Executive Constraints and State Resilience*

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Abstract

Throughout history, states have often been confronted with trying and strenuous circumstances, and while some states face failure or even collapse as a result of these, many others persevere and remain functioning even when presented with similar stress factors. Considering these observations, we inquire, under what conditions are functioning states sustainable? While tackling this general question, we emphasize the role played by *executive constraints* in improving state resilience. Through the use of a simple theoretical model we show how limited commitment with regards to taxation may lead to state failure. Then, we expound how strengthening executive constraints can help alleviate this issue. Additionally, to corroborate our findings, we present historical episodes which illustrate the mechanisms described in our model.

Key words: Executive constraints, Separation of powers, Checks and balances, Commitment, Taxes, Collapse, State resilience, State failure
JEL Classification: C73, D02, D72, H11, N43, N45, N47, O12, O17, P48

1 Introduction

Considerable effort has been taken by economic researchers in attempting to determine why nations prosper, both by analyzing the phenomenon of development and uncovering the many mechanisms behind it. Among the countless notions stemming from this body of work, a fairly uncontroversial one is how the existence of a functioning state constitutes a necessary condition for the advent of development. In other words, the notion that a nation's development hinges on the existence of a state that ensures the security of its citizens. Nevertheless, the conditions required for fostering such states still remain quite elusive to scholars in the field. Despite this fact, many economists implicitly assume away the possibility of state failure, taking the existence of functioning states for granted.

Meanwhile, the issue of state failure, and the closely related phenomenon of societal collapse, have been the subject of substantial inquiry by a sizable interdisciplinary literature. Within this literature, authors have extensively analyzed the multitude of historical cases of societal collapse and state failure occurring throughout history, drawing several distinct, and often conflicting conclusions. Among these findings, the significance of social factors, in particular political institutions and their characteristics, remains a consistent and uncontentious one throughout most of the literature (e.g. Bates 2008; Butzer 2012; Butzer and Endfield 2012;

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Cline 2014; Dugmore et al. 2012; Dunning et al. 2012; Goldstone 2008; Harris 2012; Knapp and Manning 2016; Streeter et al. 2012).

In this paper, we focus on a particular aspect of political institutions that may play a crucial part in improving state resilience, that of checks and balances, more specifically in the form of executive constraints. These encompass institutional aspects, such as legislative oversight, that place limits on the power of an executive leader. The concept of executive constraints has been extensively studied by scholars and researchers in several fields belonging to the social sciences since antiquity, in particular on works dealing with the theory of separation of powers.[1]

Earlier writings notwithstanding, the modern literature on separation of powers can trace its origins back to the seminal works of Locke (1689/2008) and Montesquieu (1748/2001), and, as such, places considerable emphasis on the importance of constitutional checks and balances on the separate powers, such as executive constraints. According to most authors, the presence of checks and balances is a feature of constitutions that helps sustain the separation of powers by preventing any encroachment of one power on another. This argument is plainly conveyed by James Madison in the following excerpt from the Federalist Papers:

> It is equally evident, that the members of each department should be as little dependent as possible on those of the others, for the emoluments annexed to their offices. Were the executive magistrate, or the judges, not independent of the legislature in this particular, their independence in every other would be merely nominal. But the great security against a gradual concentration of the several powers in the same department, consists in giving to those who administer each department the necessary constitutional means and personal motives to resist encroachments of the others. (Madison 1788)

Therefore, the current view on checks and balances highlights their role in sustaining healthy political institutions, by mainly constraining the bad behavior of political actors. This specific view is reflected in a vast segment of the political economy literature (e.g. Acemoglu et al. 2013; Angelucci et al. 2020; Baron 1998; Besley et al. 2016; Besley and Mueller 2018; Besley and Reynal-Querol 2017; Diermeier and Myerson 1999; Levi 1988; Persson et al. 1997, 2000). In our analysis, we diverge from this interpretation by showing how checks and balances can help rulers secure their positions and increase their revenues without necessarily improving the situation of their subjects.

In our simple theoretical model, we show how constraints on the executive can help solve commitment issues related to taxation. At the heart of this model, lies the idea that leaders cannot credibly commit to certain tax levels due to the possible gains from expropriation. Thus, our paper contributes to the considerable literature on the issue of commitment and taxation. Within this literature, authors have repeatedly emphasized the importance of patience in overcoming the complications arising from limited commitment (e.g. Besley and Ghatak 2009; Grossman and Noh 1990, 1994; North and Weingast 1989; Olson 1991, 1993). Olson's argument (1991, 1993) viidly illustrates this perspective: short-sighted leaders behave like "roving bandits," undermining investment and production incentives. Conversely, enhancing the security and time horizons of these leaders can transform them into "stationary bandits", effectively addressing the issue. Building on these arguments, we present an alternative solution: the introduction of executive constraints. Specifically, we show how executive constraints can help a leader make a credible commitment, even when heavily discounting

[1]Ideas related to this topic can be found as far back as Aristotle (350 BCE/2013) and Polybius (167-119 BCE/1889).

future payoffs.

Fundamentally, in our model, a leader may be particularly tempted to expropriate from citizens when facing adverse shocks. Recognizing this, citizens might be reluctant to engage in production upon witnessing such shocks. When this occurs, a leader is unable to extract tax revenues and is unwilling and unable to uphold his duties in maintaining a state. As a result, adverse shocks can cause the breakdown in the relations between citizens and a leader, leading to state failure. The presence of executive constraints helps lower the gains from expropriation, and, consequently, relaxes the credibility constraint faced by the leader. As such, executive constraints help a state weather adverse shocks without failing, allowing the leader to sustain his tax revenues. Moreover, we witness this effect even when these executive constraints are not binding on the equilibrium path, i.e. when they do not bind the executive's optimal choice of taxation. Hence, we surprisingly find that executive constraints help promote efficiency even though they allow a leader to extract higher tax revenues.

From an investigation on the role of executive constraints in improving the resilience of states, i.e. how likely a society is to collapse and devolve into a failed state, we obtain this paper's main result. We observe that in the absence of executive constraints, functioning states may not always be sustainable as a result of the leader's limited commitment. Moreover, we show that the introduction of executive constraints serves as a solution to this issue, allowing functioning states to exist even under adverse conditions, and improving efficiency in our model's economy. Thus, our approach also contrasts with the previous contributions by economists on the subject of collapse by providing a rationale for this phenomenon that does not rely on population dynamics (e.g. Brander and Taylor 1998; Dalton and Coats 2000; Georgescu-Roegen 1971; Pezzey and Anderies 2003; Usher 1989). Furthermore, by illustrating the potential advantage of constrained leadership in promoting state resilience, our paper challenges the arguments of Hobbes (1651/2011) and similar works that advocate for unchecked autocracies as superior in managing crises and upholding order.

Constraints placed on rulers have been connected to the development of nations within the economics literature in the past. Most notably, this has been the case in the influential work of North and Weingast (1989), where, as described by Besley and Ghatak (2009), the authors "argued that a decisive point in the history of state development in England came after the Glorious Revolution which limited the arbitrary power of the King subordinating his ability to raise taxes to Parliament". Nevertheless, our analysis diverges from the aforementioned work of North and Weingast (1989) in a few distinct ways. First, the constraints examined in North and Weingast (1989) act on different aspects of executive power than the constraints present in our model do. Second, we explicitly show how the constraints in our model may allow a leader to improve his fortunes without improving those of his subjects, whereas the narrative in North and Weingast (1989) emphasizes gains made by the English Parliament at the expense of their monarch following the Glorious Revolution. Finally, and perhaps most importantly, North and Weingast (1989) take the existence of a functioning state for granted, and focus their discussion on how executive constraints affect development in such a state. As such, their analysis implicitly ignores the possibility of state failure and its deleterious effects, leaving a gap which is directly addressed in this paper.

In order to buttress our results, we also present historical case study evidence that support the ideas presented in our model. We start by comparing the cases of Late Medieval England and France, with a focus on the impact that a fledgling parliament had on the former. From this comparison, we find evidence that corroborates the mechanisms shown by our model. Then, we examine the collapse of civilizations during the Late Bronze Age and the current inter-disciplinary debate regarding it. From this examination, we suggest that our model sheds new light on our current understanding of the Late Bronze Age Collapse by showing mechanisms that can reconcile opposing views regarding its causes.

The rest of this paper is organized as follows. In section 2 we outline a basic model of a society which communicates our arguments in a clear and undemanding fashion, in section 3 we present some historical case study evidence, and on section 4 we conclude our paper by summarizing our findings.

2 Model

In this section, we employ a simple theoretical framework to model the interactions of citizens with the leader of a nation, during an infinite number of discrete periods. Then, we employ this simple model to convey our findings regarding the benefits of executive constraints.

2.1 Citizens and production

We consider a society of homogeneous citizens who discount future payoffs based on parameter $\delta \in (0, 1)$, and whose decisions can be described by those of a representative citizen, C. Each period, C faces the problem of deciding whether or not to produce some positive level of output, i.e. choosing $Y_t \in \{y, 0\}$, where $y > 0$. Without loss of generality, we define a binary cost function $C(Y_t)$, which is equal to zero when $Y_t = 0$, and equal to c when $Y_t = y$, with $c \in [0, y]$, representing the cost of producing a positive level of output.

C's output is subject to a threat of expropriation by roving bandits, which we assume may be prevented if security is provided to citizens. Further, the produced output may be taxed whenever it is not expropriated by bandits. As such, the representative citizen's flow payoff can be described as follows:

$$u_t^C = S_t Y_t - T_t - C(Y_t), \tag{1}$$

where T_t represents the level of taxation and S_t is an indicator function for the provision of security, i.e. $S_t = 1$ when security is provided and $S_t = 0$ otherwise.

2.2 Leader's policy decision and executive constraints

Interacting with C, there is a leader K (for King) with the same discount factor $\delta \in (0, 1)$,[2] who can invest in security to protect citizens from the aforementioned bandit threat. In return, K is able to extract some rent via taxes.

At the beginning of each period, K decides whether to make a costly investment in security or not, i.e. he chooses $S_t \in \{0; 1\}$, while C simultaneously make his choice of production Y_t.[3] The cost of this investment is represented by parameter κ_t. In other words, whenever K provides security in period t by choosing $S_t = 1$, he incurs an exogenous cost of κ_t.

Following K's investment decision, bandit theft is realized if $S_t = 0$.[4] Subsequently, K decides on a level of taxation, while taking into consideration the executive constraints he is subject

[2]Although we make this assumption for simplicity, the results presented on this paper do not rely on it. Thus, it is possible to consider different discount factors for citizens and the leader.

[3]The results from our model do not rely on this decision occurring simultaneously. In order to show this we analyze a modified version of the model where K's security investment decision occurs before C's choice of production.

[4]Information regarding whether theft by bandits occurred or not is common knowledge.

to. More specifically, executive constraints limit how much a leader can tax out of citizens, by placing a maximum level of taxation $\bar{T}(Y_t)$ defined as follows:

$$\bar{T}(Y_t) \equiv \phi\bar{\kappa} + (1-\phi)Y_t, \tag{2}$$

where $\phi \in [0,1]$ represents the strength of the executive constraints and $\bar{\kappa}$ the highest possible cost of providing security. As such, it follows that $T_t \leq \min\{\bar{T}(Y_t); S_tY_t\}$.

Executive constraints within our model limit the leader's ability to impose taxes beyond what is necessary to fund security in the worst possible state. Put differently, executive constraints never prevent a leader from levying sufficient taxes to provide security in the most adverse scenario, their function is solely to prevent excessive taxation beyond that threshold. To illustrate this notion, it is worth outlining the limiting cases of $\phi = 0$ and $\phi = 1$. The former describes a scenario where executive constraints are absent, i.e. where the leader is free to choose any level of taxation he desires. As such, the leader is only bound by the natural constraint of taxing all the remaining output following the actions of bandits, and $\bar{T}(Y_t) = S_tY_t$. Alternatively, the latter describes a scenario where executive constraints are so strong that the leader is unable to tax anything more than the highest possible cost of providing security. As such, the leader is perfectly bound by the executive constraints, $\bar{T}(Y_t) = \bar{\kappa}$.

Finally, we can express the leader's flow payoff as:

$$u_t^K = T_t - \kappa_t S_t. \tag{3}$$

2.3 Security costs and state resilience

In order to explore the resilience of states against temporary shocks, we introduce a stochastic environment where security costs follow a Time-Homogeneous Markov Chain.

Suppose security costs at time t, κ_t,[5] can take any value from the state space $\mathbf{K}$, where $\mathbf{K}$ is a finite set with n elements that belong to $\mathbb{R}_+$. We can then describe the set $\mathbf{K}$ as follows:

$$\mathbf{K} \equiv \{\kappa^1, \kappa^2, \kappa^3, \dots, \kappa^n\}, \tag{4}$$

where $\kappa^i < \kappa^{i+1}$.

Additionally, consider the following $n \times n$ transition matrix P describing the conditional probabilities

$$\mathbf{P} \equiv \begin{bmatrix} \rho_{11} & \rho_{12} & \rho_{13} & \cdots & \rho_{1n} \\ \rho_{21} & \rho_{22} & \rho_{23} & \cdots & \rho_{2n} \\ \vdots & \vdots & \vdots & \ddots & \vdots \\ \rho_{n1} & \rho_{n2} & \rho_{n3} & \cdots & \rho_{nn} \end{bmatrix}, \tag{5}$$

where ρ_{ij} describes the conditional probability $\mathbb{P}\big[\kappa_{t+1} = \kappa^j | \kappa_t = \kappa^i\big]$.

We make the following assumption about the transition matrix $\mathbf{P}$

[5]We assume that the value of κ_t is common knowledge.

Assumption 1. ***(First-Order Stochastic Dominance of Low States)*** *$p_J(i)$ is decreasing in i, $\forall J$, where $p_J(i) \equiv \sum_{j=1}^{J} \rho_{ij}$.*

Assumption 1 illustrates the notion that future security costs should be similar to present ones. More specifically, Assumption 1 implies that when security costs are high today, it is more likely that they will also be high in the future. Essentially, by making this assumption, we depict a situation in which adverse shocks not only decrease current payoffs but also future ones.

We also assume that state capacity is not easily restored following any period where K does not provide security. Consequently, all agents earn a continuation payoff of 0 following any period where $S_t = 0$. Then, we call a state *resilient* if we have that positive levels of output and security investment may be sustained for every value of κ in the state space $\mathbf{K}$. In other words, we call a state resilient if it can weather temporarily high security costs while still maintaining a functioning state.

2.4 Timing of events and equilibrium concept

To summarize, the timing of events during each period is as follows:

- κ_t is realized,
- K makes his investment in security S_t, and C makes his production choice Y_t,
- If $S_t = 0$ bandit theft is realized,
- K decides the tax level T_t,
- Payoffs are realized.

In general terms, each period the representative citizen must choose a production level based on the history up to that period. Thus, we can define C's strategy as a sequence of functions $\{Y_t\}_{t\in\mathbb{N}}$, where $Y_t : H_t \to \{y, 0\}$, and H_t represents the set of feasible histories of prior actions at time t.

Meanwhile, the leader's choice every period consists of first deciding if he should invest in security based on the current history, and then choosing the taxation level based on both the history and the representative citizen's decision. Thus, similar to C's strategy we define K's strategy as a sequence of vectors of functions $\{P_t\}_{t\in\mathbb{N}}$ where $P_t \equiv (S_t, T_t)$, with $S_t : H_t \to \{0, 1\}$ and $T_t : H_t \times \{y, 0\} \to \mathbb{R}_+$.

Moreover, we focus on the concept of Subgame Perfect Equilibria (SPE), defined, as usual, as a strategy profile which constitutes a Nash Equilibrium in all subgames of the model. Throughout the paper, we shall refer to these simply as equilibrium.

In particular, we shall consider two classes of possible equilibria, which we call *resilient state equilibrium* and *vulnerable state equilibrium.* The first of these, a resilient state equilibrium, is characterized by a leader's decision to invest in security on the equilibrium path, regardless of the present level of security costs $\kappa_t \in K$. Conversely, a vulnerable state equilibrium is characterized by a leader's decision to provide no security when faced with some high enough levels of security costs κ_t in the state space K.

2.5 Resilient state equilibria and executive constraints

Notice that when K does not provide security, C's best response will be to not produce anything. Moreover, when C produces nothing, K's best response will be to not provide any security. Consequently, a vulnerable state equilibrium will always exist, regardless of the parameters of the model. However, the same is not true for resilient state equilibria, and, these may not exist depending on what the parameters of the model may be. Thus, it is important to establish the conditions for the existence of resilient state equilibria.

First, we know that the representative citizen, C, can always choose to produce nothing, i.e. choose $Y = 0$, and get a payoff of 0. Thus, any resilient state equilibrium must have the property that, $\forall \kappa \in K$:

$$y - c - T(\kappa) + \sum_{k=1}^{\infty} \delta^k \mathbb{E}_t[y - c - T(\kappa_{t+k}) | \kappa_t = \kappa] \geq 0. \tag{6}$$

Second, we know that under a resilient state equilibrium, the leader, K, should never want to deviate from tax schedule $T(\kappa_t)$, and, expropriate the maximal amount $\bar{T}_t \equiv \phi\kappa_t + (1-\phi)Y_t$. Thus, any resilient state equilibrium must have the property that, $\forall \kappa \in K$:

$$T(\kappa) + \sum_{k=1}^{\infty} \delta^k \mathbb{E}_t[T(\kappa_{t+k}) - \kappa_{t+k} | \kappa_t = \kappa] \geq \phi\bar{\kappa} + (1-\phi)y + \Psi(\kappa), \tag{7}$$

where $\Psi(\kappa)$ represents the expected future payoffs of a leader when facing punishments for deviating.[6] Inspecting (7), it is possible to notice that its RHS is increasing in $\Psi(\kappa)$. Thus, it is clear that a resilient state equilibrium will exist whenever (7) is satisfied under the optimal punishment scheme, which is $\Psi(\kappa) = 0 \ \forall \kappa \in K$.[7] It is possible then to simplify (7) as follows:

$$T(\kappa) + \sum_{k=1}^{\infty} \delta^k \mathbb{E}_t[T(\kappa_{t+k}) - \kappa_{t+k} | \kappa_t = \kappa] \geq \phi\bar{\kappa} + (1-\phi)y. \tag{8}$$

Furthermore, by isolating a leader's discounted tax revenues, conditions (6) and (8) can be rewritten as follows:

$$\tau(\kappa) \leq y - c + \sum_{k=1}^{\infty} \delta^k \mathbb{E}_t[y - c | \kappa_t = \kappa] \equiv \upsilon(\kappa), \tag{9}$$

$$\tau(\kappa) \geq (1-\phi)y + \phi\bar{\kappa} + \sum_{k=1}^{\infty} \delta^k \mathbb{E}_t[\kappa_{t+k} | \kappa_t = \kappa] \equiv \zeta(\kappa), \tag{10}$$

where $\tau(\kappa)$ represents a leader's discounted tax revenues, which can be represented as follows:

$$\tau(\kappa) \equiv T(\kappa) + \sum_{k=1}^{\infty} \delta^k \mathbb{E}_t[T(\kappa_{t+k}) | \kappa_t = \kappa]. \tag{11}$$

Under any resilient state equilibrium, both the representative citizen's participation constraint (6) and the leader's incentive compatibility constraint (8) must be satisfied. Consequently, under any such equilibrium, the following condition must hold $\forall \kappa \in K$:

[6] A punishment as stated here refers to an infinite stream of one-period action profiles by the representative citizen C, triggered in response to a leader's deviation from a particular action profile. Moreover, a punishment must still be part of an equilibrium strategy for C.

[7] An optimal punishment scheme in an infinitely repeated game gives the deviating player the lowest possible payoff he could achieve under any equilibrium. For a more thorough discussion on this concept consult Abreu (1988).

$$\zeta(\kappa) \leq \tau(\kappa) \leq \upsilon(\kappa). \tag{12}$$

In essence, this condition tells us that the expected present value of tax revenues must be less than the the expected present value of surplus, i.e. output net of effort costs, and greater than the expected present value of state costs plus the expected present value of the leader's utility when deviating. In turn, for this condition to hold it must be that $\zeta(\kappa) \leq \upsilon(\kappa)\ \forall \kappa \in K$, which translates to:

$$(1-\phi)y + \phi\bar{\kappa} + \sum_{k=1}^{\infty} \delta^k \mathbb{E}_t[\kappa_{t+k}|\kappa_t = \kappa] \leq y - c + \sum_{k=1}^{\infty} \delta^k \mathbb{E}_t[y - c|\kappa_t = \kappa], \tag{13}$$

which can be further simplified to:

$$(1-\phi)y + \phi\bar{\kappa} \leq y - c + \sum_{k=1}^{\infty} \delta^k \mathbb{E}_t[w(\kappa_{t+k}) \mid \kappa_t = \kappa], \tag{14}$$

where $w(\kappa) \equiv y - c - \kappa$ represents the flow social surplus in state κ. Notice that as a consequence of assumption 1, we only need to check condition (14) for $\bar{\kappa}$, the maximum of set K.[8] Building on this, the following proposition summarizes the effects of executive constraints on the existence of resilient state equilibria.

Proposition 1. *Whenever the flow present value of social surplus at the highest state is non-negative, i.e. $w(\bar{\kappa}) \geq 0$, a resilient state equilibrium exists if and only if executive constraints are strong enough. That is, $\exists \hat{\phi} \in [0,1]$ such that a resilient state equilibrium exists if and only if $\phi \geq \hat{\phi}$.*

By interpreting proposition 1, we can make some conclusions on the effect and value of executive constraints. First and foremost, proposition 1 shows that strong enough executive constraints are a necessary and sufficient condition for the existence of resilient state equilibria. Intuitively, this occurs as the presence of strong executive constraints lowers the deviation payoffs to a leader, relaxing his credibility constraint and allowing the existence of a functioning state even under lower continuation payoffs.

Second, proposition 1 suggests that episodes of state failure are more likely to occur in states with weaker executive constraints, *ceteris paribus*. Fundamentally, this results from the fact that, by definition, state failure cannot occur under a resilient state equilibrium. Thus, when executive constraints are strong enough to support a resilient state equilibrium, state failure will only occur under some equilibria instead of under every single one.

Finally, it is possible to notice that executive constraints need not be binding in order for a resilient state equilibrium to be sustained.[9] Consequently, the leader's optimal choice of taxation under a resilient state equilibrium will always be lower than the maximal amount he would be able to tax under executive constraints of strength $\hat{\phi}$. This result is summarized in the following corollary stemming from proposition 1.

Corollary 1. *Constraints need not be binding in order for a resilient state equilibrium to exist, i.e. $\hat{\phi} < \bar{\phi}$, where $\bar{\phi} \equiv \frac{c}{y-\bar{\kappa}}$ is the level of binding executive constraints.*

[8] This observation is formally proven through lemma 1 found on the appendix.

[9] Executive constraints are binding if a leader's optimal choice of taxation is equal to the maximal amount he is allowed to tax, i.e. if $T_t = \bar{T}(Y_t)$. This occurs whenever $y - c \geq \phi\bar{\kappa} + (1-\phi)y$.

Corollary 1 highlights an important characteristic of executive constraints in our model. Executive constraints contribute to state resilience not by limiting the amount of taxes a leader collects in equilibrium, but rather by restricting the deviation payoffs of this leader. As such, stronger executive constraints can help sustain a functioning state even when they do not reduce the amount of taxes taken by a leader.

2.6 Production, efficiency and resilience

Based on the results previously described, it is clear that strong executive constraints help sustain a resilient state equilibrium, *ceteris paribus*. Nevertheless, the effect executive constraints have on the efficiency of a state is still not completely evident. Therefore, we devote some attention to this issue in this subsection's analysis.

We start our analysis by introducing a social planner, R, who decides on a level of output $y \in \mathbb{R}_{++}$, at the start of each period. This decision by the social planner occurs before the level of κ_t is revealed, and, consequently, before C makes his binary production decision. Furthermore, we redefine c, the cost of producing a positive level of output, as a continuous, increasing and convex function of y.[10]

The social planner R makes his decision with the objective of maximizing the social surplus under a resilient state, given a certain level of executive constraints ϕ. We can simplify the social planner's decision as the solution to the following constrained optimization problem[11]

$$\begin{aligned} \max_{y} \quad & y - c(y) \\ \text{s.t.} \quad & w(\bar{\kappa}) - (1 - \phi)[y - \bar{\kappa}] \geq 0. \end{aligned} \tag{15}$$

We can then compare the social planner's solution to the optimization problem above with the benchmark socially optimal level of output $y^* = \arg\max_y \; y - c(y)$. By doing so, we can notice that the socially optimal level of output might be unfeasible under a resilient state when executive constraints are weak, even if such a state is sustainable. Intuitively, cutting back output limits the leader's deviation payoff, helping sustain a resilient state equilibrium when executive constraints are only marginally above the minimal required. Therefore, even stronger executive constraints are needed to fully deal with the inefficiency caused by the leader's lack of commitment. The following proposition summarizes this result.

Proposition 2. *If executive constraints are only marginally above a minimal required level $\underline{\phi}$, then the level of output may not be efficient. In other words, if $\phi = \hat{\phi} + \varepsilon$ with an infinitesimal $\varepsilon > 0$, then $y^{\phi} \leq y^*$, where y^{ϕ} is the solution to (15).*

Proposition 2 shows how the strength of executive constraints can have an impact on efficiency, even when these are already strong enough to sustain a resilient state equilibrium. Alternatively, it also shows how marginal improvements to the strength of executive constraints can be beneficial even when a state is already resilient. This result further highlights the benefits of improving the strength of executive constraints.

2.7 An illustrative example

In order to better illustrate some concepts discussed in the previous subsections, let us turn our focus to a simple example by assuming security costs are given and constant, i.e. where

[10] More formally, we define $c(y)$ as a bijection $c : \mathbb{R}_+ \to \mathbb{R}_+$, which is twice differentiable with $c'(y) > 0$ and $c''(y) > 0$.

[11] We define $W(\bar{\kappa}) \equiv \sum_{k=0}^{\infty} \delta^k \mathbb{E}[w(\kappa_{t+k}) | \kappa_t = \bar{\kappa}]$.

set K is a singleton. With this assumption, we can simplify conditions (6) and (8) as follows:

$$y - c(y) - T \geq 0, \tag{16}$$

$$T - \frac{\delta}{1-\delta}[T - \kappa] \geq \phi\kappa + (1-\phi)y. \tag{17}$$

Combining the two preceding conditions, we can find:

$$y - c(y) \geq T \geq (1-\pi)y + \pi\kappa, \tag{18}$$

where $\pi \equiv \phi - \phi\delta + \delta$.

Examining π, we can interpret it as a modified discount factor for a leader. In essence, by lowering the deviation payoff for a leader, stronger executive constraints make him less likely to deviate. This is analogous to the effect of increasing a leader's discount factor δ. Thus, a leader facing executive constraints of strength ϕ, will have incentives analogous to those of a leader with a discount factor of π.

Considering (18), we can see that a resilient state equilibrium will exist if and only if:

$$\pi y - c(y) \geq \pi\kappa. \tag{19}$$

Notice that (19) may be violated at the maximal surplus level, i.e. at a level y that maximizes $y - c(y)$, while being satisfied at lower levels of surplus. This occurs because the output level which maximizes $\pi y - c(y)$ is lower than that which maximizes the social surplus $y - c(y) - \kappa$, as shown by their respective first-order conditions:

$$c'(y) = \pi \tag{20}$$

$$c'(y) = 1 \tag{21}$$

This plainly illustrates the result discussed in the previous subsection. Moreover, it is evident that, whenever $\phi < \hat{\phi}$, there are multiple combinations of y and T that constitute Pareto improvements from a failed state, as illustrated in Figure 1. Nevertheless, these are unfeasible when executive constraints are too weak due to the issue of limited commitment present in the model. Figure 2 then shows how strengthening executive constraints can allow some of these combinations to be sustained in equilibrium, by relaxing the leader's incentive constraint. This creates an area (represented in green on Figure 2) between the curves $y - c(y)$ and $\pi\kappa + (1-\pi)y$ where condition (19) is satisfied.

Another feature of proposition 1 that becomes salient is the relationship between $\hat{\phi}$ and certain parameters of the model. To see this, let us rearrange (19) to find the following expression:

$$\phi \geq \frac{1}{1-\delta}\Big[\frac{c(y)}{y-\kappa} - \delta\Big], \tag{22}$$

which yields us the following expression for $\hat{\phi}$:

$$\hat{\phi} = \frac{1}{1-\delta}\Big[\frac{c(y)}{y-\kappa} - \delta\Big]. \tag{23}$$

Analyzing this expression, we can first notice that $\hat{\phi}$ is decreasing in δ. Intuitively, this shows how more patient leaders have less incentives to deviate, and, as such, it is possible to sustain a functioning state under weaker executive constraints. Second, we can also notice that $\hat{\phi}$ is increasing in κ. Intuitively, this shows that a leader has greater incentives to deviate when running a functioning state becomes too costly. As such, stronger constraints need to be placed on him in order to keep him from doing so.

Finally, it is possible to show in this example that the minimal constraints that sustain a particular resilient state equilibrium are not binding. To see this, consider the binding level of constraints:

$$\bar{\phi} = \frac{c(y)}{y-\kappa}. \tag{24}$$

Notice that $\hat{\phi} < \bar{\phi}$ as long as $y - c(y) - \kappa > 0$. Thus, a leader's optimal choice of tax under executive constraints of strength $\hat{\phi}$ will always be lower than the maximal amount he is allowed to tax, as described by Corollary 1. This result is illustrated by Figure 3, where the bold line $\bar{T}$ represents the maximal amount a leader is allowed to tax under executive constraints of strength $\hat{\phi}$ for any given level of output y. Examining Figure 3, it is evident that the curve $\pi\kappa - (1-\pi)$ always lies above the curve $\phi\kappa - (1-\phi)$, regardless of the value of ϕ. Thus, when curve $\phi\kappa - (1-\phi)$ is tangential to curve $y - c(y)$ at $\hat{\phi}$, curve $\bar{T}$ will clearly not intercept curve $y - c(y)$. This reveals that a resilient state equilibrium will exist even when a leader is able to choose levels of taxation that violate the representative citizen's participation constraint, as stated in Corollary 1.

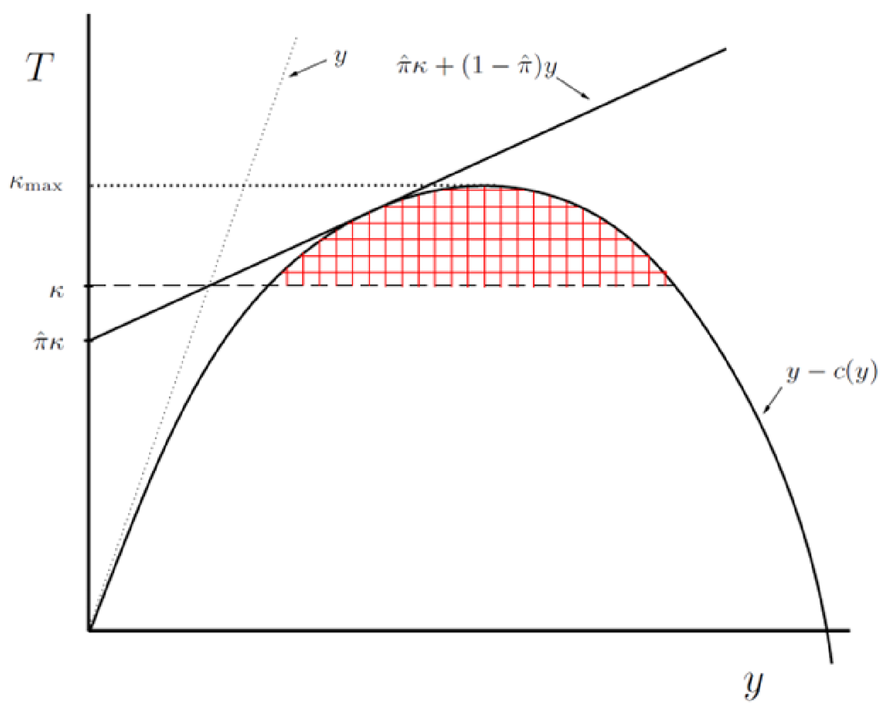

Figure 1

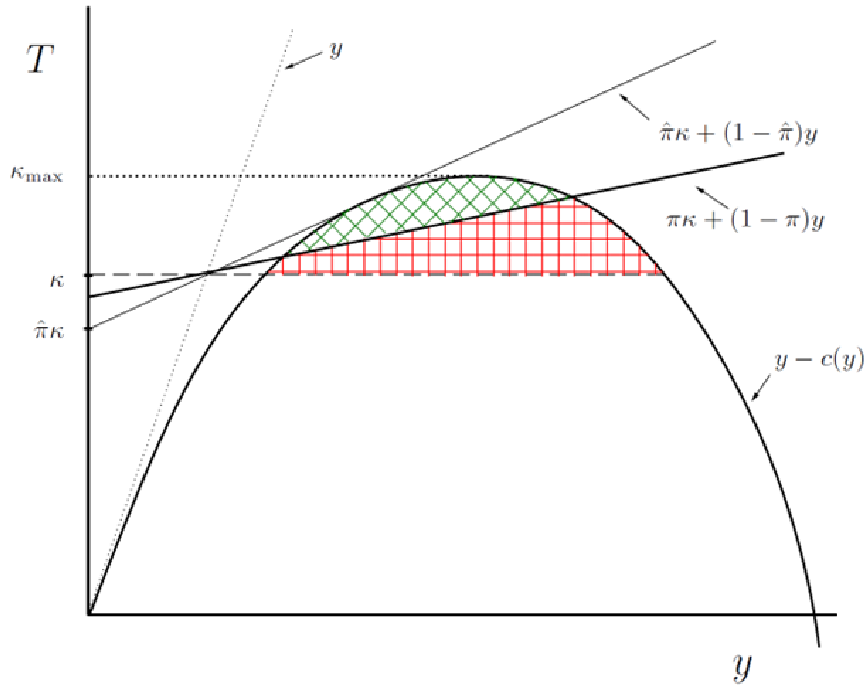

Figure 2

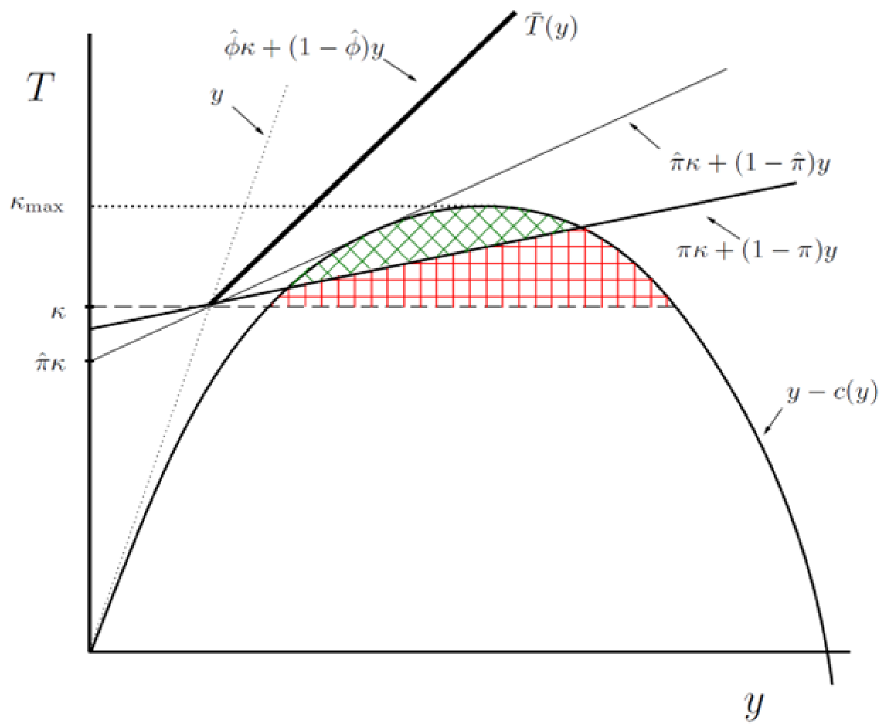

Figure 3

2.8 Vulnerable state equilibria and executive constraints

As we have previously ascertained, a resilient state equilibrium will only be sustainable if executive constraints are strong enough, whereas vulnerable state equilibria will always exist. Nevertheless, we have yet to explore the nature of vulnerable state equilibria when executive constraints are not strong enough to sustain a resilient state equilibrium, i.e. when $\phi < \hat{\phi}$.

A major aspect of a vulnerable state equilibrium is how states may be able to remain functioning under certain levels of security costs, but fail if they get too high. Nevertheless, it remains unclear under which levels of security costs a functioning state remains sustainable given executive constraints weaker than $\hat{\phi}$.

Then, we start our analysis by examining the strength of executive constraints necessary to sustain a functioning state at some level of security costs. In order to do so, we define $\tilde{\phi}_m$ as the minimum strength of executive constraints such that a functioning state is sustainable when $\kappa \in K_m = \{\kappa^i \in K : i \leq m\}$, but not when $\kappa \in K \setminus K_m$. $\tilde{\phi}_m$ is given by the following function

$$\tilde{\phi}_m = 1 - \frac{W_m(\kappa^m)}{y - \kappa^m}, \tag{25}$$

where y and $W_m(\kappa)$ are, respectively, the output level and the expected present value of social surplus, in state κ when a functioning state is sustainable only for $\kappa \leq \kappa^m$.

Examining (25), it is immediately evident that $\tilde{\phi}_n = \hat{\phi}$. Moreover, one might expect that supporting a functioning state under a subset of possible states would be easier than supporting it under all possible states. As such, we should have $\tilde{\phi}_m$ be weakly increasing in m. Nonetheless, that may not always be the case, and, under certain circumstances, it is conceivable that $\tilde{\phi}_{m-1} > \tilde{\phi}_m$ for some m. Whenever that is the case, either executive constraints are strong enough to support a functioning state under security costs of both κ^{m-1} and κ^m, or they are too weak to sustain such a state under either.

Proposition 3. *When executive constraints are marginally weaker than $\tilde{\phi}_m$, i.e. when $\phi = \tilde{\phi}_m - \varepsilon$ with an infinitesimal $\varepsilon > 0$, state failure may also occur for security costs lower than κ^m, i.e. $\tilde{\phi}_{m-1} > \tilde{\phi}_m$.*

Intuitively, agents know that a state will collapse if security costs at period t are greater or equal to κ_m when executive constraints are weaker than $\tilde{\phi}_m$. Consequently, the future expected payoffs of a leader in all other states will be lowered based on the probability that security costs will become at least as high as κ_m in the future. This change in payoffs tightens the leader's incentive compatibility constraint by making compliance less appealing to him. As a result, it may become impossible to support a positive level of output even under levels of security costs that are lower than κ_m. In essence, this occurs because the prospect of collapse in the future may precipitate collapse in the present.

Proposition 3 shows how marginal changes in executive constraints may have drastic effects on the vulnerability of states to collapse. As we can see, these marginal changes might have a domino effect, where a functioning state becomes unsustainable under multiple possible security costs all at once. Therefore, the results summarized in proposition 3 are further proof of the importance of strong executive constraints.

Having the distribution of κ be sensitive to the current κ_t complicates things somewhat, but is ultimately unnecessary to illustrate the main point of proposition 3. Thus, to illustrate this, let us consider a simpler example.

In this simpler example, let us assume that the security costs at time t, κ_t, follow an i.i.d. discrete uniform distribution. As such, the transition matrix will take the following form

$$\mathbf{P} \equiv \begin{bmatrix} \frac{1}{n} & \frac{1}{n} & \frac{1}{n} & \cdots & \frac{1}{n} \\ \vdots & \vdots & \vdots & \ddots & \vdots \\ \frac{1}{n} & \frac{1}{n} & \frac{1}{n} & \cdots & \frac{1}{n} \end{bmatrix}. \tag{26}$$

With this simplifying assumption in mind, we can simplify (25) finding the following expression for $\tilde{\phi}_m$

$$\tilde{\phi}_m = 1 - \frac{1}{y - \kappa^m} \left[\frac{y - c - \delta \frac{\sum_{i=1}^{m} \kappa^i}{n}}{1 - \delta \frac{m}{n}} - \kappa^m \right]. \tag{27}$$

It is then possible to see that $\tilde{\phi}_m$ can be decreasing under certain parameters. For instance, when $y = 2$, $c = 1$ and $K = \{0; 0.01; 0.02; \ldots; 0.8\}$ we can see that $\tilde{\phi}_m$ will be decreasing for a high enough δ.[12]. Moreover, we can see that $\tilde{\phi}_n > 0$ for some of these values of δ, guaranteeing that a ruler is not patient enough to make a resilient state equilibrium sustainable by default, i.e. even in the absence of executive constraints.[13] Figures 4 and 5 show the values of $\tilde{\phi}_m$ when $\delta = 0.3$ and $\delta = 0.5$ respectively. This illustrates a scenario where functioning states will never be sustainable should a resilient state equilibrium be unattainable. In other words, state failure may be assured if executive constraints are too weak to support a resilient state equilibrium.

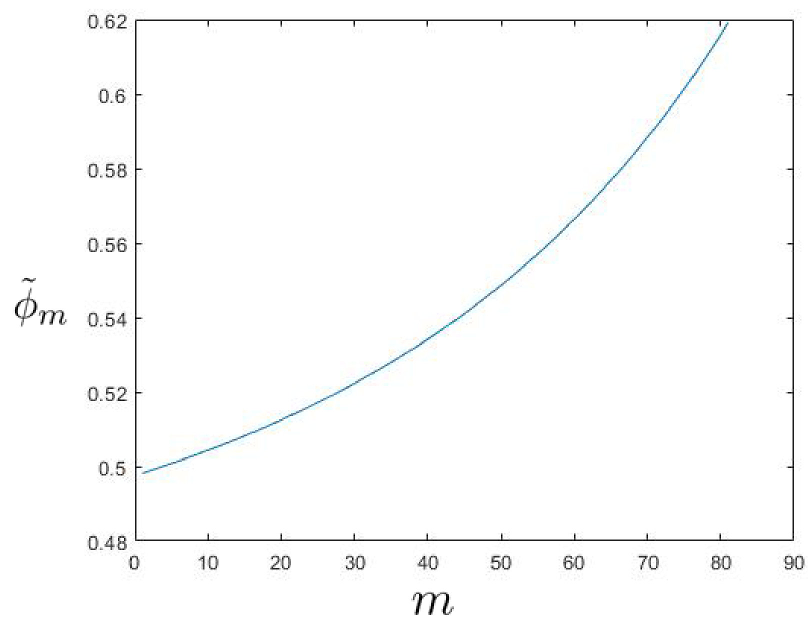

Figure 4

[12]Larger than approximately 0.401.

[13]As long as they are lower than approximately 0.625.

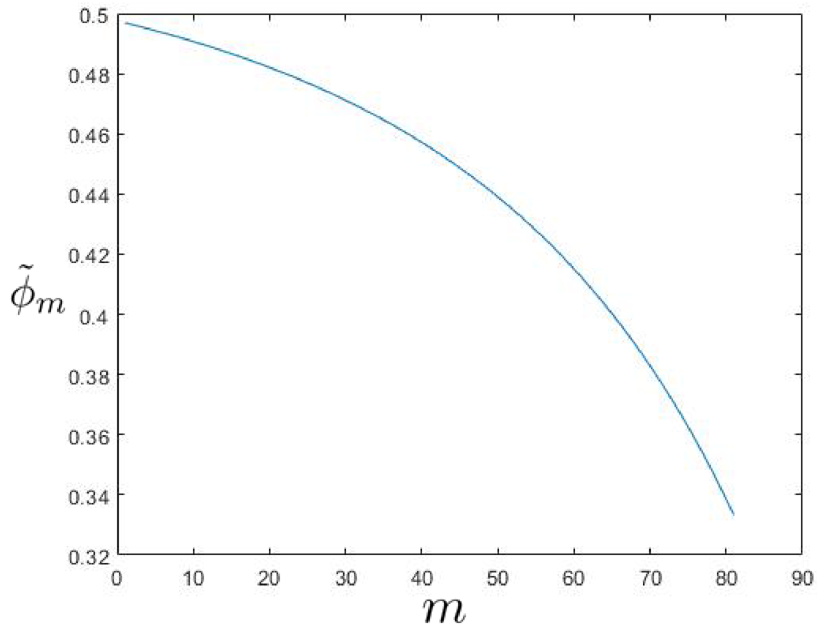

Figure 5

2.9 Tax revenues and executive constraints

After exploring how executive constraints shape equilibria, we must highlight their effects on a specific equilibrium outcome: the amount of taxes extracted by a leader. More precisely, we seek to examine if executive constraints allow a leader to generate higher or lower tax revenues and if these constraints positively affect citizens.

To begin, we introduce function $\tau^*(\kappa, \phi)$, representing the maximal discounted expected tax revenue attainable in equilibrium under initial security costs κ and executive constraints of strength ϕ. Formally,

$$\tau^*(\kappa, \phi) \equiv T^*(\kappa, \phi) + \sum_{k=1}^{\infty} \delta^k \mathbb{E}_t[T^*(\kappa_{t+k}, \phi)|\kappa_t = \kappa], \tag{28}$$

where $T^*(\kappa, \phi)$ represents the maximal value of equilibrium taxes in a period with security costs κ and executive constraints of strength ϕ.

Now, let us consider the behavior $\tau^*(\kappa, \phi)$, based on the strength of executive constraints ϕ. Recall that Proposition 1 showed that a resilient state equilibrium existed whenever $\phi \geq \hat{\phi}$. In other words, as long as executive constraints are strong enough, there exists an equilibrium where a state is always functioning and a leader is always able to extract some taxes. Moreover, we know from Corollary 1 that a leader is always able to extract the optimal amount of taxes if $\phi \in [\hat{\phi}, \bar{\phi}]$. Consequently, $\tau^*(\kappa, \phi)$ must be maximized when executive constraints are of some strength $\phi \in [\hat{\phi}, \bar{\phi}]$. Conversely, if executive constraints are too strong, i.e. $\phi \in (\bar{\phi}, 1]$, then a leader will be bound by these constraints at certain levels of κ, resulting in a decrease of his expected tax revenues.

At the same time, if executive constraints are too weak, i.e. $\phi \in [0, \hat{\phi})$, then no resilient state equilibrium will exist. Considering Proposition 3, we know that vulnerable state equilibria can entail many configurations, including ones where a functioning state is never sustainable. Therefore, a leader will be unable to extract tax revenues under at least some levels of security costs when $\phi \in [0, \hat{\phi})$, making his revenues strictly lower than they would be if $\phi \in [\hat{\phi}, \bar{\phi}]$. This result is summarized by the following proposition.

Proposition 4. *A leader's maximal discounted tax revenue in equilibrium, $\tau^*(\kappa, \phi)$, must be non-decreasing in ϕ on the interval $[0, \bar{\phi}]$ $\forall \kappa \in K$. Moreover, $\tau^*(\kappa, \phi') > \tau^*(\kappa, \phi)$ $\forall \phi' \in [\hat{\phi}, \bar{\phi}]$ and $\forall \phi < \hat{\phi}$.*

In essence, Proposition 4 suggests that a leader can always improve his tax revenues by implementing executive constraints that are strong enough to make a state resilient, but not enough to bind him. As such, a leader has a vested interest in making a state resilient to negative shocks by constraining his own power.

Moreover, Proposition 4 reveals an important aspect of executive constraints in our model. Stronger executive constraints do not bolster state resilience by reducing the amount taken by a leader and leaving citizens with a larger share of the pie. Instead, they mainly help a self-interested leader in making a credible commitment to a certain taxation level, potentially encompassing the entire surplus generated. In this way, executive constraints promote state resilience by motivating such leaders to provide security to their citizens, though this may not translate into improved welfare for the citizens themselves.

3 Historical Evidence

In this section we analyze a few historical cases which lend credence to the model and conclusions presented in the previous section. We start by discussing the experiences of the English and French monarchies during the mid 14th century. In particular, we focus on the issue of royal taxation following the outbreak of the Hundred Years' War.

Then, we explore the political institutions of ancient civilizations in the Eastern Mediterranean and the events that led to their collapse in the Late Bronze Age. More specifically, we present some of the competing theories that exist in the academic literature concerning these events and their causes.

Although the link between these historical cases and executive constraints may not be immediately evident, we argue that the evidence we present paints a picture where lack of commitment impairs a leader's capacity to extract rents from citizens and may lead to the breakdown of a state. Moreover, the evidence suggests that executive constraints can act as a solution to this commitment issue and ensure a state's resilience.

3.1 England, France and the Edwardian War

A watershed in Western history, we can trace the origins of the Hundred Years' War back to the death of Charles IV of France in 1328. His death left the French throne vacant and with three possible successors. Of those three, the concurrent claims of two would lead to the outbreak of the war in 1337.

The first claimant, and the closest male successor to Charles IV, was the English King Edward III, from the House of Plantagenet, whose claim was inherited from his mother, Isabella of France. The second claimant was Philip of Valois, whose patrilineal claim conformed to Salic law, which barred women and their heirs from acceding to the French throne. Considering these two main players in the Hundred Years' War, it is possible to largely see it as a conflict between two leaders from royal houses of French origin, whose key difference lied in the nature of the institutions they were subject to.

One important contrasting characteristic of the institutional frameworks facing the English and French monarchs was the presence of constraints placed upon their power. In late thirteenth and early fourteenth century France, institutions were poorly developed, and presented little constraints on the power of the French monarchy. Consequently, legal experts of the royal entourage frequently invoked the Roman legal theory of royal sovereignty, which, according to Henneman (1971) "offered a king sweeping powers to levy necessary taxes". The power of the French monarch was specially evident following the reign of Philip IV, as described by Henneman (1971)

> Philip the Fair did not invent new taxes, but generalized older ones, collected them more frequently, and stretched "ordinary" revenues to extraordinary lengths, while his legal advisers claimed sovereign powers for the monarch. It is generally agreed that his reign (1285-1314) was an important one for French royal finances. The military and diplomatic pattern of the fourteenth century was established in these years as a result of the continued expansion of the royal domain.

As a consequence of the institutional framework of fourteenth century France, consent for taxation and the related Roman legal maxim of *quod omnes tangit*[14] were not habitually invoked by French subjects of the period, as discussed in Henneman (1971)

> Despite many situations in which *quod omnes tangit* seemed relevant, those called to southern assemblies made little use of it and seemed more conscious of a duty to give counsel than a right to give consent.

While the French monarchy enjoyed considerable prestige and faced little to no institutional constraints to its power, that was not the case for its English counterpart in 1337. Throughout the preceding century, Edward III's predecessors had faced the imposition of increasing limitations on their power as monarchs. Most notably, we can point out the acceptance of the Magna Carta by King John in 1215 and the Provisions of Oxford and Westminster imposed on King Henry III in 1258 and 1259 respectively. From these salient historical events, rose the earliest forms of the English Parliament, limiting the powers of the monarchy. The increasingly prominent role that this institution played in constraining the King is alluded to by Hariss (1975) in his account on the expansion of taxation in 13th century England

> Although this development took place primarily in response to royal needs, baronial influence helped to establish the terms on which the King's plea of necessity should be adjudicated and the form of consent rendered to it. For, despite the omission of cap.12 and cap.14 from subsequent issues of *Magna Carta*, the principle that aids should be taken only by common counsel of the realm expressed through a large assembly of magnates was consistently maintained.

Moreover, the tumultuous reign of Edward II and his ensuing deposition in 1327 further increased the powers of the Parliament and decreased those of the King. Therefore, the institutional configuration facing Edward III at the time of his accession to the English throne in 1327 was characterized by executive constraints which were mostly absent from its continental counterpart.

[14] An important element in the rise of representation, *quod omnes tangit* placed limits on the power yielded by the monarch. Specifically, under *quod omnes tangit*, a medieval monarch was forced to seek the consent of his subjects in certain matters, including the imposition of extraordinary taxes. For a detailed discussion on this legal maxim see Post (1950).

This clear difference in the institutions of the two belligerent nations may have had an important impact on the finances of their kings. In particular, the ability to raise revenues through taxation was an important issue facing European monarchs in the 14th century. As described by Tuchman (1978/2014)

> In the woe of the century no factor caused more trouble than the persistent lag between the growth of the state and the means of state financing. While the centralized government was developing, taxation was still encased in the concept that taxes represented an emergency measure requiring consent.

In France, Philip VI faced notable difficulties in raising taxes from his subjects following the beginning of hostilities with England. As described by Henneman (1967), on several occasions the French monarch was faced by opposition to his attempts at taxation, and further negotiations were usually unsuccessful at producing uniform taxes. These obstacles faced by the French King can arguably be attributed to an issue of commitment, which parallels the one described in our model. As put by Harriss (1976) when speaking of France during the early stages of the Hundred Years' War

> Neither the nobility nor the towns were willing to countenance taxation on a national basis, being too distrustful of each other, and of the military capacity of the king, to submit their particular interests to the demands of common safety.

In this regard, Edward III was demonstrably more successful than his French opponent. The English monarch and his predecessors were able to obtain the assent of the Parliament on numerous occasions. Once again turning to Harriss (1976), we can find the following account of English royal taxation in the years preceding 1337

> In England, by contrast, the forty years between 1297 and 1337 saw fourteen lay subsidies granted by fully representative assemblies, eleven of which fell in the thirty years after Edward I's death. Taxation was thus frequent enough to be a normal act of government.

Following the decisive French defeats at Crécy in 1346 and at Poitiers in 1356, the French monarchy found itself facing additional financial strain, while possessing a diminished authority over its domains. This situation did not improve immediately after the end of the Edwardian Phase of the War following the Treaty of Brétigny of 1360. As a result, French citizens were left defenseless against the Free Companies, former mercenaries employed by the English who had turned to banditry after the Battle of Poitiers. An illustrative description of the actions of these roving bandits can be found in Tuchman (1978/2014)

> They imposed ransoms on prosperous villages and burned the poor ones, robbed abbeys and monasteries of their stores and valuables, pillaged peasants' barns, killed and tortured those who hid their goods or resisted ransom, not sparing the clergy or the aged, violated virgins, nuns, and mothers, abducted women as enforced camp-followers and men as servants.

In addition to the devastation caused by war and Free Company raids, the French also suffered from a severe shortage of labor. Caused in part by the emergence of the Black Death, it was only exacerbated by the conditions of the French state at the time. In response to taxation attempts by the French Crown, workers had increasingly migrated to other regions of the continent. As described by Tuchman (1978/2014)

> Rather than pay the repeated taxes that followed upon French defeats, peasants deserted to nearby imperial territory in Hainault and across the Meuse.

The fiscal capacity of the French monarchy would only later improve due to the efforts of Charles V following his father's capture at Poitiers. During his regency as dauphin and later reign, Charles V began to increasingly rely on regional assemblies for fiscal matters, including the collection of taxes. By virtue of this decentralized approach, Charles V was able to secure higher revenues than his predecessors, which paved the way for the French victories in the Caroline phase of the war. Nonetheless, Charles V's fiscal success came at the expense of some of his power to expropriate, as his approach evidently resulted in some fiscal autonomy at the local level, as described in Henneman (1976)

> The victories of the 1370's were founded on a system which resembled that "certain local autonomy" to which Cazelles has referred, and foreshadowed the "bureaucratic decentralization" by which Major has characterized the fifteenth-century monarchy.

In summary, it is possible to notice clear parallels between the fiscal capabilities of the English and French monarchies during the early stages of the Hundred Years' War and the mechanisms laid out in our model. In particular, we notice how the issue of commitment regarding taxation can be alleviated by the imposition of constraints on the executive, paradoxically increasing its fiscal capabilities. As most eloquently stated by Harriss (1976)

> If the English monarchy lacked the peculiar prestige of the French, its executive authority had always been greater.

Moreover, it is evident that the constraints placed on the English monarch during the 14th century were still noticeably weaker than those placed on its later iterations in the later centuries. More specifically, during this period the powers of the English parliament paled in comparison to those it would possess during the Financial Revolution of the late 17th century.[15] As such, in a similar fashion to our model, the power of the fledgling English parliament may not have lied as much in its capacity to force marginal changes in the actions of its monarch, but in its capacity to safeguard against great abuses of power.

Finally, we can also see evidence that the issue of commitment may have caused, even if temporarily, the failure of the French state following its military disasters in the Edwardian phase of the conflict.

3.2 The Eastern Mediterranean and the Late Bronze Age Collapse

In a relatively short period of time around the 12th century BCE, several ancient and developed civilizations from the Eastern Mediterranean collapsed suddenly and in close succession. This pivotal event in ancient history became known to historians and archaeologists as the Late Bronze Age Collapse, and constitutes one of the most significant episodes of societal collapse in human history. Of particular significance is the abruptness of this event, which is clearly illustrated in the example of the fall of Ugarit as described by Cline (2014)

> The textual evidence from the various archives and houses at Ugarit indicate that international trade and contact was going strong in the city right up until the last possible moment. In fact, one of the scholars publishing letters from the House of Ugarit noted almost twenty years ago that there was very little indication of the trouble, apart from the mention of enemy ships in one letter, and the trade routes seemed to be open right up until the end. The same was true for Emar, on the Euphrates River far to the east in inland Syria, where it has been noted that "the scribes were conducting normal business until the end."

[15] As discussed extensively in North and Weingast (1989).

As a result of the significance of the Late Bronze Age Collapse, a considerable body of research has been devoted to the task of analyzing this event and finding the causes and mechanisms behind it. Nevertheless, a consensus has not been reached within this interdisciplinary literature, despite the countless publications on the topic, and the true causes of the Late Bronze Age Collapse remain a mystery to historians and archaeologists alike.[16]

Among the more notable explanations for the Late Bronze Age Collapse, lies one which draws from complexity theory in order to craft a narrative where a complex network of polities in the Eastern Mediterranean broke down due to compounding stress factors, such as climate change, environmental disasters, barbarian invasions and the loss of trading partners.[17] Nevertheless, as most of the general literature on collapses, the System Collapse Theory of the Bronze Age Collapse suffers from a lack of convincing micro-foundations, which makes it impractical to scrutinize the causal links between stress factors and the collapse of Bronze Age civilizations in a compelling fashion.

Considering this particular shortcoming of previous research, our model can help support some of these narratives on collapse by providing some necessary micro-foundations. In particular, the mechanisms highlighted in our model can help contextualize some of the evidence described by previous works in the literature.

Mainly, it is possible to point out the lack of executive constraints or similar features in the make-up of political institutions of Bronze Age societies as a contributor to the collapse of these civilizations. In our model, this is a characteristic that can help contribute to a state's lack of resilience. When discussing the political and economical institutions of the Late Bronze Age, archaeologists and historians have frequently called them palace economies. These palace economies are described as highly centralized economies, where rulers had direct control over the taxation of resources and output. While authors have debated some of the aspects of centralization in these economies,[18] it seems to be clear that Bronze Age leaders enjoyed a great deal of discretionary power over taxation. This can be seen in the following discussion from Lupack (2011) regarding the relationship between leaders (*wanax*) and local communities within their territory (*damos*) in Mycenaean Greece

> As the power of the *wanax* grew, it began to overshadow that of the separate *damos* leaders, and in particular, because of their close proximity to the palace at Pylos, the *damos* leaders of *pa-ki-ja-ne.* Hence, the *wanax* had the power to tax the land and perhaps even to commandeer some of it for his own purposes.

The following excerpt from Liverani (1987) further underscores the extent of the power of Bronze Age rulers

> The political system of the Late Bronze Age in the Near East and in the eastern Mediterranean was characterized by large regional units (the result of a development of many centuries, impossible to sketch here), each endowed with a higher authority of regional extent, and a system of lower-level, local authorities with cantonal or city-specific jurisdiction. In the political language of the period the higher level is that of the 'great kings' and the lower level is that of the 'small kings', the latter subject to the former who are alone recognized as independent

[16] For more comprehensive reviews of the literature on the Late Bronze Age Collapse, consult Cline (2014) and Knapp and Manning (2016).

[17] A succinct description of this hypothesis can be found in chapter five of Cline (2014).

[18] In particular, the concept of redistribution has been a crucial point of debate within the literature regarding the political and social institutions of the Bronze Age period. For a more thorough discussion on this concept refer to Nakassis et Al. (2011) and the literature review found in Halstead (2011).

powers.

While previous authors have emphasized how the centralization of power under the institution of the palace may have magnified the effects of their collapse,[19] our model suggests that this centralization may have actually been one of the causes of their demise.

Additionally, another often mentioned key factor contributing to the collapse of civilizations at the twilight of the Bronze Age was the emergence of the Sea Peoples.[20] As described by numerous historians and archaeologists, the Sea Peoples were marauding groups of seafaring barbarians whose records of activity coincide with the period of societal collapses at the Late Bronze Age. As a result of this notable concurrence, authors have frequently crafted narratives of the Late Bronze Age collapse where the Sea Peoples play a leading role. Nevertheless, no consensus has been reached in the literature on whether the Sea Peoples were a crucial factor in the collapses of the Late Bronze Age, or just a single one among many.

In light of our model, one can interpret the actions of the Sea Peoples as driving up the security costs faced by Bronze Age Leaders in the eastern Mediterranean. Consequently, the Sea Peoples may have been a fundamental factor in the collapse of Bronze Age civilizations not through direct martial activity, but by lowering the incentives of continued leadership in those civilizations.

In summary, the model presented on this paper provides a subtle and surprising mechanism that may have played a part in the collapse of Late Bronze Age civilizations in the eastern Mediterranean, and that, to the extent of our knowledge, has not been previously formally investigated. More specifically, our model suggests that the institutional structure of those civilizations exacerbated issues of limited commitment and may have left them particularly vulnerable to stress factors they would experience at the end of the Bronze Age. Therefore, while this narrative follows the evidence documented by the previous literature on the subject, it further provides a novel perspective to an ongoing inter-disciplinary debate.

4 Conclusion

While a large interdisciplinary body of work outside of the field of economics has focused on the issue of societal collapse, this topic has been largely neglected by economists. Taking into account the deleterious effects episodes of state failure and collapse have on economies, this lack of interest by economists appears most surprising. In this paper we presented a simple theoretical model connecting political institutions and state failure. In our model, it is possible to see how a leader's lack of commitment regarding taxation may lead to a breakdown of security provision, leading to state failure. Naturally, constraining the leader in his decision making can help prevent this phenomenon from occurring. But, perhaps surprisingly, the constraints placed on the leader need not bind him fully in order to prevent rapacious behavior by the leader. This occurs because executive constraints act on off-path incentives, limiting the payoffs of deviations by the leader. Therefore, the main result from this model shows how the introduction of strong enough executive constraints can prevent state failure from occurring, even under strenuous circumstances. Furthermore, our model also shows how marginal increases in the strength of executive constraints can have other

[19] In the words of Liverani (1987), "the particular concentration in the Palace of all the elements of organization, transformation, exchange, etc. – a concentration that seems to reach its maximum in the Late Bronze Age – has the effect of transforming the physical collapse of the Palace into a general disaster for the entire kingdom."

[20] For a detailed discussion of the possible origins and characteristics of the Sea Peoples consult Sandars (1985).

significant and beneficial effects, such as increasing possible production levels and allowing vulnerable states to function under increasingly strenuous circumstances.

We have also provided a coherent mechanism behind the persistence of checks and balances in political institutions. Showing how leaders are willing to empower a legislature in order to constrain himself and prevent state failure. Moreover, we have shown how such a legislature is not required to hold the same interests as citizens in order to provide a credible source of restrictions on the leader. Particularly, we show how such an institutional framework allows for a resilient state even when agents are not as patient.

Additionally, by analyzing two distinct and extensively studied historical episodes we have illustrated some of the mechanisms described by our model. These historical case studies not only buttress the main arguments laid out in this paper, but, further, provide novel perspectives on long studied historical events.

Therefore, by providing unique insights into the phenomenon of collapse, this paper constitutes an important contribution not only for the field of economics, but also for the interdisciplinary literature on societal collapse. In essence, through a relatively simple model connecting political institutions and state failure we provide a novel and unique perspective on the benefits of strong executive constraints. Moreover, by showing how these constraints can benefit both leaders and citizens simultaneously, this paper provides a rationale for the persistence of checks and balances in modern political institutions.

The findings laid out in this paper also suggest interesting topics to be explored in future research. In particular, patience can still can cause a state to fail if agents discount their future too heavily. As such, it would be beneficial to investigate more precise forms of checks and balances that may allow for a resilient state to exist with agents of even lower patience levels. Additionally, an investigation on how unforeseen shocks to a leader's patience might affect his policies regarding checks and balances would constitute another valuable extension to our model. Finally, while issues of succession are notably absent from our model, it would be of interest to analyze how the mechanisms laid out in it would affect this ubiquitous political phenomenon.

Appendix

Lemmas

Lemma 1. *Let x_k be decreasing finite sequence. Then if $\boldsymbol{P}$ satisfies assumption 1, $y_i = \sum_{k=1}^{n} \rho_{i,k} x_k$ will be also be a decreasing finite sequence.*

Proof. Write

$$y_i = x_1 + \sum_{k=1}^{n-1} [1 - P_J(k)]\{x_{k+1} - x_k\}. \tag{29}$$

The term in braces is negative (x is a decreasing finite sequence) and the term in brackets is increasing in i since $\mathbf{P}$ satisfies assumption 1. Thus increases in i lower y_i, making it a decreasing finite sequence.

□

Lemma 2. *If assumption 1 is satisfied, then whenever (14) is satisfied for $\bar{\kappa}$, it is also satisfied $\forall \kappa \in K$.*

Proof. First, let us rewrite (14) as follows.

$$(1-\phi)y \leq y - c - \phi\bar{\kappa} + \sum_{k=1}^{\infty} \delta^k \mathbb{E}_t[w(\kappa_{t+k})|\kappa_t = \kappa]. \tag{30}$$

Now, let us show that the RHS of this inequality is decreasing in κ. In order to do so, let us focus on the last term of the equation and show that it is decreasing in κ. We can rewrite it as follows.

$$\sum_{k=1}^{\infty} \delta^k \mathbb{E}_t[w(\kappa_{t+k})|\kappa_t = \kappa] = \sum_{k=1}^{\infty} \delta^k \sum_{j=1}^{n} p_j^k(\kappa) w(\kappa^j), \tag{31}$$

where $p_j^k(\kappa)$ represents the probability that the state will be κ^j in k periods given that the current state is κ. We can then show that whenever transition matrix $\mathbf{P}$ satisfies assumption 1, then the transition matrix $\mathbf{P}^k$ will also satisfy assumption 1, where we define

$$\mathbf{P}^k \equiv \begin{bmatrix} p_1^k(\kappa^1) & p_2^k(\kappa^1) & p_3^k(\kappa^1) & \dots & p_n^k(\kappa^1) \\ p_1^k(\kappa^2) & p_2^k(\kappa^2) & p_3^k(\kappa^2) & \dots & p_n^k(\kappa^2) \\ \vdots & \vdots & \vdots & \ddots & \vdots \\ p_1^k(\kappa^n) & p_2^k(\kappa^n) & p_3^k(\kappa^n) & \dots & p_n^k(\kappa^n) \end{bmatrix}. \tag{32}$$

By definition we have that

$$p_j^k(\kappa) = \sum_{l=1}^{n} p_l^{k-1}(\kappa) \rho_{l,j}, \tag{33}$$

consequently

$$P_J^k(i) = \sum_{j=1}^{J} p_j^k(\kappa^i) = \sum_{j=1}^{J} p_j^{k-1}(\kappa^i) P_J(i). \tag{34}$$

Based on lemma 1, we know that if $\mathbf{P}^{k-1}$ satisfies assumption 1, then so will $\mathbf{P}^k$ since $P_J(i)$ is a decreasing finite sequence. By induction, it is possible to see that since $\mathbf{P}^1 = \mathbf{P}$ satisfies assumption 1, then so will $\mathbf{P}^k$, $\forall k$.

Once again applying lemma 1, we can see that (31) is decreasing in κ. Thus, we have that the RHS of (30) is decreasing in κ, which shows us that whenever it is satisfied for $\bar{\kappa}$, it will also be satisfied for all other $\kappa \in K$.

□

Lemma 3. *Matrix A exists and every element $a_{i,j}$ of it is non-negative.*

Proof. First, we can see that the $n \times n$ matrix $B = I - \delta P$ is a real Z-Matrix. Moreover, it is clear that matrix B is an M-Matrix since, based on the Perron-Frobenius Theorem, the spectral radius of P is δ, which is strictly smaller than 1.

Applying Theorem 2.3 from Chapter 6 of Berman and Plemmons (1994) we can see that the following statements are equivalent

1. B has all positive diagonal elements, and there exists a positive diagonal matrix D such that BD is strictly diagonally dominant.
2. B is a non-singular M-Matrix.
3. B is inverse-positive. That is, B^{-1} exists and $B^{-1} \geq 0$.

We can then prove statement 1. We start by noticing that all diagonal elements of B can be written as $1 - \delta\rho_{i,i}$ which is clearly positive. Then, we define $D \equiv I$, which gives us $BD = B$. Finally, we can show that B is strictly diagonally dominant since

$$\forall i \quad 1 - \delta \sum_{j=1}^{n} \rho_{i,j} = 1 - \delta > 0. \tag{35}$$

Therefore, statement 1 must be true, and, as such, statements 2 and 3 must also be true. We then conclude our proof by noticing that $A = B^{-1}$, and, based on statements 2 and 3, it exists and each of its elements must be non-negative.

$\square$

Proofs of Propositions 1-4 and Corollaries 1-2

Proof of Proposition 1. Let us start by defining the following expression:

$$\Lambda(\phi) \equiv W(\bar{\kappa}) - (1 - \phi)[y - \bar{\kappa}], \tag{36}$$

First, notice that $\Lambda(\phi)$ is weakly increasing in ϕ. Now let us define $\hat{\phi}$ as the smallest $\phi \in [0, 1]$ s.t. $\Lambda(\phi) \geq 0$. It is easy to see that whenever $w(\bar{\kappa}) \geq 0$ we shall also have that $W(\bar{\kappa}) \geq 0$, and, as such, $\hat{\phi}$ will exist since $\Lambda(1) \geq 0$. Moreover, based on lemma 2, it is evident that whenever $\Lambda(\phi) \geq 0$, condition (14) will be satisfied $\forall\kappa \in \mathbf{K}$ and a resilient state equilibrium will exist.

Now, let us show that if $\phi \geq \hat{\phi}$, then a resilient state equilibrium exists. Because $\Lambda(\phi)$ is weakly increasing in ϕ, it is clear that $\Lambda(\phi) \geq \Lambda(\hat{\phi})$ whenever $\phi \geq \hat{\phi}$. Thus, $\Lambda(\phi) \geq 0$, which, as previously mentioned, means that a resilient state equilibrium will exist.

Finally, let us show that if a resilient state equilibrium exists, then $\phi \geq \hat{\phi}$. If a resilient state equilibrium exists, then condition (14) must be satisfied $\forall\kappa \in \mathbf{K}$ and $\Lambda(\phi) \geq 0$ by definition. Thus, it must be that $\phi \geq \hat{\phi}$ based on the definition of $\hat{\phi}$ and the fact that $\Lambda(\phi)$ is weakly increasing in ϕ.

$\square$

Proof of Proposition 2. First, notice that we can simplify the constraint from (15) as follows

$$\pi y - c(y) - (1 - \delta)\Big[\sum_{k=0}^{\infty} \delta^k \mathbb{E}[\kappa_{t+k} | \kappa_t = \bar{\kappa}] - (1 - \phi)\bar{\kappa}\Big] \geq 0, \tag{37}$$

where $\pi = \delta + \phi - \delta\phi$

It is possible to see that (37) reaches it's maximum with respect to y at some level y', where $c'(y') = \pi$, which clearly is lower than y^* since $c'(y^*) = 1 > \pi$. Consequently, we have that when (37) is violated for y^* at a given ϕ, it is still possible for it to be satisfied by some $y \in [y', y^*)$.

To conclude our proof, let us define $\underline{\phi}$ as the lowest ϕ such that (37) is binding for some $y \in [\underline{y}, y^*)$, where $c'(\underline{y}) = \delta$. ☐

Proof of Proposition 3. Let us start by defining vector Ω_m of dimension $n \times 1$ described as follows

$$\Omega_m \equiv \begin{bmatrix} W(\kappa^1) \\ \vdots \\ W(\kappa^m) \\ 0 \\ \vdots \\ 0 \end{bmatrix}. \tag{38}$$

Alternatively, we can define Ω_m with the following expression

$$\Omega_m = \omega_m + \delta P \Omega_m, \tag{39}$$

where ω_m is an $n \times 1$ vector described as follows

$$\omega_m \equiv \begin{bmatrix} y - c - \kappa^1 \\ \vdots \\ y - c - \kappa^m \\ 0 \\ \vdots \\ 0 \end{bmatrix}. \tag{40}$$

Rearranging (39), we find:

$$\Omega_m = A\omega_m, \tag{41}$$

where $A \equiv [I - \delta P]^{-1}$. According to Lemma 3, we know that matrix A exists and that every single one of its elements are non-negative. Considering this, we can find that

$$\tilde{\phi}_m = 1 - \frac{a_m \omega_m}{y - \kappa^m}, \tag{42}$$

where a_m is the mth (last) row of A.

We can then find that $\tilde{\phi}_{m-1} > \tilde{\phi}_m$ is true if and only if

$$\sum_{j=1}^{m-1} \left[\Big(\frac{y - c - \kappa^j}{y - \kappa^{m-1}}\Big) a_{m-1,j} - \Big(\frac{y - c - \kappa^j}{y - \kappa^m}\Big) a_{m,j} \right] - \Big(\frac{y - c - \kappa^m}{y - \kappa^m}\Big) a_{m,m} < 0. \tag{43}$$

Looking at (43), we can notice that it is possible to rewrite it as

$$\frac{W(\kappa^{m-1})}{y-\kappa^{m-1}} - \frac{W(\kappa^m)}{y-\kappa^m} < \Big(\frac{y-c-\kappa^m}{y-\kappa^{m-1}}\Big)a_{m-1,m}. \tag{44}$$

Here we see two opposing effects that work on $\tilde{\phi}_{m-1} - \tilde{\phi}_m$. First, on the LHS, we see how supporting functioning states under lower security costs is easier than under higher security costs, as shown in proposition 1. Then, on the RHS, we see how the potential collapse under security costs κ^m lowers the continuation payoff to the leader at security costs κ^{m-1}. Whenever the effect captured on the RHS is higher than the one captured on the LHS, it is clear that state failure will occur for both κ^m and κ^{m-1} for any $\phi = \tilde{\phi}_m - \varepsilon$, where $\varepsilon > 0$.

□

Proof of Proposition 4. To begin, let us show that $\tau^*(\kappa, \phi)$ is non-decreasing in ϕ on the interval $[\hat{\phi}, \bar{\phi}]$. To do so, let us recall that Proposition 1 establishes the existence of a resilient state equilibrium, where the leader selects the tax level $T(\kappa) = y - c\ \forall \kappa \in K$, as long as $\phi \in [\hat{\phi}, \bar{\phi}]$. Thus, $\tau^*(\kappa, \phi) = \frac{y-c}{1-\delta}\ \forall \phi \in [\hat{\phi}, \bar{\phi}]$, which is clearly constant and, ergo, non-decreasing in ϕ over that interval.

Now, to show that $\tau^*(\kappa, \phi)$ is non-decreasing in ϕ on the interval $[0, \hat{\phi})$, recall that Proposition 1 also establishes that only vulnerable state equilibria exist whenever $\phi \in [0, \hat{\phi})$. Moreover, under a vulnerable state equilibrium, a functioning state is sustainable up to security cost κ^m only if $\phi \geq \tilde{\phi}_m$. Thus, if $\phi \in [0, \hat{\phi})$ a leader may only be able to tax citizens $T(\kappa) = y - c$ up to some security cost $\kappa^m \in K$. Furthermore, this cost κ^m cannot be decreasing in ϕ based on the definition of $\tilde{\phi}_m$. This implies that whenever $\phi > \phi'$ for some $\phi, \phi' \in [0, \hat{\phi})$, a functioning state cannot be sustained under higher security costs with executive constraints ϕ' than with executive constraints ϕ. Thus, $\tau^*(\kappa, \phi) \geq \tau^*(\kappa, \phi')$ revealing that $\tau^*(\kappa, \phi)$ must also be non-decreasing in in ϕ over the interval $[0, \hat{\phi})$.

Finally, notice that the tax revenues for a leader are necessarily higher under the resilient state equilibrium where he taxes $T(\kappa) = y - c\ \forall \kappa \in K$ than under any vulnerable state equilibrium. Consequently, $\tau^*(\kappa, \phi) < \frac{y-c}{1-\delta} = \tau^*(\kappa, \hat{\phi})$, proving the second half of the proposition.

□

Proof of Corollary 1. Let us start by rewriting (36) as follows

$$\Lambda(\phi) = \frac{y-c}{1-\delta} - \sum_{k=1}^{\infty} \delta^k \mathbb{E}[\kappa_{t+k} | \kappa_t = \bar{\kappa}] - (1-\phi)[y - \bar{\kappa}]. \tag{45}$$

Plugging in the definition of $\bar{\phi}$, we find

$$\Lambda(\bar{\phi}) = \frac{y-c}{1-\delta} - \sum_{k=1}^{\infty} \delta^k \mathbb{E}[\kappa_{t+k} | \kappa_t = \bar{\kappa}] - [y - \bar{\kappa} - c]. \tag{46}$$

Which is clearly strictly positive $\forall \delta \in (0, 1)$. Therefore, $\exists \phi < \bar{\phi}$ s.t. $\Lambda(\phi) \geq 0$, which, by definition, means $\hat{\phi} < \bar{\phi}$.

□

Alternative formulation

In this subsection, let us consider a scenario where K is able to fully commit to a particular investment in security S_t before C makes his choice of production Y_t. Under this scenario, the timing of events is modified as follows:

- κ_t is realized,
- K makes his investment in security S_t
- C makes his production choice Y_t,
- Bandit theft is realized,
- K decides the tax level T_t,
- Payoffs are realized.

As a consequence of the ability of K to commit to a certain security investment S_t before C makes his production decision Y_t, the optimal punishment scheme may yield positive future expected payoffs for K under certain parameters, i.e. $\Psi(\kappa) > 0$. This occurs because C may never be willing to produce nothing in response to any positive investment in security by K, even under the threat of maximal expropriation. Thus, an equilibrium where C always produces nothing and K never invests in security may never exist.

The following proposition summarizes how the results of subsection 2.5 are affected by this change.

Proposition 5. *When K can commit to his security investment before C chooses the production level Y_t, a resilient state equilibrium cannot exist under weaker executive constraints. That is, a resilient state equilibrium will not exist if $\phi < \hat{\phi}$.*

Proof. Consider that we have $\Psi(\kappa) \geq 0$ when K is able to commit to his security investment. Consequently, we can rewrite (36) as follows

$$\Lambda(\phi)' \equiv W(\bar{\kappa}) - (1 - \phi)[y - \bar{\kappa}] - \Psi(\kappa). \tag{47}$$

Then, notice that $\forall \phi \in [0, 1]$ we have that $\Lambda(\phi)' \leq \Lambda(\phi)$ because $\Psi(\kappa) \geq 0$. Thus, $\Lambda(\phi)' < 0$ $\forall \phi < \hat{\phi}$, which implies that a resilient state equilibrium will not exist when $\phi < \hat{\phi}$.

□

Based on proposition 5 we can see that allowing the leader to commit to a certain security investment before the citizens produce their output will not make it easier to sustain a resilient state equilibrium.

References

[1] Abreu, D. (1988). *On the theory of infinitely repeated games with discounting.* Econometrica: Journal of the Econometric Society, 383-396.

[2] Acemoglu, D., Robinson, J. A., and Torvik, R. (2013). *Why do voters dismantle checks and balances?.* Review of Economic Studies, 80(3), 845-875.

[3] Angelucci, C., Meraglia, S., and Voigtländer, N. (2017). *How merchant towns shaped parliaments: From the Norman Conquest of England to the Great Reform Act* (No. w23606). National Bureau of Economic Research.

[4] Aristotle (2013). *Aristotle's Politics* (C. Lord, Trans.). The University of Chicago Press. (Original work published ca. 350 BCE)

[5] Baron, D. P. (1998). *Comparative dynamics of parliamentary governments.* American political science review, 593-609.

[6] Bates, R. H. (2008). *State Failure.* Annual Review of Political Science, 11(1), 1–12.

[7] Berman, and Plemmons, R. J. (1994). *Nonnegative Matrices in the Mathematical Sciences.* Society for Industrial and Applied Mathematics.

[8] Besley, T., and Ghatak, M. (2010). *Property rights and economic development.* In Handbook of development economics (Vol. 5, pp. 4525-4595). Elsevier.

[9] Besley, T., and Mueller, H. (2018). *Executive Constraints as Robust Control* (No. 1054).

[10] Brander, J. A., and Taylor, M. S. (1998). *The simple economics of Easter Island: A Ricardo-Malthus model of renewable resource use.* American economic review, 119-138.

[11] Butzer, K. W. (2012). *Collapse, environment, and society.* Proceedings of the National Academy of Sciences, 109(10), 3632-3639.

[12] Butzer, K. W., and Endfield, G. H. (2012). *Critical perspectives on historical collapse.* Proceedings of the National Academy of Sciences, 109(10), 3628-3631.

[13] Cline, E. H. (2014). *1177 BC: the year civilization collapsed.* Princeton University Press.

[14] Dalton, T. R., and Coats, R. M. (2000). *Could institutional reform have saved Easter Island?.* Journal of Evolutionary Economics, 10(5), 489-505.

[15] Diamond, J. (2005). *Collapse: How Societies Choose to Fail or Succeed.* Viking press.

[16] Diermeier, D., and Myerson, R. B. (1999). *Bicameralism and its consequences for the internal organization of legislatures.* American Economic Review, 89(5), 1182-1196.

[17] Dugmore, A. J., McGovern, T. H., Vésteinsson, O., Arneborg, J., Streeter, R., and Keller, C. (2012). *Cultural adaptation, compounding vulnerabilities and conjunctures in Norse Greenland.* Proceedings of the National Academy of Sciences, 109(10), 3658-3663.

[18] Dunning, N. P., Beach, T. P., and Luzzadder-Beach, S. (2012). *Kax and kol: Collapse and resilience in lowland Maya civilization.* Proceedings of the National Academy of Sciences, 109(10), 3652-3657.

[19] Garfinkel, M. R., and Lee, J. (2000). *Political influence and the dynamic consistency of policy.* American Economic Review, 90(3), 649-666.

[20] Georgescu-Roegen, N. (1971). *The entropy law and the economic process.* Harvard University Press.

[21] Goldstone, J. A. (2008). *Pathways to state failure.* Conflict Management and Peace Science, 25(4), 285-296.

[22] Grossman, H. I., and Noh, S. J. (1990). *A theory of kleptocracy with probabilistic survival and reputation.* Economics and Politics, 2(2), 157-171.

[23] Grossman, H. I., and Noh, S. J. (1994). *Proprietary public finance and economic welfare.* Journal of Public Economics, 53(2), 187-204.

[24] Halstead, P. (2011). *Redistribution in Aegean Palatial Societies. Redistribution in Aegean Palatial Societies: Terminology, Scale, and Significance.* American Journal of Archaeology, 115(2), 229-235.

[25] Harris, S. E. (2012). *Cyprus as a degraded landscape or resilient environment in the wake of colonial intrusion.* Proceedings of the National Academy of Sciences, 109(10), 3670-3675.

[26] Harriss, G. L. (1975). *King, Parliament, and public finance in medieval England to 1369.* Oxford University Press.

[27] Harriss, G. L. (1976). *War and the Emergence of the English Parliament, 1297–1360.* Journal of medieval history, 2(1), 35-56.

[28] Henneman Jr, J. B. (1967). *Financing the Hundred Years' War: Royal Taxation in France in 1340.* Speculum, 42(2), 275-298.

[29] Henneman Jr, J. B. (1971). *Royal taxation in fourteenth century France: the development of war financing, 1322-1356.* Princeton University Press.

[30] Henneman Jr, J. B. (1976). *Royal taxation in fourteenth-century France: the captivity and ransom of John II, 1356-1370.* The American Philosophical Society.

[31] Hobbes, T. (2011). *Leviathan* (A.P. Martinich, and B. Battiste, Ed.). Broadview Press. (Original work published 1651)

[32] Huber, J. D. (1996). *The vote of confidence in parliamentary democracies.* American Political Science Review, 269-282.

[33] Knapp, A. B., and Manning, S. W. (2016). *Crisis in context: The end of the Late Bronze Age in the eastern Mediterranean.* American Journal of Archaeology, 120(1), 99-149.

[34] Levi, M. (1988). *Of rule and revenue.* University of California Press.

[35] Liverani, M. (1987). The Collapse of the Near Eastern Regional System at the End of the Bronze Age: The Case of Syria. In M. Rowlands, M. Larsen and K. Kristiansen (Eds.), *Centre and periphery in the ancient world* (pp. 66-73), Cambridge University Press.

[36] Locke, J. (2008). *Two treatises of government.* Yale University Press. (Original work published 1689)

[37] Lupack, S. (2011). *Redistribution in Aegean palatial societies. A view from outside the palace: The sanctuary and the damos in Mycenaean economy and society.* American Journal of Archaeology, 115(2), 207-217.

[38] Madison, J. (1788). *The federalist papers: No. 51*, The Federalist 337.

[39] Marceau, N., and Smart, M. (2003). *Corporate lobbying and commitment failure in capital taxation.* American Economic Review, 93(1), 241-251.

[40] Montesquieu, C. d. S. (2001). *The Spirit of Laws* (T. Nugent, Trans.). Batoche Books. (Original work published 1748)

[41] Nakassis, D., Parkinson W. A., and Galaty, M. L. (2011). *Redistribution in Aegean Palatial Societies. Redistributive Economies from a Theoretical and Cross-Cultural Perspective.* American Journal of Archaeology, 115(2), 177-184.

[42] North, D. C., and Weingast, B. R. (1989). *Constitutions and commitment: the evolution of institutions governing public choice in seventeenth-century England.* Journal of economic history, 803-832.

[43] Olson, M. (1991). *Autocracy, democracy, and prosperity.* In Zeckhauser, R. J. (Ed), *Strategy and choice*, (pp. 131-157). The MIT Press.

[44] Olson, M. (1993). *Dictatorship, democracy, and development.* American political science review, 87(3), 567-576.

[45] Persson, T., and Tabellini, G. (1994). *Representative democracy and capital taxation.* Journal of Public Economics, 55(1), 53-70.

[46] Persson, T., Roland, G., and Tabellini, G. (1997). *Separation of powers and political accountability.* The Quarterly Journal of Economics, 112(4), 1163-1202.

[47] Persson, T., Roland, G., and Tabellini, G. (2000). *Comparative politics and public finance.* Journal of political Economy, 108(6), 1121-1161.

[48] Pezzey, J. C., and Anderies, J. M. (2003). *The effect of subsistence on collapse and institutional adaptation in population-resource societies.* Journal of Development Economics, 72(1), 299-320.

[49] Polybius (1889). *The Histories of Polybius Vol. I (of 2)* (E. S. Shuckburgh, Trans.). Macmillan and Co.. (Original Work published ca. 167-119 BCE)

[50] Post, G. (1950). *A Roman Legal Theory of Consent, Quod Omnes Tangit, in Medieval Representation.* Wis. L. Rev., 66.

[51] Sandars, N. K., (1985). *The Sea Peoples: Warriors of the Ancient Mediterranean.* Thames and Hudson.

[52] Streeter, R., Dugmore, A. J., and Vesteinsson, O. (2012). *Plague and landscape resilience in premodern Iceland.* Proceedings of the National Academy of Sciences, 109(10), 3664-3669.

[53] Tainter, J. (1988). *The collapse of complex societies.* Cambridge university press.

[54] Tuchman, B. W. (2014). *A Distant Mirror: The Calamitous 14th Century.* Random House. (Original work published 1978)

[55] Usher, D. (1989). *The dynastic cycle and the stationary state.* The American Economic Review, 1031-1044.