is no political opposition to reform. In this case, the cost of centralizing is zero, regardless of the extent of domestic conflict. This is because strong institutions commit the ruler to reach a mutually advantageous revenue-sharing arrangement with power holders. We focus on the more interesting case $\pi_J < \hat{\pi}_J$, in which there is domestic opposition to reform and the optimal reform trades off the cost of centralization with its benefit.

Given these preliminaries, the optimal centralization pattern can be found by replacing R_J with \tilde{R}_J in the maximization problems (14) and (15). By noting that $\kappa_J = \tilde{R}_J/R_c\pi_J$, one then finds that to obtain a fiscal revenue $\tilde{R}_J = (1 - \pi_J) \cdot R_J$ the ruler must now bear the cost:

$$C_J(\tilde{R}_J) = \tilde{c}_J \cdot \tilde{R}_J^2, \quad \text{where } \tilde{c}_J \equiv \frac{1}{\tilde{R}_{J,aut}} \quad (30)$$

where, in the spirit of Equation (12):

$$\tilde{R}_{J,aut} = (1 - \pi_J) \cdot R_c \cdot \min \left[\frac{(1 - \pi_J) R_c}{P_d - \pi_J R_c B_J}, 1 \right]. \quad (31)$$

In our model stronger institutions can be simply conceptualized as a reduction in the marginal cost faced by the ruler for increasing fiscal revenue.

In (31) institutions affect (via the cost of centralizing) the autarky fiscal revenue in two conflicting ways. On the one hand, stronger institutions (higher π_J) reduce opposition to reform, increasing autarky revenues. This effect is captured by the term π_J inside the square brackets. On the other hand, stronger institutions directly reduce the ability of the ruler to grab fiscal revenues. This effect is captured by the term $(1 - \pi_J)$ outside of the square brackets. In the realistic case where the efficiency gains of centralization are large (i.e. $R_c > 2P_d$), which we assume throughout, the first effect dominates and better institutions boost autarky revenues. In this case, the marginal cost of centralization in (30) decreases in the strength of institutions: a higher π_J commits the central ruler to leave more revenues to local power holders, reducing their opposition to centralization.¹⁵

¹⁵In this range institutions are thus “win-win” in the sense that, in the absence of a cost of changing institutions the ruler should be expected to set them at the maximal value $\pi_J = \pi_J^*$ consistent with full centralization. The institutional arrangement described in footnote 24 would have different, perhaps more accurate, implications. In

Given these preliminaries, country H has a lower cost of centralization than F , that is $\tilde{c}_H \leq \tilde{c}_F$, provided:

$$\frac{(1 - \pi_J)}{P_d - \pi_H R_c} \cdot \frac{1}{B_H} \geq \frac{(1 - \pi_J)}{P_d - \pi_F R_c} \cdot \frac{1}{B_F}, \quad (32)$$

namely when institutions in H are strong relative to the intensity of domestic conflict in the same country. Even if country H is “more divided” than F (i.e. if $B_H > B_F$) its ruler can face weaker domestic opposition if institutions constrain him more than the ruler than country F .

We can exploit Propositions 2 and 3 to see the impact of institutions on centralization. Equation (25) says that, under a linear contest success function, war *amplifies* differences in the domestic cost of reform. That is, the country having relatively better institutions centralizes more than the country with worse institutions because the cost of reform is smaller in the former country. Under a power contest success function, strategic effects reinforce this conclusion. In sum, institutions support state building in divided societies because it is the presence of strong institutions that effectively turns state building into a common interest public good: when π_J is higher, not only the central ruler, but also local powerholders, benefit from centralization. We now show how these effects shed light on the link between external wars and endogenous institutional development.

5.1.2 External Wars, Centralization and Institutional Change

To endogenize institutions we assume that rulers - before undertaking any centralization - can strengthen their institutions at some cost. As the previous analysis shows, a strengthening in institutions π_J is akin to a decrease in the marginal cost of reform c_J . At the outset $\pi_{0,J} = 0$ and ruler J can upgrade his institution to a level $\pi_J > 0$ by spending $K(\pi_J)$, where $K(\cdot)$ is an increasing and convex function. This cost of institutional reform is uniform across countries but the benefit of institutional upgrading is country specific, owing to cross country differences in domestic conflict. It is this latter feature that generates institutional divergence.¹⁶ Indeed, the Appendix proves that for any contest success function satisfying the general properties stated in Section 3.3:

Proposition 4 *Denote by $W_J(\pi_J, B_J)$ the equilibrium welfare of ruler $J = H, F$ as a function of*

such arrangement the country as a whole would benefit from the presence of institutions (as the latter would boost the ability of the country to respond to external threats), but the ruler would not benefit much (and may even lose) from institutions because local powerholders would prevent him from grabbing fiscal revenues in peaceful times. As a result, the ruler would face a private cost of setting stricter checks and balances.

¹⁶The notion that $K(\cdot)$ is the same across countries is not only parsimonious (we already have country varying benefits) but also reasonable: in our setting both the ruler and local power holders benefit from stronger institutions, so $K(\cdot)$ captures the pure cost for the ruler to buy a commitment technology.

the strength of institutions π_J and of domestic divisions B_J . At a common level of institutions $\pi_H = \pi_F = \pi$ ruler H benefits more than ruler F from institutional improvements, i.e. $\left. \frac{\partial W_H}{\partial \pi_H} \right|_{\pi_H = \pi} > \left. \frac{\partial W_F}{\partial \pi_F} \right|_{\pi_F = \pi}$ if and only if:

$$\frac{\tilde{R}_H^*/\tilde{R}_{H,aut}}{\tilde{R}_F^*/\tilde{R}_{F,aut}} \cdot \frac{\tilde{R}_H^*}{\tilde{R}_F^*} > 1. \quad (33)$$

To see this result, suppose there is no external war. Now $\tilde{R}_J^* = \tilde{R}_{J,aut}$ and the first factor on the left hand side of Equation (33) drops out. The second factor then says that country H benefits more than F from institutional upgrading if and only if it is less divided than F to begin with (i.e., if $\tilde{R}_{H,aut} > \tilde{R}_{F,aut}$). In other words, a strengthening of institutions more effectively reduces the cost of centralization in a country that has a lower cost of reform to begin with. To see the intuition, suppose that differences in the cost of reform are due to domestic divisions. Then Proposition 4 says that institutional development has only a limited impact in countries that are highly fragmented (i.e. have higher B_J). This is because marginal improvements in institutions appease few domestic opponents there. In contrast, in countries where domestic conflict is weaker domestic opposition is very “elastic” to an increase in π_J . As a result, an improvement in institutions greatly boosts state building there. These effects amplify inequality among countries, favouring the country characterized by fewer domestic conflicts.¹⁷

The effect discussed above deals with the autarky scenario. Suppose however that a war threat arises. Then, the first term in (33) does not drop out because $\tilde{R}_J^* \neq \tilde{R}_{J,aut}$.¹⁸ This implies that the less divided country H becomes even more eager to upgrade institutions relative to F precisely when the external threat boosts divergence in centralization. That is, provided $\tilde{R}_H^*/\tilde{R}_{H,aut} > \tilde{R}_F^*/\tilde{R}_{F,aut}$. If, by contrast, external wars induce convergence in centralization, they also dampen cross-country differences in institutions. In sum, external war threats increase inequality in institutional development if and only if they increase inequality in state building.

This result allows us to fully characterize the patterns of institutional upgrading prevailing in the linear and symmetric contest success function of Proposition 2:

¹⁷The uniformly higher elasticity of domestic opposition to institutions in more cohesive countries is due to the fact that the distribution of β is uniform. Of course, this elasticity property no longer holds at corners. For example, in countries where domestic conflicts is so small that reforms are almost always undertaken, better institutions will play a small role. Recall however that we realistically assumed that in all countries conflicts are sufficiently strong that in autarky centralization is partial (i.e. $B_J > R_c/P_d$) and that institutions are sufficiently weak that some conflict is present (i.e. $\pi_J < \hat{\pi}_J$).

¹⁸With respect to the second term, provided the contest success function is symmetric (which is our main case of study) it is still true that $\tilde{R}_H^* > \tilde{R}_F^*$ if H is less divided than F . Hence, the second factor in (33) continues to enhance the benefit of institutional upgrading in the less divided country.

Corollary 1 Denote by $\pi_{J,aut}$ the endogenously chosen degree of institutional upgrading by ruler $J = H, F$ in autarky and by $\tilde{R}_{J,aut}$ and \tilde{c}_J the associated autarky revenues and marginal cost, respectively. Denote by κ_J^* and π_J^* the equilibrium centralization and institutions prevailing in country J when an external threat is present (i.e., when $\theta > 0$). We then have

- 1) Institutions and centralization in J are stronger than in autarky if and only if $\lambda > 3 \cdot \tilde{c}_J/4$
- 2) If centralization and institutions are partial, namely $\kappa_J^* < 1$ and $\pi_J^* < \hat{\pi}_J$ for $J = H, F$, the less divided country has higher κ_J^* and π_J^* than its opponent.

As in Besley and Persson (2010), different dimensions of state development - centralization and institutions - cluster together. In particular, external wars create asymmetries not only in centralization, but also in institutional development. Stronger institutions allow rulers to relax domestic conflicts and boost centralization. In a little divided country, institutional upgradings are effective at reducing opposition to reform. Thus, the ruler invests in such upgradings, particularly when he must meet an external war threat. In highly divided countries instead, only large institutional upgradings can effectively reduce domestic opposition. This discourages the ruler from undertaking any institutional upgrading or state building, stifling all reforms.

Interestingly, the joint pattern of institutional development and state building is shaped by λ , the sensitivity of the war outcome to fiscal revenues. Much in the spirit of Figure 6, when λ is low the external war threat dampens investments in institutions and centralization in all countries. As λ becomes intermediate, only the ruler of the less divided country disproportionately boosts his centralization and institutions, generating strong divergence. As λ becomes very large, all rulers face enormous incentives to invest in institutions and state buildings, leading to the emergence of strong and accountable states. The statistical analysis in Dincecco (2009) - who shows that centralized and constrained governments in Europe taxed more than fragmented or “absolutist” entities between 1650 and 1913 - is fully in line with the predictions of our model here.

5.2 The Choice to Go to War

In our current model, the features of warmaking are entirely captured by the rulers’ fiscal revenues (R_H, R_F), which can be viewed as a proxy for the “intensity” of military conflict, as reflected in a larger cost, duration and geographical spread of wars.¹⁹ The outbreak of war is by contrast

¹⁹War obviously becomes more intensive if either R_H or R_F or both go up. We instead do not specify how such intensive margin varies if the two revenues move in different directions. In most cases, however, in our model both R_H and R_F increase in λ although there may be divergence in the sense that in one country revenues increase much

exogenous. In reality, both going to war and the intensity of warfare reflect political choices. In this section we therefore extend our model to analyze a ruler's decision of whether or not to go to war. This section thus generates predictions on the link between state building and the frequency of war.

As in the previous analysis, assume that a war trigger arises exogenously with probability θ . Both rulers have armies ready to go to war, but now they unilaterally decide whether or not to do so depending on their economic payoff. To make things interesting, we assume that war destroys a share $(1 - \sigma) > 0$ of fiscal revenues at $t = 2$ in all countries. This implies that: i) it is impossible for both rulers to expect to gain from war, and ii) there may be circumstances where both rulers lose from the war, so that war does not always occur. In general, when $\sigma < 1$ it would be mutually beneficial for rulers to renegotiate the war away, but here we realistically assume that such renegotiations are impossible because rulers cannot commit to make the necessary transfers.

As a result, if at $t = 1$ a war trigger arrives with probability θ , two things can happen. First, both rulers may expect to lose from the war. In this case, military conflict is averted. Alternatively, either ruler may expect to gain from war. In this case, military conflict erupts. Clearly, this change in the model setup does not only affect the frequency of war, but also the ex-ante investment in state building. Indeed, the incentive to centralize at $t = 0$ will depend on the (now endogenous) probability of going to war at $t = 1$.

To see how these effects play out, let us solve the model backwards. Given the equilibrium revenues (R_H^*, R_F^*) , and conditional on the realization of a war event, conflict occurs either when H benefits from the war, formally when:

$$p(R_H^*, R_F^*) \cdot \sigma \cdot (R_H^* + R_F^*) \geq R_H^*, \quad (34)$$

or when F benefits from war, namely when:

$$[1 - p(R_H^*, R_F^*)] \cdot \sigma \cdot (R_H^* + R_F^*) \geq R_F^*. \quad (35)$$

War is averted if and only if none of the above conditions holds. Intuitively, (34) and (35) ensure that a ruler's expected revenue from going to war (the left hand side in the above expressions) is higher than what he can obtain by taxing only his own economy (the right hand side above).

more than in the other.

Under a symmetric contest success function [i.e. such that $p(R, R) = 1/2$], war cannot occur if countries have identical revenues ($R_H = R_F$); in this case, the war prize is awarded with a coin toss and no ruler expects to obtain from war more than his own revenues (since $\sigma < 1$, actually they both expect to obtain less than that). Hence, both rulers prefer a peaceful outcome. The incentive to go to war instead arises if countries are unequal; in this case, the war heavily favors one contestant, who is thus eager to initiate conflict. Since inequality in fiscal revenues is itself affected by the patterns of centralization, the probability of conflict and investment in state building are jointly determined in equilibrium. The Appendix shows that under the linear contest success function of Proposition 2 the following result obtains.

Proposition 5 *Denote by λ^* the sensitivity of war to fiscal revenue at which $\max(R_H^*, R_F^*) = R_c$, so that for $\lambda \leq \lambda^*$ state building in the two countries is partial. Then, there exist two thresholds λ_0, λ_1 where $0 \leq \lambda_0 < \lambda_1 \leq \lambda^*$ such that, conditional on the realization of a war event:*

- 1) *If $\lambda \leq \lambda_0$, war occurs with probability one and the less wealthy ruler expects to benefit from it*
- 2) *If $\lambda \in (\lambda_0, \lambda_1)$, the equilibrium is in mixed strategies and war occurs with probability $\omega \in [0, 1)$.*
- 3) *If $\lambda \geq \lambda_1$, war occurs with probability one and the wealthier ruler stands to benefit from it.*

This result has several interesting implications. First, war is most likely to arise if the sensitivity of fiscal revenues is either high or low. Second, and crucially, the identity of the party initiating conflict is different in these two cases. When the sensitivity of war to fiscal revenues is high, the wealthier country is the one initiating conflict. The intuition is that in this case the wealthier country is disproportionately more likely to win the war. As a result, it is eager to initiate conflict. In effect, with λ high enough, war behaves like a “superior good”, which is consumed to a greater extent as a ruler grows his fiscal resources. When instead the sensitivity of wartime success to fiscal revenues is low, the less wealthy country is the one initiating conflict. The intuition is that at low λ the less wealthy country wins the war with non-negligible probability, so that the prospect of conquering a more wealthy opponent acts as an inducement to conflict.

Matters are more complicated when λ is intermediate. Relative to the extent of war destructions, the probability with which either ruler wins is too low for military conflict to be appealing. One possibility in this range is that war does not occur at all, i.e. $\omega = 0$. In this case, at $t = 0$ the rulers invest as in autarky, which is an equilibrium only if in turn, at the autarky revenues, no ruler has an incentive to go to war at $t = 1$. If however at the autarky revenues one ruler wishes to initiate conflict, the equilibrium is in mixed strategies: conditional on a war trigger θ war occurs

with positive probability $\omega \in (0, 1)$. The level of ω is then determined so that - at the ex-ante probability of war $\theta \cdot \omega$ - the optimal investments in state building at $t = 0$ renders the more belligerent ruler just indifferent between initiating the war or not at $t = 1$ (and thus willing to randomize the decision of whether or not to go to war). Regardless of the specific value taken by ω in equilibrium, the general point here is that at intermediate levels of λ the probability of conflict goes down relative to the case where λ takes extreme values.

This analysis has two broad implications. First, the link between the war technology and the frequency of military conflict is non-linear. War can happen frequently both when the military technology is highly developed and expensive (i.e. λ is high) as well as when it is primitive (i.e. λ low).²⁰ Furthermore, when λ is so high that both war contenders become fully centralized (i.e. $\lambda \gg \lambda^*$), a peaceful outcome also arises. As a result, it is difficult to draw univocal predictions linking the frequency of conflict, the war technology and state building.

Second, and more interestingly, the decision of whether to go to war or not creates an additional channel whereby external threats should create convergence or divergence among countries. When the sensitivity of the war outcomes to fiscal revenues is low, military conflict is effectively a mechanism allowing weaker powers to benefit on average by challenging more consolidated ones. As a result, when λ is low, state consolidation is weak not only because each ruler has little incentive to engage in state building on his own (as we saw in Section 4), but also because war “redistributes” fiscal revenues and territories from larger to countries to smaller ones, fostering fragmentation. In contrast, when the sensitivity of the war outcome to fiscal revenues is high, military conflict is a mechanism allowing strong powers to take over weaker ones. As a result, when λ is high, state consolidation is extensive for two reasons – first, because each ruler has strong incentives to invest on his own, and second, because war is likely to redistribute fiscal revenues and territories from smaller countries to larger ones, creating further concentration. In other words, our model shows that the two key paths to the formation of strong states – the creation of a centralized authority and the conquest of weaker countries – do not operate independently but are jointly shaped by the realities of warmaking.

²⁰For $\lambda > \lambda^*$ the sensitivity of war to fiscal revenues is so high that the two countries become very equal (both approaching full centralization), and the incentive to go to war disappears again.

6 Empirical Evidence

We now shed light on the patterns of state consolidation in early modern Europe by focusing on the two key driving factors of centralization stressed by our model: the increasing importance of money for determining military success and cross-country differences in domestic conflicts.

6.1 England versus Spain: a study in contrasts

To begin, we compare state building in early modern Britain and Spain. During the period 1500-1800, both were at one point dominant powers at the height of their influence; both fought numerous wars, and both accumulated large quantities of debt. And yet, Spain quickly declined as a European power, while Britain dominated the European concert of powers for centuries and assembled the greatest empire in history.

While many scholars have examined the success of Britain and the failure of Spain, the divergence in state capacity deserves to be underlined. Spain during the 16th century was the superpower of its age. In 1550, it had more men under arms than any other power in Europe. At its height, under Philip II, the empire was so large that the sun literally never set on it. And yet, Spain declined quickly as a European power. By 1700, a mere century and a half after its apogee, its armed forces were less than half as big as they had been in 1550. In Spain, some of the earlier successes in state-building had gone into reverse by the 17 century; the country's decline as a European power paralleled the reduction in fiscal and other resources of the Crown.

As predicted by our model, internal fragmentation was a key constraint: Castile was heavily taxed, but other regions hardly contributed at all to Madrid's revenues. Spain failed to overcome this challenge. Aggressive attempts to levy taxes outside Castile typically came to nothing (such as, for example, under the Count-Duke Olivares during the Thirty Years War). Cities and entire kingdoms successfully claimed tax exemptions. Not even the Crown's monopoly over military resources was successfully asserted: By the 17th century, the arsenals of *grandees*, such as the one of the Duke of Medina-Sidonia, were once more sufficient to equip a small army (Anderson 1988).

Britain, on the other hand, gradually evolved into a highly centralized and effective state. Armed force was concentrated in the hands of the central authority. Taxation became uniform and relatively effective. Total revenue surged as the Customs and Excise took over the collection of indirect taxes after the 1690. Eventually, Britain introduced the first successfully income tax in history. Its finances were also solid enough to sustain an enormous accumulation of debt – over

200% of GDP by 1820. During the period 1500 to 1815, England went from marginal player to the dominant power in Europe, largely as a result of its superior fiscal capacity (Brewer 1988, Ferguson 2002). The Royal Navy ruled the sea; it eventually built the largest empire in history.

Figure 8 here

As Figure 9 illustrates, despite the greater underlying heterogeneity of Spain, the two countries were similarly effective at raising revenues in 1500. Strong divergence between Britain and Spain only emerged in the second half of the 17th century, which is precisely when the military revolution's effects became particularly strong. Although both countries faced the same increase in the cost of conflict, the consequences were quite different.

Consistent with our model, differences in internal fragmentation became problematic for Spain precisely when state capacity became crucial for military success.²¹ We emphasize the importance of starting conditions. Spain emerged from the Union of Crowns, joining Castile and Aragon – just as Britain emerged from the Union of Crowns between Scotland and England. In the British case, however, an Act of Union followed the Union of Crowns – Scotland was integrated into Britain administratively, in terms of taxes, and in terms of jurisdiction.²² Even at the beginning of the early modern period, the kings of England faced a much less fragmented and heterogeneous realm than their competitors on the Iberian peninsula. Apart from Wales, cultural and linguistic fragmentation was relatively limited; cities were not represented directly in parliament. In Spain, every Royal territory continued to have its own laws, customs barriers separated Madrid from Pamplona and Barcelona, and many veto players insisted on their ancient freedoms. Indeed, constitutional theory in many parts of the peninsula held that the king's position depended on the upholding of medieval customary rights. In this way, new laws and edicts that tried to reduce privileges could be legitimately ignored by officials and citizens alike. One ready indicator of fragmentation is the ease of rebellion. While England succeeded in extending tax jurisdiction to Wales and Scotland, Castile failed at the same task. When a serious attempt was made (under Olivares, the so-called "Union de Armas"), armed rebellion in Catalunya, Portugal, and Naples followed. Even if only

²¹Here, we differ from the classification in Dincecco (2009), who characterizes Britain before 1690 as centralized and absolutist. For our purposes, fragmentation in tax collection - with delegation of tax powers to the cities - is what matters, and it was broadly similar in Britain and Spain. Only after the introduction of the Customs and Excise does the collection of indirect taxation become more centralized.

²²Several provisions of the Act of Union were actually ignored, such as tax exemptions and special rules for the kirk.

one of these succeeded, the centralizing agenda in Spain suffered a permanent setback. Rebellious territories, even after being defeated, kept most of their ancient rights. As John Elliott (1969) put it: “Such strength as it [the Spanish Monarchy] possessed derived from its weakness.”²³

Consistent with our model, the divergent paths of England and Spain also hold a lesson about the co-evolution of institutional change and state building. England’s ability to raise revenue was not impressive until after the “Glorious Revolution” in 1688 (North and Weingast 1989). We are not the first to note that the 1688 allowed a “grand bargain” to be struck between Crown and parliament, allowing more oversight and control by the latter in exchange for far greater revenue-raising by the former. By strengthening constraints on the executive in a fairly unified country, the optimum rate of centralization actually increased markedly. Our model offers a perspective for why this bargain could be struck – and why it resulted in much greater fiscal centralization and revenue raising – in England than elsewhere.

In sum, the contrast between Spain and England offers powerful support for the predictions of our model. Faced with the same shock - the rise in the cost of armed conflict due to the Military Revolution - one of them succeeded in building a centralized, highly capable state apparatus, while the other failed. Differences in starting conditions, especially in terms of initial fragmentation, were crucial for divergence.

6.2 The Military Revolution, Fragmentation and State Building in Early Modern Europe

We now provide some statistical evidence on the mechanism highlighted by our model for a cross section of early modern European countries. The goal of this analysis is not to identify the causal impact of the changing war technology and domestic divisions on state building, but rather to assess whether the basic correlations in the data are consistent with our theory.

6.2.1 Money and military success

We first provide some evidence on the changing importance of money for military might by analysing data on the outcomes of 153 major battles in Europe between 1500 and 1780. We focus on this period since it encompasses the entire period of the military revolution and the centuries during

²³In the 18th century, the Bourbon kings made another attempt at centralization. While they succeeded in eliminating ancient "freedoms" in Catalunya, they did not succeed in permanently centralizing and consolidating power. For example, internal customs barriers were quickly re-erected (Grafe 2011).

which state consolidation in Europe got under way. The data are from Jacques (2007), combined with fiscal data from Karaman and Pamuk (2010).²⁴ For each battle, we code the outcome as either success or defeat. For each combatant state, we collect data on total tax revenue, as well as revenue per capita at the nearest available point in time.

Table 3 here

A simple way to present results is given in Table 3. We show the number of battles won by the richer power (in terms of total revenue), as well as the odds ratio, for four periods: i) the early modern period as a whole, ii) before 1600, iii) from 1600-1700 and, iv) from 1700 to 1780. In the century after 1500, fiscally stronger powers actually did not win battles more often. Only 8 out of 19 battles, equivalent to 42% were decided in their favour. This translates into an odds ratio of 0.72, where 1 would indicate an even chance of winning. By the 17th century, the odds of battlefield success have moved decisively in favour of the financially stronger powers – the odds ratio has risen to 1.8. It continues to be far above unity in the 18th century (1.49), even if it is not quite as strong as before.

Table 3 examines the odds of the richer contestant winning without measuring the revenue gap between contestants. To account for this latter aspect, we next estimate the likelihood of success for the fiscally stronger power as a function of the revenue ratio between both sides, the presence of allies, and the nature of the engagement:

$$S_{H,t} = C + \hat{\lambda} \cdot \frac{R_{H,t}}{R_{L,t}} + \delta \cdot A_{H,t} + \epsilon_{H,t} \quad (36)$$

where $S_{H,t}$ is a dummy variable equal to unity if the stronger power wins, and zero otherwise, C is a constant, $A_{H,t}$ is a dummy indicating the presence of allies on the side of the fiscally stronger power, and $\frac{R_{H,t}}{R_{L,t}}$ is the ratio of the fiscally stronger power's total revenues to those of the weaker power. The coefficient $\hat{\lambda}$ captures the importance of money for winning a war, providing a proxy for the sensitivity of war outcomes to fiscal revenues λ in our model.²⁵

We estimate a linear probability model under OLS; results are substantially unchanged if we use Probit estimation. Table 4 gives the results. Except in the case of naval engagements before

²⁴The Revolutionary Wars with France after 1793 were fought according to rules that differed markedly from those before, and we chose not to include them. The massive use of troops from conquered territories (which remained nominally independent) as well as the complex fiscal transfers during the period would complicate the analysis.

²⁵Equation (36) holds almost exactly (up to the revenues of the allied) in the power specification of the contest success function.

1650 - of which there were few - the intercept is always close to 0.5, indicating that without taking fiscal variables into account, the likely outcome of a battle is well-approximated by a coin flip.

Crucially, the estimated coefficient λ changes substantially over time. Before 1650, there is no evidence of a clear effect of relative fiscal strength on battlefield success. If anything, the coefficient is negative, but insignificant. This is true for land battles, naval engagements, and all battles combined. After 1650, the coefficient becomes positive, and significantly so for land battles and for the sample overall; for naval battles, it becomes much less negative. The size of the effect is also meaningful in military terms: A one st.dev. increase in the revenue ratio increases the chances of battlefield success by approximately 11 percentage points.

Table 4 here

We therefore find that after 1650, battlefield outcomes became much more sensitive to the relative economic strength of the belligerents. This is consistent with the basic driving force behind state building in our model: an increase in the sensitivity of the war outcome to fiscal revenues.

6.2.2 Fragmentation, the Military Revolution and state building

The main empirical prediction of our model concerns the link between a country's ability to raise taxes and the underlying heterogeneity of the population, interacted with the military revolution. We use two measures of heterogeneity – Alesina et al.'s (2003) measure of ethnic heterogeneity, and the number of predecessor states on the territory of each country. Figures 11 and 12 give an overview of the cross-sectional correlation between revenue per capita (in grams of silver per capita) and two measures of internal fragmentation. Each observation is labelled by country:

Figures 9 and 10 here

As is readily apparent in Figure 11, countries with high levels of ethnic heterogeneity had relatively low levels of revenue per capita in early modern Europe. Homogenous countries' level of revenue varied, but the only ones with very high levels of output per capita display a high degree of homogeneity. The same is true for the second measure of heterogeneity - the number of predecessor states in 1300 on a state's territory. We can also see that the trade-off between heterogeneity and revenue becomes steeper over time, as countries with lower levels of heterogeneity are successful at raising more and more revenue. At the high-heterogeneity end of the spectrum, on the other hand,

revenues either stagnate (as was the case in the Ottoman Empire) or they show no clear pattern over time (Spain).

We now examine the connection between the ability to raise revenue and ethnic heterogeneity, with an eye to how this link changes as the military revolution unfolds over time. In table 5, we estimate models of the type:

$$R_{i,t} = C + \beta \cdot B_{i,t} + \delta D_{post1650} + \rho B_{i,t} D_{post1650} + \epsilon_{i,t}$$

where $R_{i,t}$ is revenue per capita - as a measure of fiscal capacity -, $B_{i,t}$ is our measure of heterogeneity (ethnic fragmentation or the number of predecessor states), $D_{post1650}$ is a dummy that takes the value of unity if observations are from years after 1650, and zero otherwise.

In Table 5, we use both of our measures of fragmentation. In panel A, we examine the effect of ethnic heterogeneity; in panel B, the one of earlier territorial divisions.

Table 5 here

In the full sample, we see that states with a higher degree of ethnic fragmentation had much lower revenue collection per capita on average (regression 1, panel A). A one standard deviation increase in heterogeneity (0.108) is associated with revenue per capita that, on average, is lower by 14.8 grams of silver, or 36 percent of the average. In columns (2) and (3), this effect is shown to be mostly the result of developments after 1650. Before that date, heterogeneity only seems to have a mildly negative effect on a state's ability to tax. After 1650, the size of the coefficient jumps to 204, suggesting that a one st.dev. increase in heterogeneity is associated with 42% lower revenue per capita. Column (4) demonstrates that the interaction effect between the measure of ethnic differences and time is significant.

If we use data on the number of predecessor states, broadly the same pattern emerges. Countries that "inherited" numerous territorial divisions from the recent past had, on average, lower revenues (regression 5). Before 1650, the effect is statistically significant but relatively weak; thereafter, it becomes stronger. Regression 10 shows that differences between the period pre- and post-1650 is statistically significant.

Which states are capable of raising taxes to the greatest extent? Our model predicts that having a homogenous population should make the process of building a state capable of taxing large quantities easier. This is also what the data confirm. Interestingly, the effect of fragmentation –

measured either as ethnic heterogeneity or as territorial fragmentation – becomes stronger and more significant after 1650, i.e. during the period when our earlier results indicate that the benefits of money in terms of the chances to win in war matter more. Our empirical results therefore support the following story: States begin the period with a wide variety of tax systems, yielding different quantities of revenue. As success in battle depends more and more on financial resources, all states try to tax more. They succeed to a differing extent – states that are relatively homogenous to start with raise revenue easily; those that face a highly fragmented populace face major challenges, and succeed much less.

7 Conclusion

Centralized, powerful states are a relatively recent invention in the history of mankind. In many parts of the world, states do not have a monopoly of violence, collect only a small share of GDP as taxes, and provide few essential services. To understand how state capacity came to be high in some countries, we analyse the origins of European states in the early modern period. We build a model that is designed to give insight into the process by which these powers eventually build large, efficient, centralized states. We emphasize the importance of internal centralization, which went hand-in-hand with consolidation of hundreds of states and statelets into a small number of highly successful states. We also shed light on the transformation of the European state system that allowed a handful of consolidated states to emerge.

In our model, princes consider whether to invest in state capacity - centralizing tax collection, wresting control over tariffs and the judiciary from local princes, etc. Powers differ in their pre-existing levels of fragmentation. Without the threat of war, princes have to trade off the gains in terms of revenue against the threat of rebellion. A highly fragmented territory requires a lot of efforts to become unified; a more uniform state will have the same benefit, but requires less time and effort in investing in “state capacity”.

The threat of war changes the calculus. On the one hand, monarchs now have to fear that they may be attacked, and territory (and treasure) taken from them. This reduces their incentive to invest in state capacity, since the gains may be smaller than in autarchy. At the same time, the need to fight wars makes money more valuable. This increases the incentive to invest in state capacity, by strengthening the tax bureaucracy, etc. How strong these two effects are depends on i. each power’s initial fragmentation – shorthand for the threat of revolt ii. how costly wars are.

Everything else equal, expensive wars make it more attractive to invest in centralization.

During the early modern period, the cost of war kept increasing - armies grew in size, equipping them became more costly, and wars lasted longer. In our model, at some point, war is so costly that at least the stronger, more centralized power finds it worthwhile to augment state capacity because of the threat of war. The weaker power, on the other hand, will simply invest less, and may drop out of power competition altogether. As the cost of war increases even further, the importance of money for survival starts to outweigh the dangers of rebellion. Therefore, when wars are very costly, both the unified and the fragmented power invest in state capacity.

We apply our framework to the case of early modern Europe. Successful states tore up the ancient "liberties" of towns, clergy, and the nobility, ignored laws based on custom, imposed legal norms uniformly, and abolished tax exemptions. By 1800, a patchwork of small and weak states had consolidated into a few, powerful entities that enjoyed a monopoly of violence internally, jurisdictional unity, and the power to tax on a vast scale. We argue that Europe's rise to global domination after 1500 reflects a benign externality of the intense struggle for supremacy in Europe. The exogenous shock that set off the rise of European state capacity was that wars became ever more costly after 1500, as a result of the "Military Revolution". As the cost of conflict rose, rulers needed to tax more and centralize revenue collection to ensure their independence. Weaker powers increasingly dropped out of the competition and often disappeared from the map, leaving the field to their more potent competitors. In this way, our model explains how, in response to the rising cost of conflict, average state capacity in Europe grew dramatically, while only a few consolidated, powerful states survived.

Our model also explains how the growing importance of fiscal revenue for success on the battlefield helped to improve institutions. Where rulers could commit to revenue sharing with local power holders, resistance to reform and centralization was weaker. Under ideal circumstances, this led to the creation of a "consensually strong" state (Acemoglu 2005), which becomes centralized and powerful precisely because the ruler is constrained. We interpret the rise of Britain after 1689 in this light. In this sense, the rapidly rising cost of naval warfare increased the importance of revenue generation for the monarch. Initial levels of fragmentation were low, and centralization could proceed apace - resulting in such advances as the highly efficient customs & excise administration, and the first successful income tax in history - because crown and parliament could strike a deal that led to constraints on the former, while permitting an unprecedented rise in the percentage of output appropriated by the state.

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Tables

Table 1: Frequency of War

Century	Number of wars	Average duration (years)	Percentage years under warfare(%)
16th	34	1.6	95
17th	29	1.7	94
18th	17	1	78
19th	20	0.4	40
20th	15	0.4	53

Source: Tilly 1990

Table 2: Army size in Early Modern Europe (in 1,000s)

	1550			1700			1780		
	army	navy	total	army	navy	total	army	navy	total
England	41	25	66	76	115	191	79	109	188
France	43	14	57	224	118	342	183	85	268
Dutch Republic				90	86	176	27	22	49
Spain	145	18	163	37	26	63	64	62	126
Austria	9	0	9	62	0	62	253	0	253
Prussia				37	0	37	181	0	181
Russia				52	0	52	408	19	427
Ottoman Empire	90	50	140	130	30	160	120	30	150

Table 3: War and fiscal resources (land battles only)

	richer	wins?	odds of success (richer power)
	Y	N	
1500-1780	81	59	1.36
1500-1600	8	11	0.72
1600-1700	18	8	1.8
1700-1780	55	37	1.49

Table 4: Battlefield success and relative fiscal strength

	1	2	3	4	5	6
type of engagement	Land battles		Naval battles		All battles	
years	< 1650	>=1650	< 1650	>=1650	< 1650	>=1650
Revenue ratio	-0.04	0.078*	-0.22**	-0.017	-0.11	0.07*
	(0.07)	(0.044)	(0.08)	(0.095)	(0.07)	(0.04)
Allies	0.46**	0.46**	0.105	na	0.32*	0.14**
	(0.19)	(0.2)	(0.32)		(0.18)	(0.09)
Naval					0.04	0.1
					(0.2)	(0.09)
C	0.35**	0.53***	0.92	0.92**	0.48**	0.55**
	(0.16)	(0.08)	(0.17)	(0.17)	(0.16)	(0.08)
N	25	107	9	31	34	138
R²	0.15	0.07	0.45	0.0012	0.15	0.05
<i>Standard errors in parentheses</i>						
<i>p < 0.1, ** p < 0.05, *** p < 0.01</i>						

Table 5: Revenue raising and fragmentation

	1	2	3	4
PANEL A: Ethnic Heterogeneity	full	pre1650	post1650	interaction
Heterogeneity	-134.6*	-0.0992	-203.8*	-0.0992
	(55.2)	(49.4)	(78.88)	(48.42)
Post1650				73.08**
				(23.57)
Het*Post1650				-203.7*
				(93.2)
C	67.55***	18.39	91.46***	18.39
	(15.38)	(10.88)	(20.82)	(10.66)
N	58	19	39	58
R²	0.08	0	0.135	0.214
	5	6	7	8
PANEL B	full	pre1650	post1650	interaction
#of predecessor states	-2.3***	-0.65*	-3.01***	-0.65
	(0.53)	(0.36)	(0.7)	(0.35)
Post1650				59.13**
				(16.8)
# of predecessor states*Post1650				-2.5***
				(0.79)
C	66.5***	25.99***	85.12***	25.99***
	(11.45)	(8.34)	(14.5)	(8.2)
N	58	19	39	58
R²	0.22	0.12	0.31	0.37

Standard errors in parentheses

*p < 0.05, ** p < 0.01, *** p < 0.001*

Figures

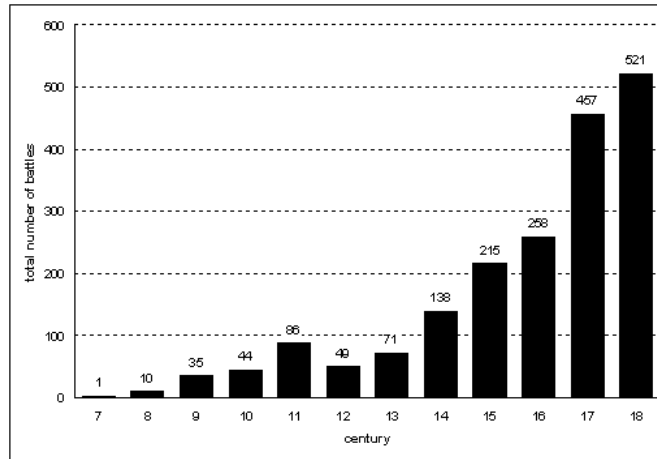


Figure 1: Number of Battles in Europe per Century

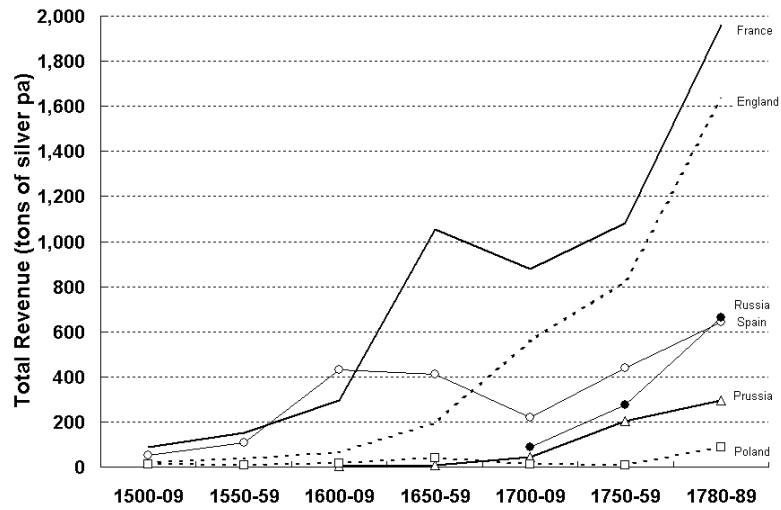


Figure 2: Fiscal Revenue in Europe, 1500-1780

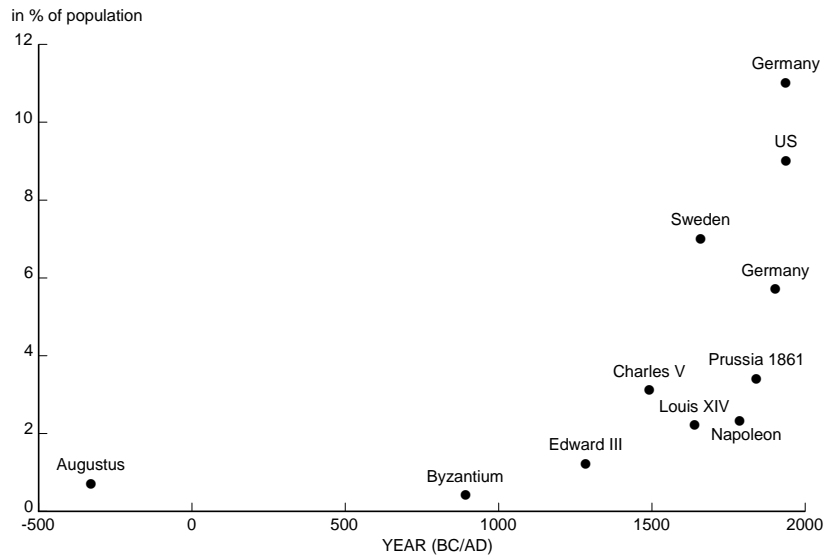


Figure 3: Army Size from Augustus to 1944

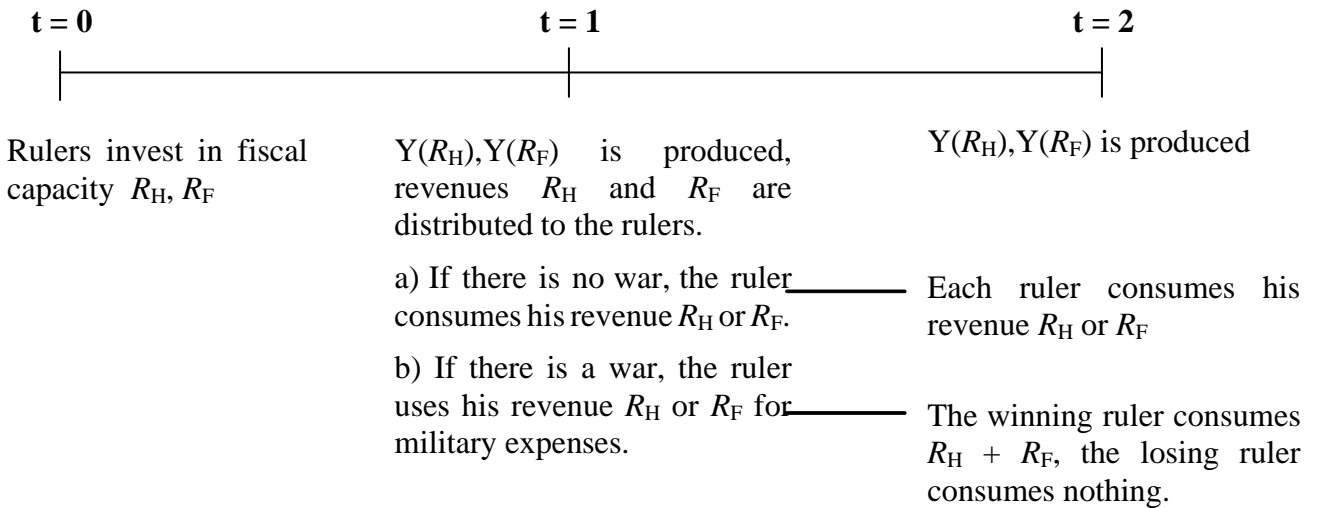


Figure 4: Timing

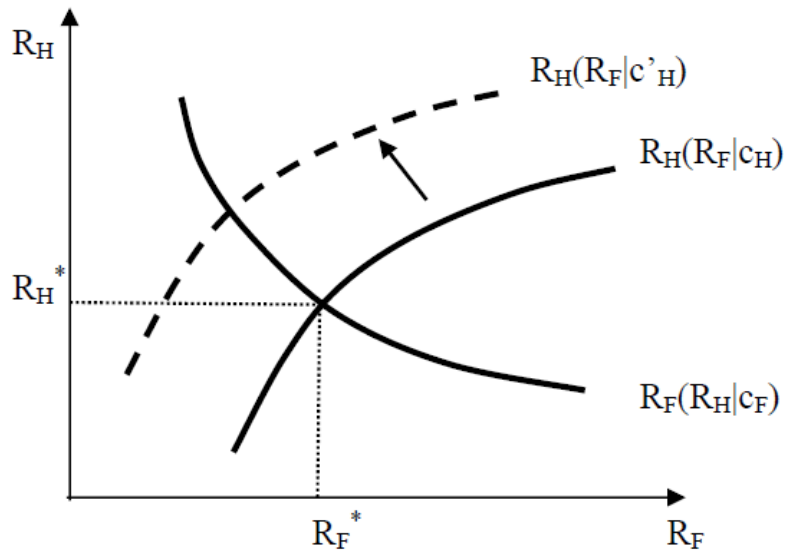


Figure 5: The effect of a reduction in the cost of reform c_H in the aggressive reformer H .

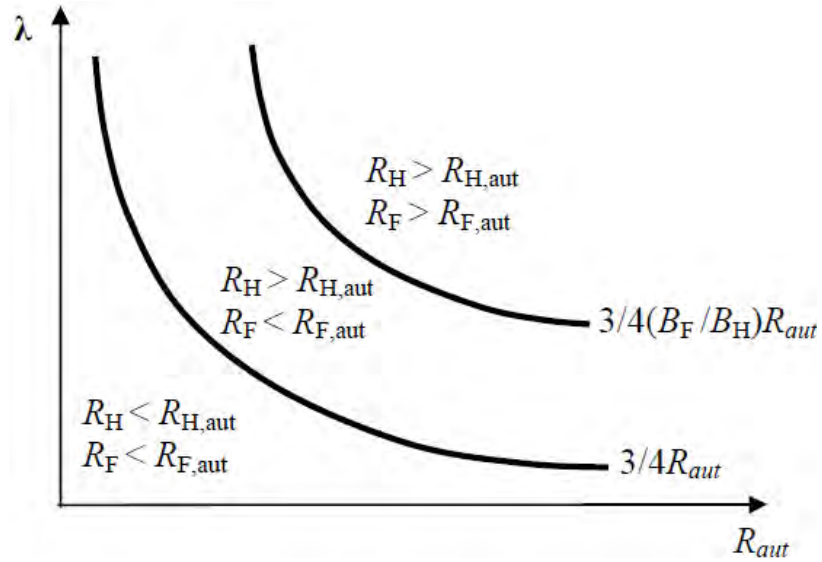


Figure 6: Capital Intensity, Domestic Conflict, and State Building

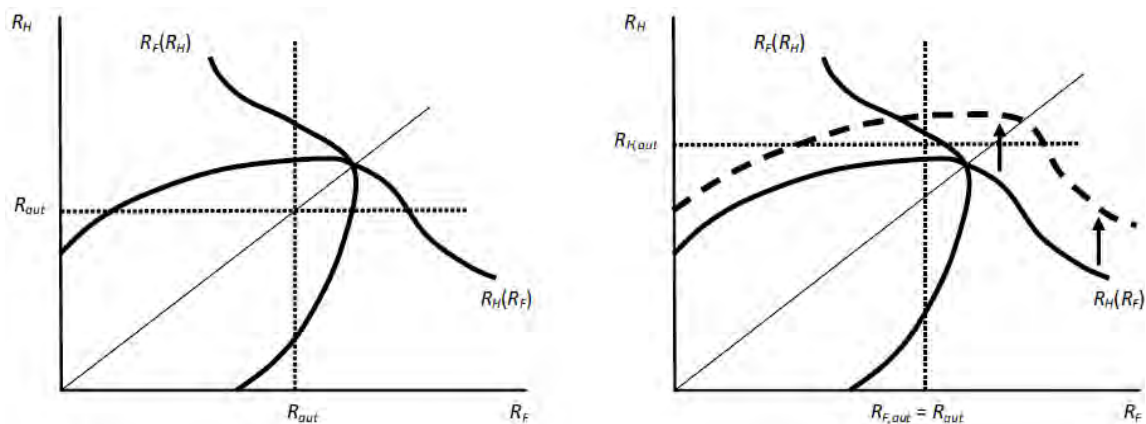


Figure 7: Symmetric case $R_{H,out} = R_{F,out} = R_{out}$ (left panel) and asymmetric case $R_{H,out} \gg R_{F,out} = R_{out}$ (right panel)

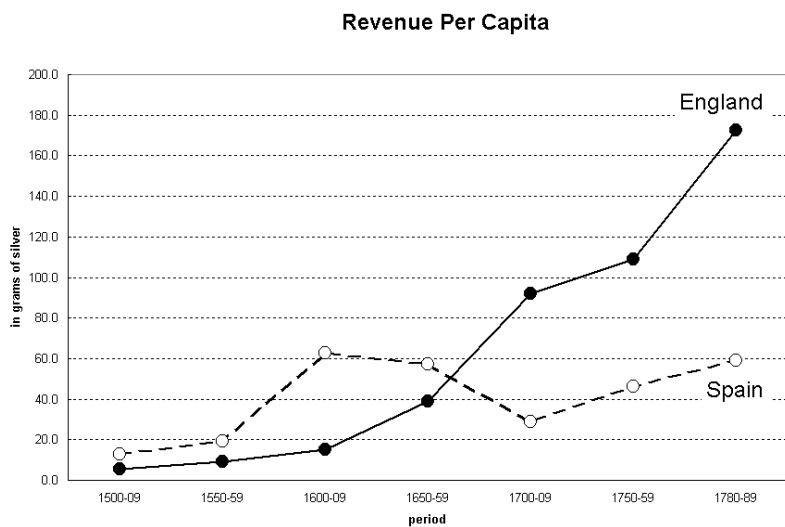


Figure 8: Revenue per Capita, Spain and England, 1500-1789

Appendix 1: Proofs

Proof of Lemma 1. Suppose that all power holders except i follow the taxation strategy $(\tau_{l,d}, \tau_{m,d})$. Regardless of what the others do, with respect to local production, the power holder of district i will optimally extract all surplus by setting $\tau_{l,i} = (A_l - A_h)/A_l$. With respect to market production, power holder i renders its undertaking profitable by setting:

$$(1 - \tau_{m,i} - \tau_{m,d})A_m = A_h, \quad (37)$$

which implies a tax rate $\hat{\tau}_{m,i} = [(1 - \tau_{m,d})A_m - A_h]/A_m$ and a tax revenue for the power holder equal to:

$$2\hat{\tau}_{m,i}A_m = 2[(1 - \tau_{m,d})A_m - A_h]. \quad (38)$$

If instead the power holder sets $\tau_{m,i} > \hat{\tau}_{m,i}$, everybody engages in local production and the power holder's revenue is:

$$\tau_{l,i}A_l = (A_l - A_h). \quad (39)$$

The power holder prefers to discourage market production (i.e. to set $\tau_{m,i} > \hat{\tau}_{m,i}$) if and only if (39) is above (38), which is the case when:

$$\tau_{m,d} > \bar{\tau}_{m,d} = \frac{2A_m - A_l - A_h}{2A_m}. \quad (40)$$

Two points are noteworthy. First, $\bar{\tau}_{m,d} > (A_m - A_h)/2A_m$ (for $A_m > A_l$). Thus, there is always a symmetric equilibrium where $\tau_{m,d} = (A_m - A_h)/2A_m$ and all engage in market production. However, there are infinitely many symmetric equilibria where $\tau_{m,d} > \bar{\tau}_{m,d}$. In these equilibria, market production is over-taxed and all engage in local production. ■

Proof of Proposition 1. Denote by $\Pi^j(R_H, R_F)$ the payoff of ruler $j = H, F$. The rulers' first order conditions then equal to $\Pi_{R_j}^j(R_H, R_F) = 0$ for $j = H, F$, which give rise to Equations (16) and (17). These conditions guarantee an optimum if the problem of the rulers is concave at the equilibrium, namely if $\Pi_{R_j R_j}^j(R_H, R_F) < 0$ for $j = H, F$, which become:

$$(\theta/2) [p_{HH}(R_H + R_F) + 2p_H] - 1/R_{H,out} < 0, \quad (41)$$

$$(\theta/2) [-p_{FF}(R_H + R_F) - 2p_F] - 1/R_{F,out} < 0, \quad (42)$$

which we assume throughout. Applying the implicit function theorem to (16) and (17) implies that:

$$\frac{dR_H(R_F)}{dR_F} = \frac{\Pi_{R_F R_H}^H}{\left| \Pi_{R_H R_H}^H \right|} = \frac{(\theta/2) [p_{HF}(R_H + R_F) + p_H + p_F]}{|(\theta/2) [p_{HH}(R_H + R_F) + 2p_H] - 1/R_{H,aut}|}, \quad (43)$$

$$\frac{dR_F(R_H)}{dR_H} = \frac{\Pi_{R_F R_H}^F}{\left| \Pi_{R_F R_F}^F \right|} = -\frac{(\theta/2) [p_{HF}(R_H + R_F) + p_H + p_F]}{|(\theta/2) [-p_{FF}(R_H + R_F) - 2p_F] - 1/R_{F,aut}|}. \quad (44)$$

The above expressions show that the reaction functions have opposite sign, formally $\text{sign} \left(\frac{dR_H(R_F|\cdot)}{dR_F} \right) = -\text{sign} \left(\frac{dR_F(R_H|\cdot)}{dR_H} \right)$. We also have that:

$$\frac{dR_H(R_F)}{d\theta} = \frac{\Pi_{R_F, \theta}^H}{\left| \Pi_{R_H R_H}^H \right|} = \frac{(1/2) [p_H(R_H + R_F) - (1 - p) - 1]}{|(\theta/2) [p_{HH}(R_H + R_F) + 2p_H] - 1/R_{H,aut}|}, \quad (45)$$

$$\frac{dR_F(R_H)}{d\theta} = \frac{\Pi_{R_F, \theta}^F}{\left| \Pi_{R_F R_F}^F \right|} = \frac{(1/2) [-p_F(R_H + R_F) - p - 1]}{|(\theta/2) [-p_{FF}(R_H + R_F) - 2p_F] - 1/R_{F,aut}|}. \quad (46)$$

An equilibrium (R_H^*, R_F^*) can be identified by the equation:

$$\{1 + (\theta/2) [-p_F(R_H(R_F^*) + R_F^*) - p - 1]\} - \frac{R_F^*}{R_{F,aut}} = 0, \quad (47)$$

which is obtained by replacing H 's reaction function $R_H(R_F)$ into (??), together with $R_H^* = R_H(R_F^*)$. Consider the value of the left hand side of (47) at the boundaries. Since $p_2 \leq 0$, when $R_F = 0$, the left hand side is positive. When $R_F(R_H(R_c)) < R_c$ the left hand side of (47) is negative at $R_F = R_c$. In this case, a unique equilibrium exists if and only if (47) is decreasing. To see that this is indeed the case, rewrite (47) as $\Pi_{R_F}^F(R_H(R_F^*), R_F^*) = 0$. Then, by exploiting (43) and (44), one find that the derivative of the left hand side of (47) with respect to R_F is equal to:

$$\left| \Pi_{R_F R_F}^F \right| \frac{dR_F(R_H)}{dR_H} \cdot \frac{dR_H(R_F)}{dR_F} + \Pi_{R_F R_F}^F < 0,$$

which holds because $\frac{dR_F(R_H)}{dR_H} \cdot \frac{dR_H(R_F)}{dR_F} < 0$ and $\Pi_{R_F R_F}^F < 0$. As a result, if an equilibrium exists, it is also unique. ■

Proof of Corollary 0. The statement of the Corollary is: *A higher $R_{J,aut}$ increases reform R_J^* in country J . If $\frac{dR_J(R_{-J}|\theta, R_{J,aut})}{dR_{-J}} > 0$, then a marginal increase in $R_{J,aut}$ decreases reform R_{-J}^* in country $-J$ while a marginal increase in $R_{-J,aut}$ increases reform R_J^* in country J .* The proof of

the Corollary works as follows. By differentiating the first order conditions, we obtain:

$$\Pi_{R_H R_H}^H dR_H + \Pi_{R_H R_F}^H dR_F = -\frac{R_H}{R_{H,aut}^2} dR_{H,aut}, \quad (48)$$

$$\Pi_{R_F R_H}^F dR_H + \Pi_{R_F R_F}^F dR_F = -\frac{R_F}{R_{F,aut}^2} dR_{F,aut}. \quad (49)$$

By solving the linear system it is easy to see that:

$$dR_H = \varphi \frac{R_H}{R_{H,aut}^2} dR_{H,aut} + \varphi \frac{\Pi_{R_H R_F}^H}{\left| \Pi_{R_F R_F}^F \right|} \frac{R_F}{R_{F,aut}^2} dR_{F,aut}, \quad (50)$$

$$dR_F = \varphi \frac{\left| \Pi_{R_H R_H}^H \right| \left| \Pi_{R_F R_F}^F \right|}{\left| \Pi_{R_F R_F}^F \right|^2} \frac{R_F}{R_{F,aut}^2} dR_{F,aut} - \varphi \frac{\Pi_{R_F R_H}^F}{\left| \Pi_{R_F R_F}^F \right|} \frac{R_H}{R_{H,aut}^2} dR_{H,aut} \quad (51)$$

where $\varphi = \frac{\left| \Pi_{R_F R_F}^F \right|}{\left| \Pi_{R_H R_H}^H \Pi_{R_F R_F}^F \right| + \left| \Pi_{R_H R_F}^H \Pi_{R_F R_H}^F \right|} > 0$. Clearly, $\frac{dR_H}{dR_{H,aut}} > 0$, $\frac{dR_F}{dR_{F,aut}} > 0$, and $\frac{dR_H}{dR_{F,aut}} > 0$ if and only if $\frac{dR_H(R_F)}{dR_F} > 0$, while $\frac{dR_F}{dR_{H,aut}} < 0$ if and only if $\frac{dR_H(R_F)}{dR_F} > 0$. ■

Proof of Proposition 2. In this and the remaining proofs, we will always replace the marginal cost of reform c_J with its counterpart $1/R_{J,aut}$. When $\gamma = 1$ from the reaction functions we obtain:

$$R_J^* = \left(\frac{1 - 3\theta/4}{1 - \theta\lambda R_{J,aut}} \right) \cdot R_{J,aut}, \quad (52)$$

which a maximum provided $\theta < \hat{\theta} \equiv 1/\lambda \max_J R_{J,aut}$. We will always consider the case where θ is sufficiently low that in the range of variation of λ of interest [the one where not all countries have fully centralized, formally $\min_J R_J^* < R_c$] the condition is always met. We also focus on the case where the probability of either ruler winning is interior, which is guaranteed by the condition $\lambda(\max_J R_J^* - \min_J R_J^*) < 1/2$. This is equivalent to;

$$2\lambda(1 - 3\theta/4)(\max_J R_{J,aut} - \min_J R_{J,aut}) \leq (1 - \theta\lambda R_{H,aut})(1 - \theta\lambda R_{F,aut}), \quad (53)$$

which we also assume by focusing on similar country pairs (i.e. where $\max_J R_{J,aut} - \min_J R_{J,aut}$ is small). If the two countries are sufficiently similar, condition (53) is fulfilled for all λ . The remaining properties then follow by inspection of the first order condition. ■

Proof of Proposition 3. When $\gamma \leq 1$, by solving for (R_H^*, R_F^*) using the reaction functions,

after some algebra one obtains that:

$$\frac{R_H^*}{R_F^*} = \frac{R_{H,aut}}{R_{F,aut}} \cdot \frac{1 + \theta\lambda R_{F,aut}(1 - 2\gamma)}{1 - \theta\lambda R_{H,aut}(2 - \gamma)}. \quad (54)$$

The other properties follow by inspection of the above equation. ■

Proof of Lemma 2. By using $|\partial p(R_H, R_F)/\partial R_J| = \lambda \cdot p(1-p)/R_J$, (27), the first order conditions become:

$$\begin{aligned} R_H^* &= R_{H,aut} \cdot \left\{ 1 + (\theta/2) \left[\lambda \cdot p(1-p) \frac{R_H^* + R_F^*}{R_H^*} - (1-p) - 1 \right] \right\}, \\ R_F^* &= R_{F,aut} \cdot \left\{ 1 + (\theta/2) \left[\lambda \cdot p(1-p) \frac{(R_H^* + R_F^*)}{R_F^*} - p - 1 \right] \right\}. \end{aligned}$$

When $R_{H,aut} = R_{F,aut} = R_{aut}$ the equilibrium is symmetric, $p = 1/2$, so that:

$$R_H^* = R_F^* = R_{aut} \left[1 + \frac{\theta}{4}(\lambda - 3) \right]. \quad (55)$$

The remaining properties follow by the proof of Proposition 1 and by inspection of the above conditions. ■

Proof of Proposition 4. Equations (14) and (15) imply that:

$$W_J(\pi_J, B_J) = \max_{R_J} \theta \cdot \left\{ p_J(\tilde{R}_J, \tilde{R}_{-J})(\tilde{R}_J + \tilde{R}_{-J}) - 2\tilde{R}_J \right\} + 2\tilde{R}_J - \frac{\tilde{R}_J^2}{\tilde{R}_{J,aut}},$$

where $p_J(\tilde{R}_J, \tilde{R}_{-J})$ is the probability with which the ruler of country J wins the war. By the envelope theorem:

$$\frac{dW_J(\pi_J, B_J)}{d\pi_J} = \frac{\left(\tilde{R}_J^* \right)^2}{\tilde{R}_{J,aut}} \cdot \frac{2 - (1 - \pi_J) - 2P_d/R_c}{[P_d/R_c - \pi_J](1 - \pi_J)},$$

It is then easy to see that :

$$\left. \frac{\partial W_H}{\partial \pi_H} \right|_{\pi_H=\pi} > \left. \frac{\partial W_F}{\partial \pi_F} \right|_{\pi_F=\pi} \Leftrightarrow \left(\frac{\tilde{R}_H^*}{\tilde{R}_F^*} \right)^2 > \frac{\tilde{R}_{H,aut}}{\tilde{R}_{F,aut}}. \quad (56)$$

■

Proof of Corollary 2. By inspection and using the notions developed in the Proof of Proposition 2. ■

Proof of Proposition 5. Under the linear-symmetric contest success function, (34) can be rewritten as:

$$\left[\frac{1}{2} + \lambda(R_H^* - R_F^*) \right] \cdot \sigma \cdot (R_H^* + R_F^*) \geq R_H^*, \quad (57)$$

$$\Leftrightarrow \lambda\sigma \left[(R_H^*)^2 - (R_F^*)^2 \right] - (1 - \sigma)R_H^* \geq \frac{\sigma(R_H^* - R_F^*)}{2}. \quad (58)$$

Given the symmetry of the contest success function, (58) can be used to study under what conditions does the stronger or weaker ruler wish to initiate a war.

Suppose in fact that H is the strong ruler, namely $R_H^* > R_F^*$. Then (58) becomes:

$$\lambda\sigma(R_H^* + R_F^*) - (1 - \sigma)\frac{R_H^*}{R_H^* - R_F^*} \geq \frac{\sigma}{2}. \quad (59)$$

Given the dependence of (R_H^*, R_F^*) on λ in Proposition 2, it is easy to see that the left hand side increases in λ over the range where $R_H^*, R_F^* < R_c$. Define λ^* as the sensitivity at which $R_H^* = R_c$. Then, if $\lambda^*R_c > 1/2$ there exists a $\hat{\sigma} < 1$ such that, for $\sigma \geq \hat{\sigma}$, there exists a $\lambda_1 < \lambda^*$ such that for $\lambda \geq \lambda_1$ condition (59) is met. If $\lambda^*R_c < 1/2$ or $\sigma < \hat{\sigma}$, then set $\lambda_1 = \lambda^*$. Clearly, even though $\lambda_1 < \lambda^*$, for $\lambda > \lambda^*$ the distance $R_H^* - R_F^*$ becomes smaller and smaller, so that at some point, when λ becomes large, (59) is violated.

Suppose now that F is the weak ruler, namely $R_H^* < R_F^*$. Then (58) becomes:

$$\lambda\sigma(R_F^* + R_H^*) + (1 - \sigma)\frac{R_H^*}{R_F^* - R_H^*} \leq \frac{\sigma}{2}. \quad (60)$$

Given the dependence of (R_H^*, R_F^*) on λ in Proposition 2, it is easy to see that the left hand side decreases in λ over the range where $R_H^*, R_F^* < R_c$. When $\lambda = 0$, the value of the left hand side is finite. As a result, there exists a $\hat{\hat{\sigma}} < 1$ such that, for $\sigma \geq \hat{\hat{\sigma}}$, there exists a λ_0 such that for $\lambda \leq \lambda_0$ condition (60) is met. For $\sigma < \hat{\hat{\sigma}}$, set $\lambda_0 = 0$.

We thus have seen that in $\lambda \in [0, \lambda_0] \cup [\lambda_1, \lambda^*]$ war occurs for sure and the optimal fiscal investments of Propositions 2 indeed characterize the full equilibrium. Suppose now that we are in $\lambda \in (\lambda_0, \lambda_1)$. Here our goal is not to fully derive the mixed strategy equilibrium but describe how the equilibrium works. In this range, at the fiscal investments of Proposition 2, countries have no incentive to go to war. How is an equilibrium determined in this case? Suppose first that for $\lambda \in (\lambda_0, \lambda_1)$ the equilibrium probability of war is $\omega = 0$. In this case, countries go back to the autarky investments $(R_{F,out}, R_{H,out})$. If at these investments no country has an incentive to go to

war, then the equilibrium is one where for $\lambda \in (\lambda_0, \lambda_1)$ war does not occur and countries behave as in autarky. It is easy to check that if this is the case, then $\lambda_0 = 0$. The logic is that, again by Proposition 2, state building (and asymmetry among countries) falls in λ . As a result, if no ruler has an incentive to fight in autarky, when $\lambda = 3/4R_{J,aut}$, a fortiori no ruler has any incentive to fight for $\lambda = 0$, for in this latter case countries are even more equal. In sum, if $\omega = 0$, war only arises for $\lambda \in [\lambda_1, \lambda^*]$.

If instead at the autarky investments either ruler has an incentive to go to war, then in equilibrium the probability ω of going to war must be positive. Crucially, since autarky revenues are too high (and unequal) to avert war, it must be that a positive probability of war ($\omega > 0$) *reduces* state building in the two countries, much in the spirit of Proposition 2 for $\lambda < 3/4R_{J,aut}$. From an ex-ante standpoint, an overall probability of going to war of $\theta\omega$ induces (according to Proposition 2) optimal investments $[R_F^*(\lambda, \omega), R_H^*(\lambda, \omega)]$. The equilibrium is then reached by setting ω such that, at the equilibrium probability of H winning $p(R_F^*(\lambda, \omega), R_H^*(\lambda, \omega))$, the party who at autarky revenues is willing to attack is just indifferent between attacking or not (and thus willing to mix with probability ω). ■