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The Political Economy of Sovereign Default

Theory and Empirics

Sebastian Hohmann

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What do self-interested governments' needs to maintain loyal groups of supporters imply for sovereign incentives to repay debt? Many sovereign defaults have occurred at relatively low levels of debt, while some highly indebted nations continue to honour their obligations. This poses a problem for traditional models of sovereign debt, which rely on the threat of economic sanctions to explain why and when a representative agent seeking to maximise social welfare would choose debt-repayment. The political-economy model of sovereign default developed in this ePaper shows that those governments that depend on small groups of loyalists drawn from large populations are more likely to default on sovereign debt than those governments dependent on large groups of supporters. These findings contribute to a growing body of literature on the importance of institutions in sovereign debt and default.

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TABLE OF CONTENTS

Annexe

Introduction

1 Europe's debt crises of 2009 onward raise at least two challenges for economics. First, the idea of a "graduation" to invulnerability to default[1] looks false. Today's advanced economies may default less frequently than during earlier centuries or than many developing countries today, but with large enough debt burdens, even they get into trouble.

2 Fundamentals, in other words, still matter. Second, democratically elected governments seem extremely keen to avoid default, even if this implies considerable costs for their citizens.[2] This observations points to politics as an important factor in determining whether a country that experiences difficulty in repaying its debt will actually default.

3 Politics can only become relevant for the question of default because sovereign states are fundamentally different from private companies. Whereas creditors to private entities usually have legal means to enforce repayment, lenders to sovereign states cannot easily sue for compliance or seize the sovereign's assets in case of default. In international law the principle of sovereign immunity prevents one state to be sued in the court of another[3] . This conundrum has inspired a large literature trying to explain the sustainability of lending to foreign sovereigns. Accounts have focused on different forms of economic sanctions that will be triggered in the case of default, with threats of sanctions preventing countries in difficulties from defaulting on their debt. Domestically, the legal means available to creditors of sovereign entities are likely even more limited. Sovereign states both make the law and enforce it and are thus, a priori, able to renegue on ex ante promises they have made by changing the law arbitrarily ex post. Therefore the repayment of sovereign debt depends not only on the *ability* of states to generate sufficient revenue to meet their obligations, but also crucially on the *willingness* to do so.[4]

4 If, as the literature suggests, sanctions are supposed to ensure the willingness to repay, targeting them matters. Assuming people look out for their interests, punishment and threat of punishment will be most effective in deterring defaults if their intended target expects a large reduction in welfare in case the punishment is triggered. Sanction mechanisms will be less effective if they leave their intended target's welfare essentially unchanged in expectation.

5 Taking as an example the "threat of exclusion from international capital markets" argument, suppose countries as a whole value the ability to borrow because having this

option is welfare-improving.[5] Consequently, countries as a whole should be unwilling to default if the price of non-repayment is losing access to sovereign borrowing. Countries, however, do not make decisions. Government officials do. What might be useful for a country as a whole may or may not be so for the individuals making decisions.

6 What then motivates *governments* to repay debt? Some authors posit politicians "idiosyncratic desire to repay" (McGillivray and Smith, 2003) or the weight a politician puts on social welfare (Borensztein and Panizza, 2008) as part of the story. This seems unsatisfactory. The natural assumption to make in an economic model is that self-interested politicians care about exercising power, i.e. staying in office as long as possible. [6] Achieving this goal requires maintaining the loyalty of a sufficiently large group of political supporters. Whether threats of punishment will be effective in deterring default will therefore depend on whether the economic cost of lost borrowing opportunities or some other sanction will cost the government the loyalty of its supporters. If, following a default and the ensuing punishment, governments are certain to command the loyalty of a large enough group of supporters and therefore to remain in office, defaults should occur more frequently than if governments can be certain to be ousted.

7 What is crucial therefore is whether and how economic sanctions following a default might cost the government the loyalty of its supporters. My hypothesis is that this hinges on a country's institutions. Institutional mechanisms determine how economic sanctions that hit entire economies translate into political costs for countries' leaders. The functioning of these institutional transmission mechanisms determines whether sanctions, such as investors shunning a country's sovereign bonds, are effective in deterring frequent defaults. Analysing this transmission mechanism will therefore help explain why some countries default more frequently than others, why some countries default at debt levels that pose no apparent problem for others, and why some countries try to avoid default at all cost.

8 To analyse the problem of incentive compatible sovereign debt repayment more formally, I draw on the *Selectorate*-theory, advanced by Bueno de Mesquita et al. (2003). Rather than conceptualizing governments in terms of categorical regime types such as "democracy" or "monarchy", its authors define regimes along two institutional dimensions. The **Selectorate**{*S*} is the set of people who have at least a nominal say in choosing their leaders. In a democracy {*S*} coincides with the electorate. The most important aspect of belonging to {*S*} is that membership conveys the opportunity of belonging to the **Winning Coalition**{*W*}. Formally, {*S*} is defined as:

> the set of people whose endowments include the qualities or characteristics institutionally required to choose the government's leadership and necessary for gaining access to private benefits doled out by the government[7]

9 The support of a subset, {*W*}, of {*S*} is needed to keep the incumbent in office. Again formally, {*W*} is:

> a subset of {*S*} of sufficient size such that the subset's support endows the leadership with political power over the remainder of the selectorate as well as over the disenfranchised members of society[8]

10 With these definitions in place, I build a theoretical model of the political economy of sovereign borrowing. The central insight is that governments maintained in power by a small set of political supporters drawn from a large group are more likely to default on sovereign debt than governments dependent on a large Winning Coalition. Coalitions tend stay loyal to a defaulting government in the former, rigged-election autocracy, case.

Coalitions in the latter, usually democratic, case tend to abandon their governments if they default. This mechanism keeps democratic governments "honest" and allows popularly elected autocrats the discretion of more frequent sovereign defaults.

11 I then proceed to test these theoretical predictions using data assembled by Bueno de Mesquita et al. using a range of dependent variables and economic controls. Results are somewhat mixed, but point in the direction of the expected effect for Selectorate size, in particular for external debt. Using a threshold-estimator proposed by Hansen (1999), I find the expected effect of institutions on interest rates for countries below a 61% threshold of public debt to GDP.

12 Overall, my findings support the contention that power politics plays a role in sovereign defaults. The rest of the thesis is organized as follows. Section below surveys the literature. Section 1 develops the theoretical model. Section 2 tests the model, and the last Section concludes.

Literature review

13 Why do private investors lend to governments without binding laws that ensure repayment of sovereign debts? And why do governments repay? Eaton and Gersovitz (1981) model countries facing macroeconomic shocks and valuing access to the consumption smoothing possibilities of external borrowing. To maintain access to debt, countries must never default. If shocks are sufficiently large and borrowing opportunities compensate enough of this, sovereign debt is repaid. Bulow and Rogoff (1989) maintain that reputational concerns alone will not deter defaults, since countries would otherwise build up debts beyond the point where the cost of repayment exceeds discounted benefits from future borrowing and then default. Instead they argue that even if creditors of defaulting governments might not be able to seize assets in the sovereign's own country, they might be able to do so abroad. As a further cost, creditors may try to cut off defaulting countries involved in international trade from the short-term financing needed for these transactions. The combined threat of these punishments then ensures repayment.

14 Turning to political economy models of debt, Drazen (1997) considers a two-period endowment economy where individuals, who differ in wealth, aggregate their preferences to determine degrees of repudiation on domestic and foreign debt. Individuals with above average wealth prefer higher interest including repudiation on domestic debt and more domestic borrowing, since interest paid on domestic public debt is a tax-financed transfer to them. Poorer individuals prefer payment on domestic debt below the world interest rate and more foreign borrowing. Countries facing unexpected financing needs raise taxes and repudiate more domestic and foreign debt, with the weights given to each dependent on income distribution, mode of preference aggregation and punishments attached to repudiation of foreign debt.

15 In the economic history of sovereign debt default, a key contribution is North and Weingast (1989). The authors interpret the Glorious Revolution of 1688 as a watershed for British government borrowing and propose that the political constraints established by constitutions make governments more credible as sovereign borrowers, since they allow credible commitments to repay. Stasavage (2007) argues that the true sea-change in British sovereign borrowing occurred not in 1688 but in 1715, at the onset of the

parliamentary supremacy of the Whig party, which represented the interests of sovereign lenders in the legislature. Consequently, it were not constitutional constraints that enforced sovereign respect of property rights of lenders. Rather, a political coalition of creditors made commitment credible through effective exercise of voting power in parliament.

16 Borensztein and Panizza (2008) propose a model in which the likelihood of defaults depends on the altruism of leaders. Politicians less concerned with public welfare are more likely to delay default, since defaults entail the possibility of losing office. In my model I will challenge their conclusions by arguing that the likelihood of deposition following a default depends on institutions, while leaders only care about power. The conclusion is quite different: leaders, who need not worry about losing political support and thus able to behave more selfishly, will default *more* often. Interestingly, these authors find that defaults carry, contrary to the surprising absence of large interest-premiums and prolonged periods of capital market exclusion, large political costs: Leaders and top bureaucrats tend to lose their positions following defaults. Defaults on bond debt appear to entail larger political costs in democracies and defaults on bank debts are more costly in dictatorships.

17 The most direct inspiration for my thesis is McGillivray and Smith (2003). The authors build a political economy model of default and argue that leaders who are easily removed from office will default less often. They also draw on the data assembled Bueno de Mesquita et al. (2003) for the empirical portion of their paper. They do not, however, explicitly incorporate the Selectorate theory into their model to show why defaulting leaders facing certain institutions are more likely to be removed from office than others. This is what I attempt in the theoretical portion of my thesis. I show that the Selectorate yields a natural explanation of the political economy of default and thereby gives a direct justification for using Bueno de Mesquita et al.'s data to test the hypothesis that constraints on executive discretion influence sovereign borrowing behaviour.

NOTES

1. Reinhart and Rogoff (2009), p. 283-287.

2. This applies both to countries such as Greece, where democratically elected politicians are pushing through painful austerity measures against strong popular opposition, and to countries such as Germany, where democratically elected politicians continue to back large and widely unpopular bailout packages for other European countries.

3. This principle has been eroded somewhat *de jure* in recent years, but actual enforcement of repayment remains rare *de facto*. See Panizza et al. (2009).

4. That sovereign defaults are not mere debt-to-GDP mechanics is empirically true. As Reinhart and Rogoff (2009), p. 24, document, more than half of all external defaults of middle-income countries over the period 1970-2008 have occurred at debt levels below 60 percent of GDP.

5. This is the argument of Eaton and Gersovitz (1981).

6. This means country and government are not the "unified actor" (Reinhart and Rogoff (2009), p. 53), whose interests coincide with some measure of social welfare.

7. Bueno de Mesquita et al. (2003), p. 64.
8. *Ibid.*, p. 79.

1. Theory

1 This section presents a model of the political economy of sovereign borrowing. I show that changes in the sizes of two sets – one composed of the group of people potentially with political say in a country, the other, a subset of the former, containing the government's supporters[9] – have an unambiguous influence on sovereign borrowing. Everything else equal, governments maintained in power by smaller (and thus more loyal) groups of supporters tend to default more often. Since lenders expect to be compensated for a higher risk of default with higher interest rates, governments maintained only by a few loyal supporters face higher borrowing costs.

1.1. General setup

2 The model builds on the intuition of the Selectorate theory presented by Bueno de Mesquita et al. (2003), but departs from the authors' original model to focus on sovereign borrowing.[10] The model is an infinitely repeated game with one round presented here. There are three actors in the model. They are the members of the Winning Coalition W, the members of government and lenders to the government. All are assumed to be infinitely lived, risk neutral, maximising their utility and discounting the future at the common rate δ, with $0 < \delta < 1$. Only governments that have not yet defaulted are able to borrow. A country can, however, regain access to sovereign borrowing if the government is replaced. The people responsible for making this decision are the members of W. A government that is able to borrow does so at the rate at which lenders are willing to lend. The timing in each round is as follows: At the beginning of each period, governments that have not yet defaulted take out a loan at the competitive rate. The economy then rolls along for one period. Output is produced and taxed and the government doles out a mix of public and private goods to the country's residents. At the end of the period, governments must make a payment on the loan they have taken out or decide to default. If they default, the members of the government's Winning Coalition decide whether or not to depose the government.

3 My solution of the game will take the form of two comparative statics conditions, which show a definitive effect of changes in political institutions on the likelihood of default.

Before these conditions can be established, it is necessary to describe how institutions affect government resource allocation.

4 To make decisions, governments need to survive politically. The Selectorate theory therefore assumes that politicians seek to maximize the time spent in office. Each period, the government has *R* resources at its disposal. *R* consists of tax income *T* plus borrowing *L* if credit is available. Hence

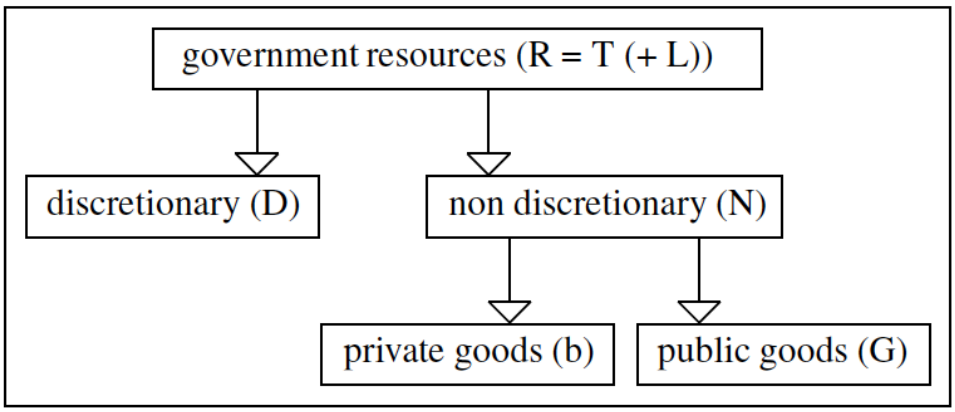
$$R = \begin{cases} T + L & \text{if the government hasn't yet defaulted} \\ T & \text{otherwise.} \end{cases}$$

5 I assume *T* to be given exogenously.[11] Given *R*, the government chooses optimally what fraction of *R* to allocate to discretionary spending *D*[12] and allocates the rest to non-discretionary spending *N*. Non-discretionary spending consists of spending on public goods *G* benefiting everyone in society and bribes *b* to keep the members of the government's Winning Coalition happy. Figure 1 shows this carve-up of resources schematically.

6 All Selectors are assumed to have the same additively separable preferences over government provided goods. That is the utility they receive from government provided goods may be written as

$$U(x_1, x_2, \cdots, x_n) = \sum_{i=1}^{n} u_i(x_n).$$

Figure 1: Distribution of resources *R* available to government



7 I also assume

$$u_i(0) = 0 \quad , \quad \frac{\partial[u_i(x_i)]}{\partial x_i} > 0 \ \ \forall\, i.$$

8 Selectors receive utility from the non-discretionary portion of government spending. Those excluded from *W* receive the benefit of *G*, which consists of public spending *t* financed out of taxation and additional credit-financed spending *l* if the government can borrow. Members of *W* receive *t* and, if available *l*, plus a bonus of an additional *b* in private goods to keep them loyal, where *b* is a function of the size of the Winning Coalition. Hence the utility of members of *W* equals $U(t, l, b(w))=u_1(t) + u_2(l) + u_3(b(w))$ under a government which has always repaid and $U(t,l,b(w))=u_1(t)+u_3(b(w))$ under a government, which has already defaulted. Selectors excluded from *W* receive $U(t,l,b(w))=u_1(t)+u_2(l)$ in the former and $U(t,l,b(w))=u_1(t)$ in the latter case.

Comparative statics of institutional change for government goods provision

9 Governments will only spend just enough of *R* on non-discretionary purposes to keep their Winning Coalition from withdrawing support.

10 Should the *current W* decide to withdraw support from its government, whether or not its members end up again in the *new W* depends on the size of *w*/*s*. I assume that all members of *S* are the same a priori, and so the probability of being a part of the new Winning Coalition equals *w*/*s*, while the probability of being excluded equals 1-*w*/*s*.

11 To keep its Winning Coalition from defecting, the government must take into account the loyalty norm *w*/*s* as well as the absolute size of *W*. I now examine how the government's resource allocation decision is affected by institutional change.[13]

An increase in *s*

12 Holding *w* constant, an increase in the size of the Selectorate implies that *w*/*s* falls and hence the probability of exclusion from future Winning Coalitions following defection from the incumbent rises for current members of *W*. This increases the loyalty of the government's Winning Coalition and thus discretion for the government, which can consequently appropriate a larger share of *R* as *D*. This shift in the division of *R* between *D* and *N* does not affect the division of *N*. Increased loyalty means simply that more resources go to the government and less to the Selectorate. *t* and, if available *l* will fall, but the size of *b*(*w*) relative to the size of *t* and *l* remains unaffected. The loyalty of *W* is ensured by rewarding its members above and beyond the public goods that ordinary Selectors enjoy, while taking account of the relative efficiency of spending on public and private goods.[14] In their decision to maintain an incumbent in power, members of *W* compare the pile of goods they would receive as ordinary Selectors to their allocation of resources. An increase in *s* means both of these shrink in absolute terms, but the loyalty maintaining *relative advantage b*(*w*) that members of *W* enjoy remains unaltered.[15]

An increase in *w*

13 An increase in the size of the Winning Coalition has several effects. First, the loyalty norm *w*/*s* increases, which reduces the loyalty of the Winning Coalition through the potential of future exclusion effect and therefore the amount of resources *D* the government can appropriate for itself. Changes in *w* do not influence the relative importance of public goods accruing to all Selectors and privative goods going only to *W* through this channel.

Their level rises, making the Winning Coalition and the excluded Selectors better off, but the edge the Winning Coalition enjoys is the same.

14 A second effect does, however, influence *b(w)*. As *w* expands, private goods need to be spread more thinly among the members of *W*. This by itself will reduce the per capita bonus *b(w)* each member of *W* receives. Further, as *W* expands, spending resources to buy off its individual members is an increasingly inefficient way for the government to deliver utility to its supporters.[16] Thus, as *w* increases, a larger proportion of *N* is spent on public goods, which, combined with the dilution effect of a larger Winning Coalition means that *b(w)* declines.[17]

15 This discussion leads to the following comparative statics for *b(w)*.

$$\frac{\partial[b(w)]}{\partial s} = 0\,, \qquad \frac{\partial[b(w)]}{\partial w} < 0,$$
$$\frac{\partial[t(w,s)]}{\partial s} < 0\,, \qquad \frac{\partial[t(w,s)]}{\partial w} > 0,$$
$$\frac{\partial[l(w,s)]}{\partial s} < 0\,, \qquad \frac{\partial[l(w,s)]}{\partial w} > 0,$$

16 where the last four conditions follow from changes in the loyalty norm *w/s*.

1.2. The Winning Coalition's reaction to a default

17 To stay in power, a government needs the support of its Winning Coalition. More goods are allocated to members of a *W* sustaining a government in power that is still able to borrow. But the edge that members of *W* enjoy over excluded Selectors does not disappear if a government that has once defaulted is no longer able to borrow. That government will not provide its Winning Coalition with resources as plentiful as before the default, but the benefits accruing to *W* may still be worth continued support. I now consider the problem facing the members of *W* once their government has defaulted.

1.2.1. A member of W loyal to a defaulting government

18 Assume one representative member of *W*. If this member chooses to maintain his government in power indefinitely following a default, his utility is

(1)

$$U(W_L) = \frac{1}{1-\delta}[u_1(t(w,s)) + u_3(b(w))].$$

1.2.2. A member of W that deposes a defaulting government

19 If the Winning Coalition instead chooses to withdraw its support from the government, a new government takes over. This new government then needs one period to re-establish

credibility as a borrower, following which it once again can and does borrow. Therefore, a member of *W* that deposes its government and ends up once again as a member of the *W* supporting the new government receives a utility of

(2)

$$U(W_D) = u_1(t(w,s)) + u_3(b(w)) + \frac{\delta}{1-\delta}[u_1(t(w,s)) + u_2(l(w,s)) + u_3(b(w))].$$

20 If he is shut out of the new Winning Coalition, his utility will be

(3)

$$U(NW_D) = u_1(t(w,s)) + \frac{\delta}{1-\delta}[u_1(t(w,s)) + u_2(l(w,s))].$$

21 Should the *current W* decide to withdraw support from its government, whether or not its members end up again in the *new W* depends on *w*/*s*. It follows that the expected utility of a member of a *W* that deposes a defaulter government equals

(4)

$$\begin{aligned} &\left[\frac{w}{s}\right] U(W_R) + \left[1 - \frac{w}{s}\right] U(NW_R) \\ &= \frac{1}{1-\delta}\left[\left[\frac{w}{s}\right] u_3(b(w)) + u_1(t(w,s)) + \delta u_2(l(w,s))\right]. \end{aligned}$$

1.2.3. To depose or not to depose

22 The members of *W* will decide to depose a defaulting government if the expected utility from doing so exceeds the utility from keeping a defaulting government in power as a member of *W*. That is, a defaulting government will be removed if

(5)

$$\frac{1}{1-\delta}\left[\left[\frac{w}{s}\right] u_3(b(w)) + u_1(t(w,s)) + \delta u_2(l(w,s))\right] > \frac{1}{1-\delta}[u_1(t(w,s)) + u_3(b(w))].$$

23 This can be arranged as

(6)

$$\delta u_2(l(w,s)) > \left[1 - \frac{w}{s}\right] u_3(b(w)).$$

24 Therefore, when (6) holds, deposing the defaulting government is the better option and members of *W* will do so. (6) has a straightforward interpretation. The potential benefit

members of W deposing their government can incur is the renewed access to benefits from government borrowing $u_2(l(w,s))$.[18] The risk they run is losing the benefit attached to belonging to the Winning Coalition, $u_3(b(w))$ times the probability of incurring this loss – the probability of exclusion from future Winning Coalitions $1-w/s$. If the discounted benefit from future borrowing opportunities exceeds the expected loss from gambling on the membership in future Winning Coalitions, a defaulting government loses support.

1.2.4. Showing the possibility of continued support and deposition

25 I now show that (6) can be such that either the LHS or the RHS is larger. I consider two cases.

26 The first is that of a democracy, where the Selectorate comprises essentially the whole adult population and the Winning Coalition is a large subset of this group. $l(w, s)$ must be large in this case because a substantial amount of government borrowing opportunities benefit the Selectors, since the government cannot funnel off resources effectively, given the weak loyalty of its Winning Coalition. Further, public goods provision is more effective than bribes to the members of W, given their number. At the same time, $b(w)$ will be small, since again, public goods provision is more effective than private goods in keeping the Winning Coalition happy. The dilution effect that comes with a large w reinforces this, making individual benefits attached to membership in W small. Therefore the LHS of (6) will exceed the RHS and a defaulting government will be deposed.

27 Second, consider a rigged election autocracy with the government depending for support on only a small Winning Coalition drawn from a large Selectorate.[19] In this case, given the strong loyalty of its Winning Coalition, the government can expropriate a substantial part of borrowing for discretionary purposes, leaving little for public goods provision and thus $l(w, s)$. Also, given the small size of W, private goods are a more effective loyalty-inducing device than public goods. Even though non-discretionary spending is smaller overall in this case, given the small number of individuals in W, the per capita benefit $b(w)$ each of them receives is still large enough to offer a substantial advantage over the meagre public goods excluded Selectors receive from the government. Consequently, the RHS of (6) is large and exceeds the LHS, meaning that the Winning Coalition will maintain its government in power after a default.

1.2.5. Comparative statics of institutional change for the loyalty of the Winning Coalition post default

28 I now consider what happens to the incentives of the members of W when institutions change.

An increase in s

29 Taking partial derivates with respect to s on both sides of (6), I obtain

(7)

$$\underbrace{\delta}_{\in (0,1)} \underbrace{\frac{\partial[u_2(l(w,s)]}{\partial l}}_{+} \underbrace{\frac{\partial[l(w,s)]}{\partial s}}_{-} > \underbrace{u_3(b(w))}_{+} \underbrace{w}_{\in (0,1)} \underbrace{\frac{1}{s^2}}_{+} .$$

30 (7) cannot hold, since the LHS is negative while the RHS is positive. Therefore an increase in *s* increases the RHS of (6) while decreasing the LHS, thereby making it less likely that a defaulting government will be deposed, everything else equal.

An increase in *w*

31 Taking partial derivates with respect to *w* on both sides of (6), I obtain

(8)

$$\underbrace{\delta}_{\in (0,1)} \underbrace{\frac{\partial[u_2(l(w,s)]}{\partial l}}_{+} \underbrace{\frac{\partial[l(w,s)]}{\partial w}}_{+} > \underbrace{\frac{\partial[b(w)]}{\partial w}}_{-} \underbrace{\left[1 - \frac{w}{s}\right]}_{\in (0,1)} - \underbrace{u_3(b(w))}_{+} \underbrace{\frac{1}{s}}_{+} .$$

32 (8) necessarily holds, since the LHS is positive while the RHS is negative. Therefore an increase in *w* increases the LHS of (6) while decreasing the RHS, thereby making defaulting governments more likely to be deposed, everything else equal.

1.3. The government

33 Governments want to survive politically. For each period in office, politicians receive utility Ψ. This is the extra utility politicians obtain above and beyond the enjoyment they would get from living as ordinary Selectors. Once in power, governments take out a loan each period, provided they have not defaulted yet. Once a default has occurred, access to credit is lost. Defaulting, however, does not automatically entail being deposed. Whether a government loses the support of its *W* depends on whether the latter's members receive a utility by continuing to support a defaulting government that is greater than their expected utility after overthrowing their government. If the government is deposed, politicians lose the utility Ψ attached to office.[20]

34 A member of a government that chooses to honour the country's debt receives utility Ψ from being in office today plus the discounted utility of occupying office at the beginning of next period. Repaying debt costs the government θ, which can be thought of as the political penalty that servicing debt entails. The more difficult debt is to repay, for instance because of negative macroeconomic shocks, the larger θ. I assume this difficulty to lie outside the government's control and treat θ as a random variable such that $\theta \sim f(\theta)$ over $[0, \bar{\theta}]$. If a government repays its debt in the current period it finds itself in the next period again with the choice of honouring its debt or defaulting. After some algebra, I can write the expected utility of a government that chooses to honour its debt as

(9)

$$g_H = \frac{1}{1 - \delta F(\theta_T)}[\Psi - \theta + \delta[1 - F(\theta_T)]g_D],$$

where $F(\theta_T) = \int_0^{\theta T} f(\theta)d\theta = P(\theta < \theta_T)$, i.e. the probability that cost of repayment lies below the threshold θ_T defined below, and g_D is the expected utility of a defaulting government.

If the government defaults, it is retained in office by its Winning Coalition with probability $q(w, s)$. As I showed in section 1.2, members of W are more likely to depose a government following a default, the larger w and are less likely to do so, the larger s. I therefore have the following comparative statics for the probability of governments being retained in office, following default.

$$\frac{\partial[q(w,s)]}{\partial s} > 0\,, \qquad \frac{\partial[q(w,s)]}{\partial w} < 0.$$

If a government is deposed, its members lose the extra enjoyment Ψ attached to office. I can therefore write the expected utility of a defaulting government as

(10)

$$g_D = \Psi + \frac{\delta}{1 - \delta}\Psi q(w, s).$$

1.3.1. To default or not to default

To determine whether a government defaults or not, I must pin down the threshold cost of repayment θ_T, which leaves the government indifferent between repayment and non-repayment of debt. This is given as the solution for θ of

(11)

$$g_H = g_D,$$

namely

(12)

$$\theta_T = \delta\Psi[1 - q(w, s)].$$

(12) has the following interpretation. The cost of debt repayment θ_T that makes a government indifferent between repayment and non-repayment is equal to the discounted utility from political life Ψ, weighted by the probability of the government being deposed following a default. Intuitively, debt repayment means incurring a cost θ.

This cost is worth incurring if it is smaller than the discounted expected loss in utility, following a default. If the cost of repayment exceeds this discounted expected loss in utility, repayment is not worth while and the government defaults.

1.3.2. Comparative statics of institutional change for the threshold cost of repayment

41 I now examine how changes in the institutional environment affect government incentives.

An increase in *s*

42 Taking partial derivatives on both sides of (12) with respect to *s* yields the partial effect on θ_T of an increase in the size of the Selectorate.

(13)

$$\frac{\partial[\theta_T]}{\partial s} = -\underbrace{\delta}_{\in (0,1)}\underbrace{\Psi}_{+}\underbrace{q_s(w,s)}_{+} < 0.$$

An increase in *w*

43 Taking partial derivatives on both sides of (12) with respect to *w* yields the partial effect on θ_T of an increase in the size of the Winning Coalition.

(14)

$$\frac{\partial[\theta_T]}{\partial w} = -\underbrace{\delta}_{\in (0,1)}\underbrace{\Psi}_{+}\underbrace{q_w(w,s)}_{-} > 0.$$

44 The signs of expressions (13) and (14) follow directly from the comparative statics developed in Section 1.2. There I showed that governments are more likely to be retained in power following a default, the larger *s*, and are less likely to be retained, the smaller *w*, everything else being equal in both cases.

45 The interpretation of (13) and (14) is clear: a marginal change in the likelihood of being deposed following a default means that a government considering a default incurs a change in expected utility should it decide to stop honouring the country's debt. The change in utility equals the discounted utility Ψ from political life weighted by the change in probability of being retained in office, following default. Politicians suffering an increased chance of being deposed following default as a result of an increase in the size of the Winning Coalition are prepared to incur higher threshold costs and hence will default less often. Politicians operating in environments with larger Selectorates are less likely to be deposed following defaults. Consequently, such governments will be prepared to incur only lower threshold costs of repayment and hence default more frequently.

1.4. Lenders and interest rates

46 Lenders have funds equal to L to lend out each period. They face the following trade-off: Either they invest their money abroad and receive a certain return, which I normalize to zero. Or they invest their money in sovereign debt, in which case they receive a return of r if things go well, but lose all their money if the sovereign defaults. Let Θ denote the probability of default. Then the interest rate r that leaves lenders indifferent between lending and not lending (the competitive rate) is given by

(15)

$$r = \frac{\Theta}{1-\Theta}.$$

Threshold cost, default risk and interest rate

47 Now recall that the cost of repayment is a random variable $\theta \sim f(\theta)$ over $[0, \bar{\theta}]$. The sovereign defaults if the realization of the cost of repayment in a particular period exceeds his threshold θ_T. Therefore a default occurs with probability

(16)

$$\Theta = 1 - \int_0^{\theta_T} f(\theta)d\theta.$$

48 Combining (15) and (16), the interest rate can be written as

(17)

$$r = \frac{1 - \int_0^{\theta_T} f(\theta)d\theta}{\int_0^{\theta_T} f(\theta)d\theta}.$$

49 (17) can now be used to investigate what happens to interest rates when θ_T rises.

(18)

$$\frac{\partial r}{\partial \theta_T} = -\frac{f(\theta_T)}{[F(\theta_T)]^2} < 0.$$

50 Thus, when θ_T rises, the threshold cost of repayment at which it is better to default than not to has become bigger and so defaults become less common. Hence interest rates fall. As I showed previously, increases in w lead to increases in θ_T, while increases in s lower it. Thus changes in these institutional parameters contribute to changes in interest rates.

1.5. Conclusion

51 In this section I have demonstrated how changes in the sizes of two groups termed *Selectorate* and *Winning Coalition* influence sovereign borrowing behaviour. Governments supported by Winning Coalitions that are small relative to the Selectorate have more loyal supporters, since the latter have a greater likelihood of being excluded from future Winning Coalitions, should they decide to depose their government. More loyal support means greater discretion for the government, which in turn translates into a greater incentive for the government to default, should the need arise. Other things equal, an increase in the size of the Winning Coalition increases the likelihood of a defaulting government's members being punished by losing office, while increases in the size of the Selectorate reduces this likelihood. Governments attached to their jobs are therefore willing to incur larger political costs in repaying debt when operating under a larger Winning Coalition, and are prepared to incur lower costs when operating under a larger Selectorate. Thus governments operating in small *s* and large *w* systems default less often. Lenders who care about default risk then lend to such governments at more favourable terms.

NOTES

9. The two sets are, as defined in the introduction, the Selectorate $\{S\}$ and the Winning Coalition $\{W\}$. I will use capital letters S and W to denote these sets, omitting the braces, and lower case letters s and w to denote their respective cardinalities.

10. In particular, the concept of "affinities" between selectors and governments is completely omitted. Further, governments are assumed to be obtaining utility only from occupying office. The issue of how many resources they have for discretionary use each period, and the utility they derive from having these resources, is ignored.

11. Bueno de Mesquita et al. (2003), p. 139-143 discuss how changes in W and S influence the tax rate.

12. This might be used for personal enrichment of leaders or some other purpose.

13. This section follows Bueno de Mesquita et al. (2003), p. l47-160.

14. This consideration is taken up below in the discussion of the effects of changes in w.

15. *Selectorate size does not influence the relative importance of public or private goods in determining the policy mix that the incumbent provides, but it does help determine the risk of exclusion from future coalitions*, Bueno de Mesquita et al. (2003), p. 158.

16. Consider, as an example, the case of pollution. Faced with the alternative between receiving a modest boost to their utility from a small bribe in form of a cheque from the government and a government policy of pollution control (a public good making everyone better off), members of a large Winning Coalition might well opt for the latter. The assumption made is that Coalition members will value the increase in environmental quality more than the small individual payoff they would receive alternatively as members of a large Winning Coalition.

17. [...] *as the coalition becomes larger, the relative difference in the value of goods received between those in and those outside the coalition becomes smaller*, Bueno de Mesquita et al. (2003), p. 149.

18. This benefit is discounted, since it accrues only after one period, which the new government needs to re-establish credibility.

19. This arrangement is exemplified by the system developed by Lenin in Soviet Russia, Bueno de Mesquita et al. p. 83-86.

20. One objection that might be raised here is that borrowing carries only risks for politicians (being deposed after an eventual default) and no additional benefits. Therefore rational governments would seem well advised to avoid borrowing altogether. However, looking at the problem from the point of view of the Winning Coalition, it is clear that a government that refuses to borrow can only deliver its *W* the payoff of a government that has already defaulted. In essence, default and non-borrowing are the same from the point of view of a government's supporters. Since the supporters decide whether or not a government is retained, it is always better to borrow in order to increase a government's chances of being maintained in office.

2. Empirics

1 This section tests the predictions of Section 1 empirically. I first describe the data. Then I present the methodology used in my estimation and my results.

2.1. Data

2.1.1. Political variables

2 My main variables of interest are institutional. Since the concepts of Winning Coalition and Selectorate are not widely used even in political science, not to mention economics, their relation to the real world needs clarification. I proceed in three steps. First, I describe which configurations of Winning Coalition and Selectorate sizes correspond to different types of political regimes. Second, I discuss how the variables are measured in practice. Finally, I use examples to show how these variables evolve for individual countries over time.

s and *w* for archetypical political regimes[21]

3 **large *s* large *w*: Democracy.** Democracies tend to grant a large subset of their residents a say in the choice of government. In modern democracies, S comprises essentially the entire adult population, with differing provisions on foreigners, convicts and so forth. Likewise, W tends to be large, although distinctions are possible, depending on the type of democracy. In presidential systems, leaders usually require $w \approx s/2$ to be elected. In first past the post parliamentary systems, where a prime minister forming a government needs one half of the votes of the elected representatives in parliament, each of whom require one half of the votes of their constituents to be elected, governments can get by with as little as $w = s/4$. In proportional representation systems, the necessary Winning Coalition might be even smaller.

4 **small *s* small *w*: Monarchy.** In monarchies, membership in the Selectorate is restricted by birth, typically to the aristocracy. This means the group of people with a potential say in choosing the government is small. In hereditary monarchies, w/s is usually assumed to equal $1/2$.[22]

5 **small *s* small *w*: Military Junta.** A different way of restricting membership in the Selectorate is practised in military juntas. Here, the group of those with a say in electing the military dictator is extremely small, usually a small group of senior military officers, who command most of the men and weapons. The eventual leader usually needs less than half of *S* to sustain himself in power. Consequently, military juntas have some of the most concentrated and privileged Winning Coalitions.

6 **large *s* small *w*: Electoral Autocracy.** Leaders supported by small Winning Coalitions drawn from a large Selectorate exemplify the case of rigged election autocracies. Here, membership the Selectorate is not overly restricted. A large group of people has a nominal say in choosing the leader. Entry into *W*, however, is usually only granted on the basis of special characteristics, such as membership in the Communist Party, as in Soviet Russia, or religious authority, as in today's Iran. Both of these regimes permit elections[23], but the outcome is a foregone conclusion. Nevertheless, any member of the Selectorate can theoretically accede to membership in *W*, unlike in monarchies or military juntas, where birth or military rank alone are the key to access.

Measuring *s* and *w*

7 Bueno de Mesquita et al. (2003) and (2010) have assembled data on Selectorate and Winning Coalition size. s and w are attractive as measures of institutions for two reasons. First, they allow comparisons across different types of categories of political regimes. Second, they provide a continuous means to parsimoniously describe the institutions shaping resource allocation. Changes within a polity over time can be captured by changes in w and s, and cross-country comparisons are facilitated by the fact that all types of regimes can potentially be placed somewhere along the two-dimensional continuum defined by these two variables.

8 In practice, the measurement of w and s, is, as the authors admit,[24] a long way from yielding an exact, continuous yardstick of politics. Instead, w and s are constructed as a weighted index of different components of commonly used *categorical* political variables. The two sources are the *Polity IV* database and Arthur Banks's *Cross National Time Series Data Archive*. Table 1 summarizes the construction.[25]

9 The authors argue that for $W_{i,t}$ no single variable alone is sufficient to guarantee a large *w*. Nevertheless, the variables used to construct the index all relate to dependence of leaders on larger or smaller groups of people for political support. Therefore, countries that check more of the boxes necessary for a large w are more likely to have larger Winning Coalitions than countries that check fewer boxes.

Table 1: Construction of institutional variables

source	variable	why use	value	translation	rationale
Banks	$Legselec_{i,t}$	measure of selectiveness of membership in legislature	$=0$ $=1$ $=2$	$S_{i,t}=0$ $S_{i,t}=0.5$ $S_{i,t}=1$	no legislature exists Selection into the legislature by the effective, executive, hereditary or ascriptive Elective system. Legislators selected by either direct or indirect popular election. **Comment:** The larger $Legselec_{i,t}$, the more likely that s is large.
Banks	$Regtype_{i,t}$	type of Regime	$=1$ or $=4$	$W_{i,t}+0.25$	Codes of 2 or 3 mean that regime type is either military or military-civilian. Military regimes are assumed to have small Coalitions. $\Rightarrow W_{i,t}$ awarded no points in this case
Polity IV	$XRCOMP_{i,t}$	how competitive is recruitment into executive	≥ 2	$W_{i,t}+0.25$	Code of 1 means chief executive selected in hereditary / rigged unopposed elections $\Rightarrow$ depends on few people. Codes of 2 or 3 signify chief executive more responsive to supporters. $\Rightarrow$ larger $W_{i,t}$.
Polity IV	$XROPEN_{i,t}$	how open is recruitment into executive	>2	$W_{i,t}+0.25$	Code >2 means chief executive recruited in process more open than hereditary $\Rightarrow$ more likely dependent on larger coalition than executive recruited through hereditary or military.
Polity IV	$PARCOMP_{i,t}$	how competitive is participation	$=5$	$W_{i,t}+0.25$	Code $=5$ means *relatively stable enduring political groups regularly compete for polit. influence at national level.* $\Rightarrow W_{i,t}$ must be larger, since would not have stable enduring polit. groups unless they believed they could influence leaders (become members of W).

10 Still, the construction of the institutional variables is a crude simplification. The upshot is that variables conceived as a continuous departure from categorical regime types in theory are in reality categorical themselves. As Tables 2 and 3 show, $W_{i,t}$ takes on only 5 distinct values and $S_{i,t}$ only 3 distinct values.

Table 2: Frequency table for $W_{i,t}$

$W_{i,t}$	Freq	Percent	Cum
0	558	6.98	6.98
.25	1,457	18.23	25.21
.5	1,855	23.21	48.42
.75	2,478	31.00	79.42
1	1,645	20.58	100.00
Total	7,993	100.00	

Table 3: Frequency table for $S_{i,t}$

$S_{i,t}$	Freq	Percent	Cum
0	899	10.95	10.95
.5	343	4.18	15.12
1	6,971	84.88	100.00
Total	8,213	100.00	

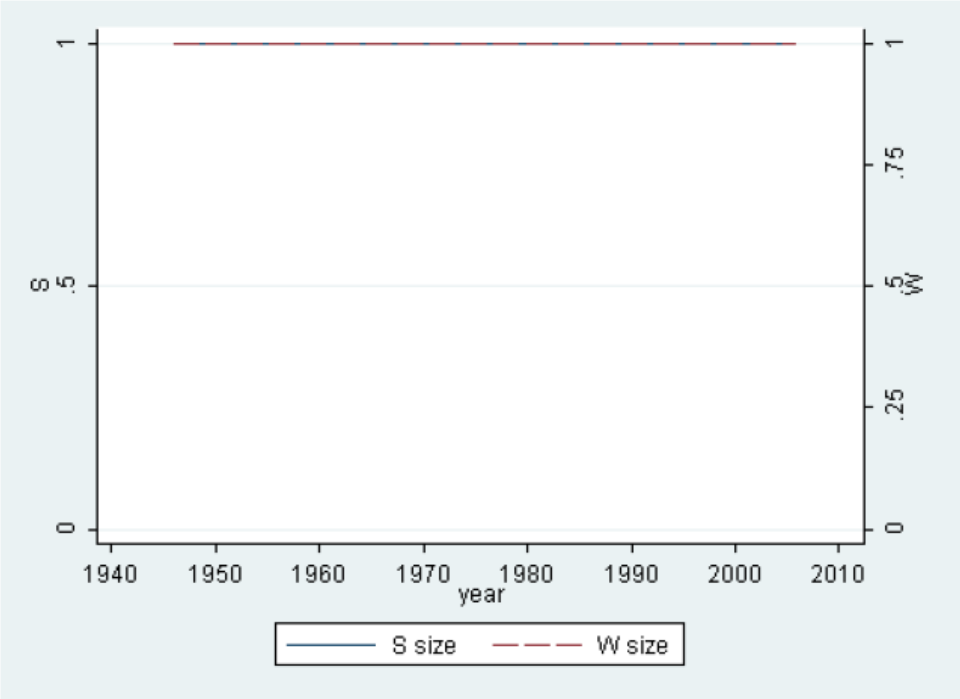
11 As is readily apparent from the frequency distributions, most countries at most times have large Selectorates (coded with a 1). This means that their legislators are selected by popular elections. A small group of countries through time have either a Selectorate value of .5 (meaning legislators are selected less openly, usually by the executive,

ascriptive or heredity) or 0 (meaning no legislature exists). For the Winning Coalition, the picture is more heterogeneous. A large group of countries have values of 1 or .75, making them broadly democratic. A smaller group of countries have smaller values of .25 or even zero, meaning recruitment into and competition for executive positions are severely restricted. Data are available for 185 countries and around 43 years.

s and *w* in the real world

12 A few examples will illustrate how the institutional variables are reflected in the historical experience for individual countries. I begin with case of a democracy. Figure 2 plots s and w for the United States from the period from 1945 until 2007. For the entire period, s is at is maximum value of 1, indicating the large Selectorate of popular elections. Similarly, w equals 1 for the entire sample period, stemming from the fact that the democratically elected executive relies on large Winning Coalitions.

Figure 2: *s* and *w* for the USA, 1945-2007



13 Second, consider military juntas.[26] Figures 3 and 4 plot the institutional variables over the same period for Chile and Peru respectively. For Chile, the period of the Pinochet-regime 1973-1990 shows up in the graph as a period during which $s = w = 0$. The same is the case for Peru under General Alvarado 1968-1975 and his successor Bermúdez, who ruled until 1980. As discussed, military regimes both severely restrict the access to the Selectorate and produce leaders reliant on extremely small Coalitions. Note that the indicators closely match the historical record, with Selectorate and Winning Coalition size increasing in both countries before the juntas were officially replaced. Pinochet's lost referendum of 1988 and Peru's new constitution of 1979 drive up the variables in both countries, reflecting the transition to more open elections and democratic governance.

Figure 3: *s* and *w* for Chile, 1945-2007

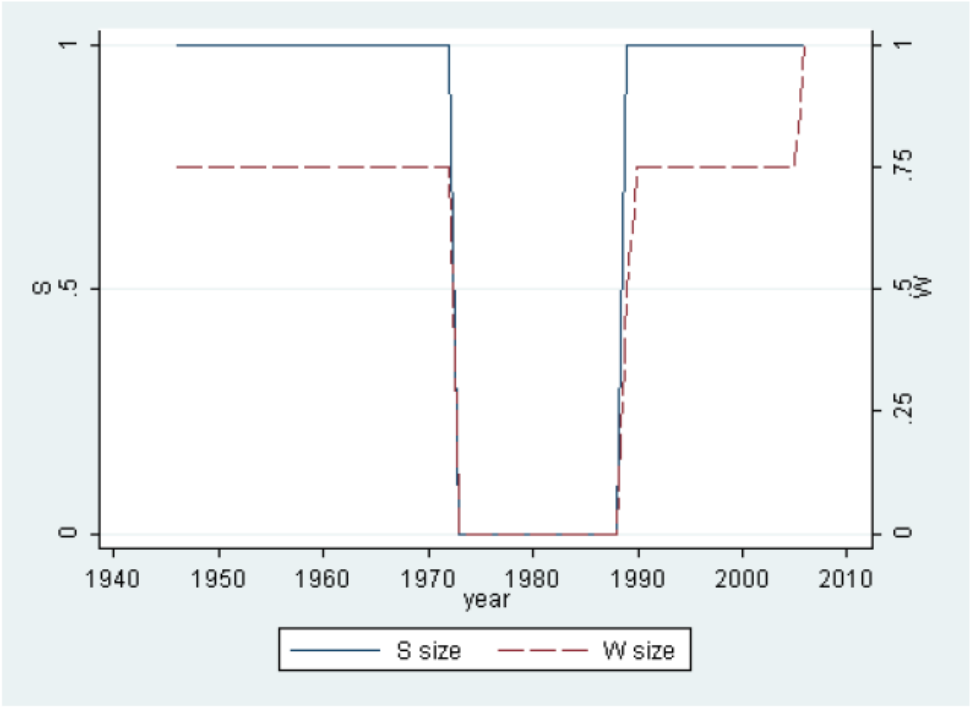
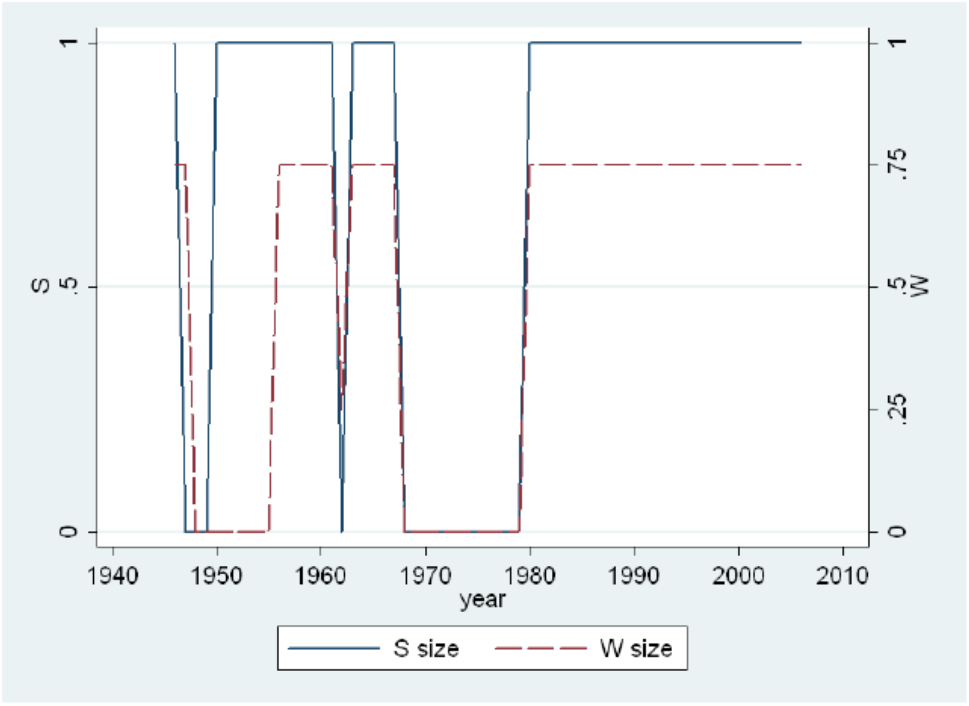


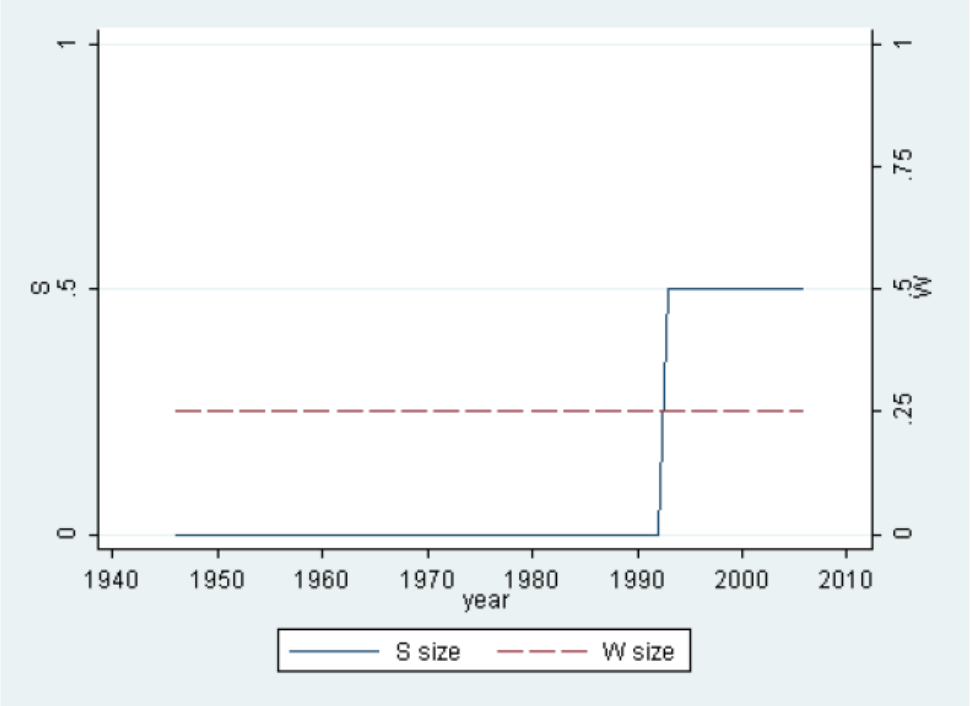
Figure 4: *s* and *w* for Peru, 1945-2007



14 For the case of a monarchy, Figure 5 plots w and s for Saudi-Arabia[27] for the relevant period. The Gulf Kingdom's political system is an absolute monarchy, with membership in the Winning Coalition likely restricted to the Saudi royal family. Consequently, W is small, but not as concentrated as in the case of a military junta, where power lies in the hands of

a few generals. Similarly, *S* is small, but has increased in size in the early 1990s. This is due to the creation of Saudi "Basic Law", a charter defining the principles of governance in accordance with Shari'a law and the "Consultative Council", a quasi-legislative body of King-appointed members with limited power, established shortly thereafter.

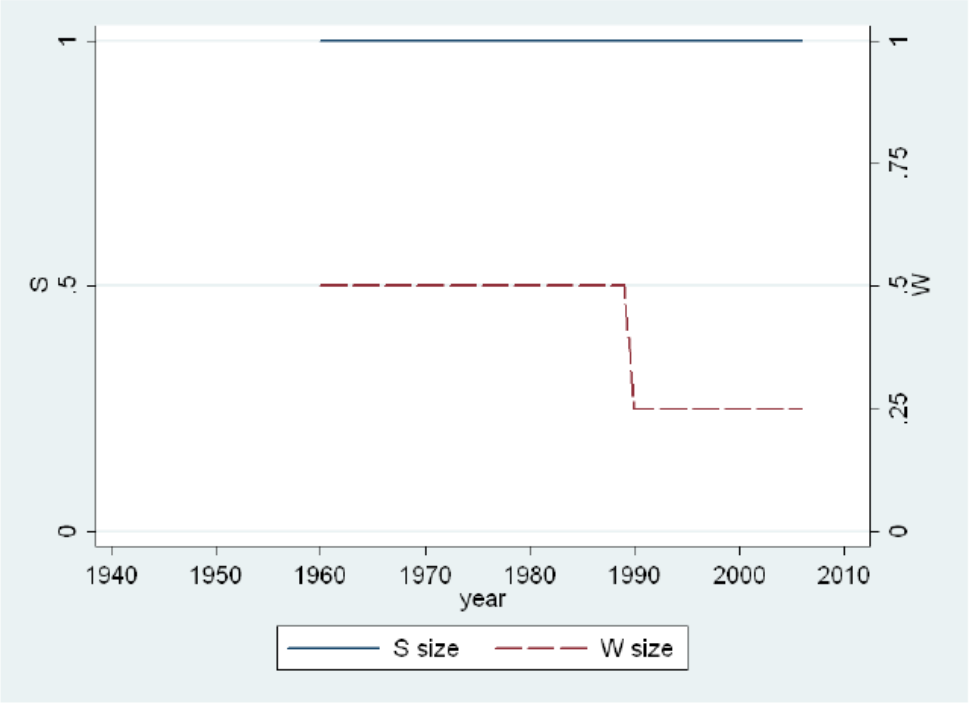
Figure 5: *s* and *w* for Saudi Arabia, 1945-2007



15 The graph for Saudi Arabia also illustrates an important general point about the data. For the period until 1993, *W* is larger than *S*. This is of course impossible in the theory, which defines the former as a subset of the latter. Consequently, the data for s and w as they stand now should be understood only ordinally: large values mean that a given group is made up of a larger fraction of a country's residents.

16 As a final example, consider the case of Gabon, a rigged-election autocracy. Figure 6 plots *w* and *s* since 1960. Gabon[28] is a multiparty republic, that, since 1990, has held legislative and presidential elections at roughly 3 to 5 year intervals.[29] Single party elections were held when Gabon existed as a one-party state from 1968 to 1990 under President Ali Bongo Ondimba and as a multiparty presidential republic since then. Thus $s = 1$ for the entire period. At the same time, elections were invariably won by the incumbent, pointing to small Coalitions. Note that despite the transition to multiparty elections in 1990, w actually declined. This is because elections under the new constitution of 1990 were once again rigged and produced the same winner as before.[30]

Figure 6: *s* and *w* for Gabon, 1960-2007



2.1.2. Economic Variables

Independent variables

17 Whether a country defaults and/or is viewed as credit-worthy by investors depends first and foremost not on institutions, but on whether its finances are "in order" – that is whether the country is seen as capable of debt-repayment in purely economic terms.

18 One determinant of credit worthiness is income level. Richer countries were seen historically as more credit-worthy (although that might change in the coming years). I thus collected data on GDP per capita.[31] Further, countries that are growing more quickly reduce their relative debt burden and allow their governments to generate revenues with which to repay debt. Countries that try to inflate away their debt might be seen as not trustworthy. At the same time, high inflation is indicative of macroeconomic instability, and can also be interpreted as a proxy for other factors contributing to an increased likelihood of default. I thus collected data on GDP growth and inflation. For external debt, it might also matter whether a country is a net exporter or net importer. I therefore collected data on Current Account balances, a large part of which are trade balances. These data come from the World Bank's World Development Indicators (WDI) and cover around 180 countries up to 2009 going back on average until around 1980 although country coverage becomes much thinner beyond that date.

19 The most important variable in assessing whether a country's debt is "sustainable" is its debt-to-GDP ratio. I collected these data from Abbas et al. (2010), a newly created IMF database covering 173 countries up to 2009, with time-coverage similar to the WDI data. The identity of the creditor might also matter[32] since default on foreign-owned debt entails not making net transfers to foreigners, whereas defaults on domestically-held

debt means the effect stays "in the country". In fact, as Panizza (2007) discusses, good data on creditor-identity are hard or impossible to come by. He therefore suggests jurisdiction of issuance of debt as an alternative measure. Accordingly, *external debt is debt issued in foreign countries and under the jurisdiction of a foreign court*.[33] I thus collected data on domestic and foreign debt as a share of total sovereign debt. These data come from an updated version of Panizza (2007) and cover 123 countries for around 30 years on average.

Dependent variables

20 The phenomena I seek to explain are defaults, interest rates, spreads, and sovereign ratings.

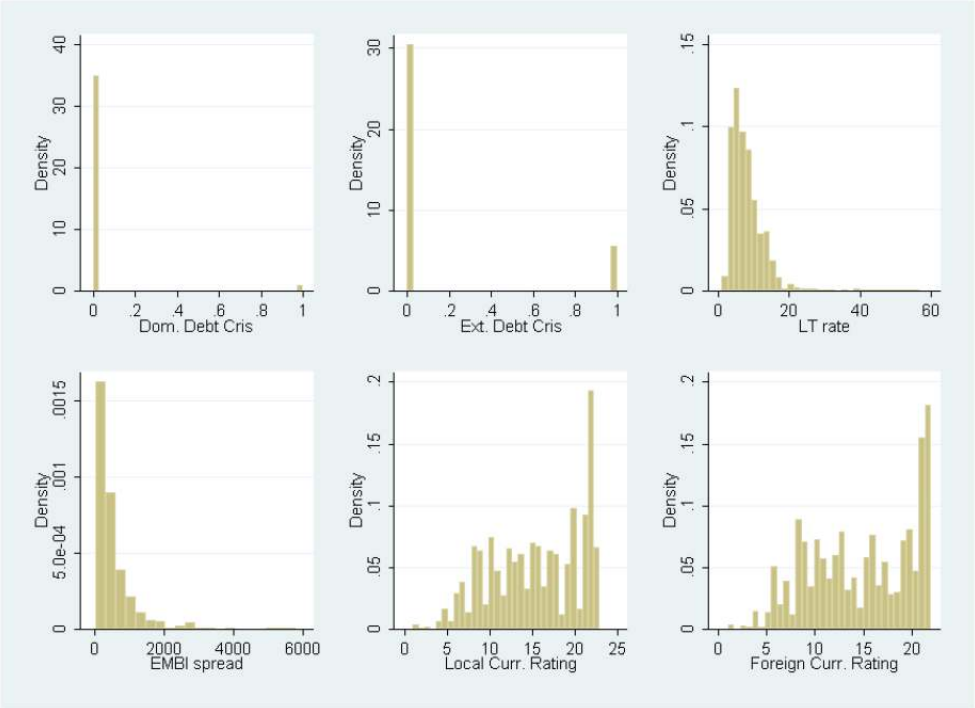
21 Patterns of default are the "most direct" phenomenon, with interest rates, spreads, and ratings presumably dependent on the risk of default. The problem is that outright default episodes are very rare and might not lend themselves to produce precise estimates. Nevertheless, I collected data on domestic and external[34] sovereign debt crises from a database assembled by Reinhart and Rogoff (2010). These data are available for 70 countries until 2010. While their series extend until the 19th century for some countries, I used the data from 1940. I also produced an aggregate dummy from these two variables, which takes a value of one if country *i* is in an either a domestic or an external debt crises at time *t* and zero otherwise.

22 A potentially more fruitful avenue for testing my hypothesis are interest rates on longterm government bonds. Short-term rates are policy-rates and thus likely negatively correlated with default risk: governments or central banks might lower rates to prop up the economy during a recession when the risk of default is high. Long-term bonds, on the other hand, are traded for a longer period and their interest rates should therefore more accurately reflect market perceptions of default risk. I thus collected data on longterm interest rates on government bonds from the IMF's International Financial Statistics. These data cover 68 countries for a period of on average 31 years.

23 While better than short term rates, long term interest rates may reflect more things than simply the risk of lending to a sovereign. For this reason, I follow McGillivray and Smith (2003) and collected data on JPM's Emerging Market Bond Index spreads.[35] The EMBI covers bonds issued by sovereign and quasi-sovereign entities denominated in $U.S. Only issues with a face value outstanding of 500 millions $U.S. or more are included. Spreads are over the theoretical zero coupon yield on U.S. treasury securities.[36] Data are limited, covering 45 countries for a period of on average a little over 9 years.

24 As a final way of testing my theory, I explored sovereign ratings. Ratings reflect the *ability and willingness of an issuer to repay in full and on time* (S&P's ratings)[37], *credit risk as a function of country economic resiliency and government financial robustness* (Moody's ratings)[38], or *the likelihood of repayment* (Fitch ratings).[39] They are thus an excellent market-based measure of sovereign risk. I thus obtained data on sovereign ratings from these three major rating agencies, and produced a simple arithmetic mean of the three ratings. Country coverage is better than for defaults and interest rates with around 140 countries, but the series are much shorter with only 17 and 13 years until 2010 on average for foreign and local currency ratings respectively.

Figure 7: Histograms of the dependent variables



25 Figure 7 shows histograms for my different dependent variables. Clearly, cases of low interest rates and spreads dominate the sample. There are many more instances of countries not in default than in default. Finally, more countries at most times have good ratings, although the picture is less skewed than for the other variables. All of these facts point to some degree of sample selection. More data are available for rich countries, who default less often, pay lower interest rates and enjoy higher ratings.

2.2. Baseline specifications

26 I work with the following vector of regressors for all baseline specifications

$$\mathbf{x_{i,t}} = \begin{bmatrix} log\_gdp\_cap_{i,t} \\ gdp\_growth_{i,t} \\ inflation_{i,t} \\ debt\_to\_gdp_{i,t} \\ CA\_balance_{i,t} \\ S_{i,t} \\ W_{i,t} \end{bmatrix}.$$

27 Also for all baseline specifications, β is the vector of true coefficients associated with the vector of regressors.

Debt crises

28 The first two left-hand-side variables I examine are *domestic_debt_cris* and *external_debt_cris*. I estimate the binary response for a model with individual country-effect α_i

$$P(\text{country } i \text{ in debt crises at time } t|\mathbf{x_{i,t}}) = F(\alpha_i + \mathbf{x_{i,t}^{\top}}\beta).$$

29 I first specify *F* (.) as a linear probability model with country fixed effects. That is I have

$$P(\text{country } i \text{ in debt crises at time } t|\mathbf{x_{i,t}}) = \alpha_i + \mathbf{x_{i,t}^{\top}}\beta + \epsilon_{i,t},$$

30 where the α_i are allowed to be correlated with the regressors and $\in_{i,t}$ is assumed *i.i.d.* uncorrelated with α_i or the regressors. Second, I specify *F*(.) as a Probit and estimate it under the assumption that the α_i are uncorrelated with the regressors, using random effects. That is I have

$$\begin{aligned} P(\text{country } i \text{ in debt crises at time } t|\mathbf{x_{i,t}}) &= \Phi(\alpha_i + \mathbf{x_{i,t}^{\top}}\beta) \\ &= \int_{-\infty}^{\alpha_i + \mathbf{x_{i,t}^{\top}}\beta} \frac{1}{\sqrt{2\pi}} e^{-\frac{u^2}{2}} du. \end{aligned}$$

31 Finally, I specify *F*(.) as a Logit and estimate it using both random and fixed effects, the latter allowing for the correlation between the α_i and the regressors.[40] This gives

$$\begin{aligned} P(\text{country } i \text{ in debt crises at time } t|\mathbf{x_{i,t}}) &= \Lambda(\alpha_i + \mathbf{x_{i,t}^{\top}}\beta) \\ &= \frac{e^{\alpha_i + \mathbf{x_{i,t}^{\top}}\beta}}{1 + e^{\alpha_i + \mathbf{x_{i,t}^{\top}}\beta}}. \end{aligned}$$

Long terms interest rates and spreads

32 As alternative right-hand-side variables, I examine long-term-interest rates and EMBI spreads. Since these are continuous variables, I use conventional panel-data models. I estimate

$$\begin{aligned} LT\_rate_{i,t} &= \alpha_i + \mathbf{x_{i,t}^{\top}}\beta + \epsilon_{i,t}, \\ EMBI_{i,t} &= \alpha_i + \mathbf{x_{i,t}^{\top}}\beta + \epsilon_{i,t}, \end{aligned}$$

33 using (1) pooled OLS, (2) random effects, and (3) fixed effects. In the pooled OLS case, a common intercept is assumed for all countries, that is $\alpha_i = \alpha \forall i$, whereas individual country specific effects are possible for (2) and (3). For (2), it must be assumed that $E[\mathbf{x_{i,t}}^{\top} \alpha_i] = 0$, whereas in the fixed effects case, individual country specific heterogeneity can be correlated with the regressors.

Ratings

34 Finally, I investigate the relationship between ratings on the left-hand-side and the institutional variables on the right-hand-side, controlling again for economic variables in $\mathbf{x_{i,t}}$, using (1) pooled OLS, (2) random effects, and (3) fixed effects. Specifically, I estimate the following two models three times each

$$FCR_{i,t} = \alpha_i + \mathbf{x_{i,t}}^\top \beta + \epsilon_{i,t},$$
$$LCR_{i,t} = \alpha_i + \mathbf{x_{i,t}}^\top \beta + \epsilon_{i,t},$$

35 where *FCR* stands for foreign currency rating and *LCR* for local currency rating. The same comments apply for these specifications as for interest rates and spreads.[41]

2.3. Baseline results

Debt crises

36 The results for debt crises are in Tables 4-6. As it is likely that time invariant idiosyncratic disturbances are correlated with the institutional variables, fixed effects is the most sensible estimation method. Results are mixed. Beginning with Table 4, where I use an aggregate dummy taking a value of 1 if country *i* is in either a domestic or foreign debt crisis in year *t* and 0 otherwise as the left-hand-side variable, I find that the economic controls are correctly signed and significant.

Table 4: Results for all debt crises

	(1) FE LPM	(2) RE Probit	(3)RE Logit	(4)FE Logit
	debt_cris	debt_cris	debt_cris	debt_cris
log_gdp_cap	-0.0611**	-0.674***	-1.150***	-0.675*
	(-3.11)	(-6.07)	(-5.43)	(-2.56)
gdp_growth	-0.00495	-0.0359**	-0.0558*	-0.0538*
	(-1.41)	(-2.88)	(-2.42)	(-2.33)
inflation	0.00202***	0.00779***	0.0166***	0.0166***
	(4.08)	(4.58)	(4.37)	(4.19)
debt_to_gdp	0.00370***	0.0177***	0.0354***	0.0376***
	(4.43)	(8.13)	(7.81)	(7.66)
CA_balance	0.00402	0.0274**	0.0434*	0.0404*
	(1.42)	(2.64)	(2.26)	(2.10)
S	0.119	0.783*	1.536**	1.388*
	(1.15)	(2.50)	(2.63)	(2.31)
W	0.0817	0.361	0.612	0.695
	(0.78)	(0.98)	(0.91)	(1.01)
constant	0.280	1.474	1.663	
	(1.64)	(1.67)	(0.97)	
N	1848	1848	1848	887

t statistics in parentheses
$^{*}p < 0.05$,
$^{**}p < 0.01$,
$^{***}p < 0.001$

37 Countries that are richer and that are growing more quickly experience fewer debt crises. Higher inflation and larger debt-to-GDP ratios are associated with a higher incidence of debt crises. A puzzling result is that positive Current Account balances are associated with higher incidences of defaults. This likely reflects reverse causality. Since my crisis-dummy takes a value of 1 for the entire duration of the episode, the covariance between the incidence of crises and the size of the coefficients is driven by the economic conditions in the country not only at the start of the crises, but by those prevailing for their entire duration. Countries in external debt crises must run Current Account surpluses to compensate for the Capital Account deficits as foreign investors withdraw their funds.[42] This would be one way to explain why debt crises seem associated with Current Account surpluses: countries initially in deficit as the crisis hits experience sharp reversals of their Current Accounts into surplus, leading to a positive coefficient estimate. For my institutional variables of interest, I find increases in Selectorate size to be positively and significantly[43] associated with the incidence of debt crises for three of the four specifications, including the fixed effects Logit specification in column (4). The coefficient on the size of the Winning Coalition has the wrong sign (increases in the size of *W* are associated with higher incidence of debt crises as opposed to my theory's predictions), but is insignificant at conventional levels.

Table 5: Results for domestic debt crises

	(1) FE LPM	(2) RE Probit	(3)RE Logit	(4)FE Logit
	domestic_debt_cris	domestic_debt_cris	domestic_debt_cris	domestic_debt_cris
log_gdp_cap	-0.0208	-0.518**	-0.999**	-0.854*
	(-1.65)	(-3.01)	(-2.95)	(-1.99)
gdp_growth	-0.00497*	-0.0640***	-0.115**	-0.108**
	(-2.08)	(-3.36)	(-3.12)	(-2.95)
inflation	0.000390	0.00164	0.00223	0.000353
	(0.85)	(1.12)	(0.85)	(0.14)
debt_to_gdp	0.00127*	0.0148***	0.0314***	0.0380***
	(2.23)	(4.38)	(4.46)	(4.44)
CA_balance	0.000690	0.0278	0.0593	0.0449
	(0.43)	(1.58)	(1.72)	(1.19)
S	-0.0372	-0.371	-0.732	-1.202
	(-1.08)	(-0.73)	(-0.74)	(-1.24)
W	0.0864	1.130	2.324	2.648
	(1.64)	(1.72)	(1.78)	(1.95)
constant	0.122	-0.587	-1.495	
	(1.42)	(-0.46)	(-0.60)	
N	1848	1848	1848	434

t statistics in parentheses
$^{*}p < 0.05$,
$^{**}p < 0.01$,
$^{***}p < 0.001$

38 Looking only at domestic debt crises (Table 5), the coefficients on the economic controls once again have the correct signs. Inflation is no longer significant, however. One way to explain this would be that if debt issued under domestic jurisdiction is mostly domestic currency debt and debt issued under foreign jurisdiction is mostly foreign currency debt, bouts of inflation increase the value of foreign debt in domestic currency, as they are likely to lead to a depreciation of the domestic currency. For domestic debt crises this effect is absent, and so inflation is insignificant. The discussion of the effect of debt crises on the Current Account above suggests that this effect should be absent for domestic debt crises. This is the case. Less encouraging is the fact that the coefficients on the institutional variables are all insignificant at the five percent level[44] and have the wrong sign: increases in Selectorate size are associated with lower incidence of domestic debt crises and increases in Winning Coalition size are associated with higher incidence.

39 For external debt crises (Table 6), *S* has the correct sign: increases in Selectorate size are associated with higher incidence of default. Further, this effect is statistically significant at the one percent level for all three non-linear probability models. *W* is again insignificant here. The economic controls again have the correct sign, although growth is now insignificant.

Table 6: Results for external debt crises

	(1) FE LPM	(2) RE Probit	(3)RE Logit	(4)FE Logit
	external_debt_cris	external_debt_cris	external_debt_cris	external_debt_cris
log_gdp_cap	-0.0587**	-0.676***	-1.162***	-0.703*
	(-3.18)	(-5.70)	(-5.10)	(-2.45)
gdp_growth	-0.00394	-0.0238	-0.0388	-0.0349
	(-1.20)	(-1.81)	(-1.61)	(-1.45)
inflation	0.00205***	0.00835***	0.0175***	0.0172***
	(4.13)	(4.72)	(4.42)	(4.18)
debt_to_gdp	0.00371***	0.0213***	0.0427***	0.0459***
	(4.87)	(8.66)	(8.34)	(8.30)
CA_balance	0.00407	0.0281**	0.0448*	0.0403*
	(1.47)	(2.61)	(2.23)	(1.99)
S	0.117	0.964**	1.856**	1.757**
	(1.16)	(2.83)	(2.90)	(2.65)
W	0.0677	0.286	0.504	0.582
	(0.66)	(0.73)	(0.70)	(0.79)
constant	0.250	0.921	0.640	
	(1.58)	(0.97)	(0.34)	
N	1848	1848	1848	856

t statistics in parentheses
$^{*}p < 0.05$,
$^{**}p < 0.01$,
$^{***}p < 0.001$

Long term interest rates and EMBI

40 Turning to long-term interest rates and the EMBI (results in Table 7), I once again find the controls to be correctly signed. Richer countries pay lower interest rates and have lower EMBI spreads. Inflation strongly predicts higher interest rates, but seems to play no role for the EMBI. Interestingly, higher debt burdens are a good predictor for higher spreads, but do not seem to significantly affect long term interest rates. This likely reflects the ability of heavily indebted (non-emerging-market) industrial countries such as Japan to borrow cheaply. For the institutional variables, the evidence seems to mostly reject my hypothesis. For long term interest rates, the coefficients have the correct sign and are relatively close to being significant in the fixed effects specification.[45] Spreads, on the other hand, do not fit the predictions of my model at all: Increases in the size of the Winning Coalition are strongly associated with increases in spreads, whereas Selectorate size is insignificant.

Table 7: Results for LT interest rates and EMBI

	(1) pooled OLS LT_rate	(2) RE LT_rate	(3) FE LT_rate	(4) pooled OLS EMBI	(5) RE EMBI	(6) FE EMBI
log_gdp_cap	-0.540**	-0.994**	-1.737**	-50.02	-326.6***	-565.8***
	(-2.59)	(-2.92)	(-2.84)	(-0.77)	(-4.58)	(-5.01)
gdp_growth	-0.0196	-0.0786	-0.0825	-18.25	-11.32*	-7.556
	(-0.35)	(-1.13)	(-1.14)	(-1.20)	(-2.31)	(-1.63)
inflation	0.362***	0.313***	0.306***	7.291*	3.288	0.783
	(6.41)	(4.12)	(4.01)	(2.40)	(0.73)	(0.16)
debt_to_gdp	0.00572	0.0105	0.0187	13.22**	16.03*	16.27*
	(1.04)	(0.72)	(0.97)	(3.11)	(2.04)	(2.08)
CA_balance	-0.0482	-0.0406	-0.0423	19.04**	10.33	9.370
	(-1.93)	(-0.93)	(-0.81)	(2.66)	(1.25)	(1.06)
S	5.439***	3.965	5.059	121.4	-251.2	-373.5
	(3.50)	(1.50)	(1.73)	(0.46)	(-0.79)	(-1.09)
W	-0.0311	-1.609	-5.960	380.7*	1279.0***	1526.5**
	(-0.02)	(-0.58)	(-1.49)	(2.44)	(3.79)	(3.48)
constant	6.108***	12.87***	21.84***	-126.7	1602.9	3498.6**
	(4.62)	(4.79)	(4.13)	(-0.16)	(1.64)	(3.39)
N	1158	1158	1158	290	290	290
R^2	.49	.47	.38	.42	.36	.30

t statistics based on robust Standard Errors in parentheses
*$p < 0.05$,
**$p < 0.01$,
***$p < 0.001$

Sovereign ratings

41 Looking finally at sovereign ratings (Table 8), I find that for economic controls, larger debt-to-GDP ratios as well as higher inflation are associated significantly with lower ratings.

Table 8: Results for sovereign ratings

	(1) pooled OLS LCR	(2) RE LCR	(3) FE LCR	(4) pooled OLS FCR	(5) RE FCR	(6) FE FCR
log_gdp_cap	2.983***	2.120***	1.220***	2.783***	1.484***	1.017***
	(29.89)	(10.36)	(4.81)	(31.71)	(6.83)	(4.30)
gdp_growth	0.0164	0.00619	0.0312	0.0358	0.0147	0.0265
	(0.44)	(0.28)	(1.45)	(1.05)	(0.61)	(1.08)
inflation	-0.0753**	0.00555	0.00520	-0.0388***	-0.00849*	-0.00899*
	(-3.20)	(0.48)	(0.44)	(-4.58)	(-2.04)	(-2.03)
debt_to_gdp	-0.0134***	-0.0252**	-0.0312**	-0.0149***	-0.0290***	-0.0296***
	(-4.22)	(-3.05)	(-3.34)	(-5.13)	(-4.77)	(-4.32)
CA_balance	-0.0267*	-0.0466*	-0.0492*	0.000792	-0.0374	-0.0412
	(-2.13)	(-2.21)	(-2.16)	(0.06)	(-1.62)	(-1.64)
S	2.676*	1.932***	2.491***	1.405	1.681	2.070
	(2.43)	(3.63)	(5.73)	(1.18)	(1.40)	(1.85)
W	1.482**	-1.547	-5.340*	4.038***	-0.985	-2.543
	(2.82)	(-0.82)	(-2.15)	(6.54)	(-0.30)	(-0.76)
constant	-13.15***	-3.069	8.260**	-12.68***	1.441	7.995*
	(-10.07)	(-1.76)	(3.08)	(-9.57)	(0.46)	(2.14)
N	979	979	979	1363	1363	1363
R^2	.73	.66	.24	.67	.55	.34

t statistics based on robust Standard Errors in parentheses
*$p < 0.05$,
**$p < 0.01$,
***$p < 0.001$

42 Richer countries tend to have higher ratings, although growth doesn't seem to matter. Curiously, Current Account surpluses are a significant (5 percent level) predictor of lower local currency ratings. One possible explanation is simultaneity: countries more susceptible to debt crises receive lower ratings. They must then generate Current Account surpluses to offset Capital Account deficits as investors flee the country. This effect should be more pronounced for foreign currency ratings, but in fact the Current Account balance is insignificant here. For the institutional variables, Winning Coalition size is significant at the one percent level with the correct sign for both foreign and local currency ratings in the pooled OLS specification. For fixed effects, only local currency ratings seem to be significantly influenced by the institutional variables, albeit with the wrong signs: Larger Selectorates are a highly significant (.1 percent level) predictor of better ratings, whereas increases in the size of the Winning Coalition are associated (5 percent level) with lower ratings.

Conclusions from the baseline

43 Overall, the results for debt crises point to an effect of the institutional environment on the likelihood of default that is driven by Selectorate size. Increases in the size of the Selectorate mean that current members of the Winning Coalition are more likely to be excluded from future Winning Coalitions and the benefits attached to membership, should they decide to topple the current government. Therefore, since governments are less likely to be sanctioned by more loyal Winning Coalitions, they will be more likely to default. Note however, that this effect is only present for external debt crises. One way to

interpret this effect would be that the mechanism driving my model disregards the pressure that powerful domestic creditors – likely members of the Selectorate and perhaps the Winning Coalition – are able to bring to bear directly on the government to prevent it from violating their interests. External creditors, who cannot influence the government directly, must rely on the punishment mechanisms underlying my model. Therefore, the effect of Selectorate size is only observed for external debt crises.[46] For a rough quantitative idea of the effects, I only consider the results from the fixed effects Logit specification, since this allows to consider within-country changes in institutions, while accounting for country-specific unobservables. Thus for individual countries, increases in Selectorate size by two within-country standard deviations (an increase of .54) increase the probability of a country experiencing any debt crisis by 75% and the probability of experiencing an external debt crisis by 94%. The political change involved corresponds roughly to implementing Gabon-style rigged elections in societies where small Winning Coalitions coexisted previously with limited political participation.

44 For long term interest rates, results are in line with the theory for the fixed effects specification in that the coefficients on the institutional variables are correctly signed. They are, however, too imprecisely estimated to allow me to be very confident about this. The rest of the empirical evidence does not support my model. For the Winning Coalition, the expected effect is missing. This is compounded by significant coefficient estimates contradicting my model's predictions for spreads and local currency ratings, while foreign currency ratings seem to be largely unaffected by changes in institutions.

2.4. Splitting the sample

45 The relationship between economic fundamentals and institutions on the one hand and countries' vulnerability to default on the other may not be adequately captured by a model assuming a single coefficient vector for all countries. Estimation using fixed effects allows for country specific heterogeneity in the constant term, but still imposes homogeneous slopes for all countries.

2.4.1. Panel Threshold Regression

46 One way of tackling structural breaks in the underlying data generating process is the Panel Threshold Regression (PTR) model proposed by Hansen (1999). The setup is as follows. Observed data are from a panel[47] $\{y_{i,t}, q_{i,t}, \mathbf{x_{i,t}}: 1 \leq i \leq n, 1 \leq t \leq T_i\}$, with t indexing time and i indexing individuals. y is the dependent variable, q is the threshold variable and $\mathbf{x}$ is the vector of regressors, including the threshold variable. The structural equation is

$$y_{i,t} = \begin{cases} \alpha_i + \mathbf{x_{i,t}}^\top \beta_1 + \epsilon_{i,t}, & q_{i,t} \leq \gamma, \\ \alpha_i + \mathbf{x_{i,t}}^\top \beta_2 + \epsilon_{i,t}, & q_{i,t} > \gamma, \end{cases}$$

47 which can be more compactly written by letting $\beta = [\beta_1, \beta_2]$ as

$$y_{i,t}(\gamma) = \alpha_i + \mathbf{x_{i,t}}(\gamma)^\top \beta + \epsilon_{i,t}(\gamma).$$

48 $\in_{i,t}(\gamma)$ is assumed *iid* across time, individuals and regimes, with mean zero and finite variance σ^2. The sample is split and observations are assigned to one of two regimes depending on whether a particular realization of the threshold variable $q_{i,t}$ lies above or below the threshold γ. Letting

$$\begin{aligned}\bar{y}_i(\gamma) &= \frac{1}{T_i}\sum_{t=1}^{T_i} y_{i,t}(\gamma) \\ &= \begin{pmatrix} \frac{1}{T_i}\sum_{t=1}^{T_i} y_{i,t}\mathbf{I}(q_{i,t} \leq \gamma) \\ \frac{1}{T_i}\sum_{t=1}^{T_i} y_{i,t}\mathbf{I}(q_{i,t} > \gamma) \end{pmatrix},\end{aligned}$$

49 and

$$\begin{aligned}\bar{\mathbf{x}}_\mathbf{i}(\gamma) &= \frac{1}{T_i}\sum_{t=1}^{T_i} \mathbf{x}_{\mathbf{i},\mathbf{t}}(\gamma) \\ &= \begin{pmatrix} \frac{1}{T_i}\sum_{t=1}^{T_i} \mathbf{x}_{\mathbf{i},\mathbf{t}}\mathbf{I}(q_{i,t} \leq \gamma) \\ \frac{1}{T_i}\sum_{t=1}^{T_i} \mathbf{x}_{\mathbf{i},\mathbf{t}}\mathbf{I}(q_{i,t} > \gamma) \end{pmatrix},\end{aligned}$$

50 as well as

$$\begin{aligned}\bar{\epsilon}_i(\gamma) &= \frac{1}{T_i}\sum_{t=1}^{T_i} \epsilon_{i,t}(\gamma) \\ &= \begin{pmatrix} \frac{1}{T_i}\sum_{t=1}^{T_i} \epsilon_{i,t}\mathbf{I}(q_{i,t} \leq \gamma) \\ \frac{1}{T_i}\sum_{t=1}^{T_i} \epsilon_{i,t}\mathbf{I}(q_{i,t} > \gamma) \end{pmatrix},\end{aligned}$$

51 where **I**(.) is an indicator function, the model can be written in deviations from individual specific means as:

$$\widetilde{y_{i,t}}(\gamma) = \widetilde{\mathbf{x}_{\mathbf{i},\mathbf{t}}}(\gamma)^\top \beta + \widetilde{\epsilon_{i,t}}(\gamma).$$

52 Now let

$$\widetilde{\mathbf{y}_\mathbf{i}}(\gamma) = \begin{bmatrix} y_{i,1}(\gamma) \\ y_{i,2}(\gamma) \\ \vdots \\ y_{i,t}(\gamma) \\ \vdots \\ y_{i,T_i}(\gamma) \end{bmatrix} \quad \text{and} \quad \widetilde{\mathbf{X}_\mathbf{i}}(\gamma) = \begin{bmatrix} \mathbf{x}_{\mathbf{i},\mathbf{1}}(\gamma) \\ \mathbf{x}_{\mathbf{i},\mathbf{2}}(\gamma) \\ \vdots \\ \mathbf{x}_{\mathbf{i},\mathbf{t}}(\gamma) \\ \vdots \\ \mathbf{x}_{\mathbf{i},\mathbf{T}}(\gamma) \end{bmatrix}$$

53 as well as

$$\widetilde{\mathbf{y}}(\gamma) = \begin{bmatrix} \widetilde{\mathbf{y_1}}(\gamma) \\ \widetilde{\mathbf{y_2}}(\gamma) \\ \vdots \\ \widetilde{\mathbf{y_n}}(\gamma) \end{bmatrix} \quad \text{and} \quad \widetilde{\mathbf{X}}(\gamma) = \begin{bmatrix} \widetilde{\mathbf{X_1}}(\gamma) \\ \widetilde{\mathbf{X_2}}(\gamma) \\ \vdots \\ \widetilde{\mathbf{X_n}}(\gamma) \end{bmatrix}.$$

54 The slope vector β can be estimated for a given γ using least squares on the demeaned data, i.e.

$$\hat{\beta}(\gamma) = (\widetilde{\mathbf{X}}(\gamma)^\top \widetilde{\mathbf{X}}(\gamma))^{-1} \widetilde{\mathbf{X}}(\gamma)^\top \widetilde{\mathbf{y}}(\gamma),$$

55 which yields different vectors of slopes β_1 and β_2 above and below the threshold. The regression residuals are

$$\hat{\widetilde{\epsilon}}(\gamma) = \widetilde{\mathbf{y}}(\gamma) - \widetilde{\mathbf{X}}(\gamma)\hat{\beta}(\gamma),$$

56 and the sum of squarred residuals is

$$S_1(\gamma) = \hat{\widetilde{\epsilon}}(\gamma)^\top \hat{\widetilde{\epsilon}}(\gamma),$$

57 which is simply the sum of the two SSRs above and below the threshold. γ is estimated by minimizing the concentrated sum of squared residuals using least squares, that is

$$\hat{\gamma} = \underset{\gamma}{\operatorname{argmin}}\ S_1(\gamma)$$

58 Hansen recommends implementing the minimization numerically using a grid search over a grid of quantiles of $q_{i,t}$. The model is estimated once for each grid point and the combined SSR above and below the threshold is recorded. $\hat{\gamma}$ is the value of $q_{i,t}$ corresponding to the grid point yielding the lowest combined SSR.

59 Given $\hat{\gamma}$, the slope estimate is $\hat{\beta}(\hat{\gamma})$ and the residual variance is computed as

$$\hat{\sigma}^2 = \frac{1}{n(T-1)} S_1(\hat{\gamma}),$$

Testing for a threshold

60 The significance of the threshold-effect is tested against H_0 : no structural break in the slope. This corresponds to

61 $H_0 : \beta_1 = \beta_2$.

62 Since γ is not identified under H_0, a bootstrap must be used to simulate the asymptotic distribution of the test statistic. The implementation works as follows. Under H_0, the model can be written as

$$y_{i,t} = \alpha_i + \mathbf{x_{i,t}}^\top \beta_1 + \epsilon_{i,t}.$$

63 Taking deviations from individual specific means gives

$$\widetilde{y_{i,t}} = \widetilde{\mathbf{x_{i,t}}}^\top \beta_1 + \widetilde{\epsilon_{i,t}}.$$

Applying OLS to the demeaned data yields the estimate of the homogeneous slope vector $\hat{\beta}_1^{\mathbf{H0}}$, residual vector, $\hat{\epsilon}^{\mathbf{H0}}$ and the sum of square residuals $S_0 = \hat{\epsilon}^{\mathbf{H0}\top}\hat{\epsilon}^{\mathbf{H0}}$. The test-statistic for the significance of the threshold is

$$F_1 = \frac{S_0 - S_1(\hat{\gamma})}{\hat{\sigma}^2}.$$

64 Once the actual statistic is computed, the bootstrap is implemented by drawing a sample of size *n* with replacement from the residuals $\hat{\epsilon}(\gamma)$. This draw is used to create a bootstrap sample under H_0 using a homogeneous slope-vector. Since F_1 does not depend on β_1, any slope vector can be used. With the bootstrap sample, the model is estimated under H_0 and H_1 (the threshold model) and the bootstrap F_1 statistic is computed. Repeating this procedure a large number of times, the percentage of draws for which the boostrap F_1 statistic exceeds the actual F_1 statistic is the asymptotic *p*-value for F_1 under H_0 .

2.4.2. Monte Carlo trials

65 Since the PTR estimator is not implemented for standard software packages, I coded it in *R*. To assess the performance of my program, I ran a Monte Carlo simulation using artificial data. I began by drawing $n = 100$ times $T = 30$ observations from a jointly distributed normal random vector $[x_{1;i,t}, x_{2;i,t}, \epsilon_{i,t}]$ with the mean vector for each individual

$$\mu_{\mathbf{i}} = \begin{bmatrix} E[x_{1;i,t}] \\ E[x_{2;i,t}] \\ E[\epsilon_{i,t}] \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix},$$

66 and covariance matrix for all individuals

$$\mathbf{\Sigma_i} = \mathbf{\Sigma} = \begin{bmatrix} \sigma_{x_1}^2 & \sigma_{x_1,x_2} & \sigma_{x_1,\epsilon} \\ \sigma_{x_1,x_2} & \sigma_{x_2}^2 & \sigma_{x_2,\epsilon} \\ \sigma_{x_1,\epsilon} & \sigma_{x_2,\epsilon} & \sigma_{\epsilon}^2 \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}.$$

67 I then used these data to generate observations for the left-hand-side variable under H_0 : no threshold as

$$y_{i,t} = \underbrace{0.25 \times i + 0.25 \times \frac{1}{T}\sum_{i=1}^{T} x_{2;i,t}}_{=\alpha_i} + [x_{1;i,t}, x_{2;i,t}] \begin{bmatrix} 1 \\ 10 \end{bmatrix} + \epsilon_{i,t}.$$

68 The setup for α_i was chosen to generate individual specific effects correlated with one of the explanatory variables. For H_1, I used the same raw data to generate two different sets of left-hand-side variables. The first set was generated according to

$$y_{i,t} = \begin{cases} \underbrace{0.25 \times i + 0.25 \times \frac{1}{T}\sum_{i=1}^{T} x_{2;i,t}}_{=\alpha_i} + [x_{1;i,t}, x_{2;i,t}] \begin{bmatrix} 1 \\ 10 \end{bmatrix} + \epsilon_{i,t} & x_{2;i,t} < 0.5, \\ \underbrace{0.25 \times i + 0.25 \times \frac{1}{T}\sum_{i=1}^{T} x_{2;i,t}}_{=\alpha_i} + [x_{1;i,t}, x_{2;i,t}] \begin{bmatrix} 1 \\ 11 \end{bmatrix} + \epsilon_{i,t} & x_{2;i,t} > 0.5. \end{cases}$$

69 For the second set I generated

$$y_{i,t} = \begin{cases} \underbrace{0.25 \times i + 0.25 \times \frac{1}{T}\sum_{i=1}^{T} x_{2;i,t}}_{=\alpha_i} + [x_{1;i,t}, x_{2;i,t}] \begin{bmatrix} 1 \\ 10 \end{bmatrix} + \epsilon_{i,t} & x_{2;i,t} < 0.5, \\ \underbrace{0.25 \times i + 0.25 \times \frac{1}{T}\sum_{i=1}^{T} x_{2;i,t}}_{=\alpha_i} + [x_{1;i,t}, x_{2;i,t}] \begin{bmatrix} 1 \\ 20 \end{bmatrix} + \epsilon_{i,t} & x_{2;i,t} > 0.5. \end{cases}$$

70 I picked two different slope vectors above the threshold, since I wanted to investigate how precisely my estimator would estimate small versus large structural breaks. To get a feel for the artificial data under H_0 and H_1, consider Figure 8, which plots $\mathbf{x}_2$ against $\mathbf{y}$ together with a linear regression line.

71 Clearly, the linear model is misspecified under H_1. For my simulation I generated 250 datasets under H_0 and the first H_1 and 250 under H_0 and the second H_1. I then deleted 20% of the observations at random in each to create the unbalanced panels, which I fed to my estimator. I used a grid of quantiles: {5%, 5.25%, 5.5%, ..., 94.75%, 95%}, which contains 361 grid points for x_2, and 300 replications for the bootstrap. The estimator performed decently for the case of the small structural break and well for the large structural break. Tables 9 and 10 present summary statistics for the two simulations.

Figure 8: Simulated data with and without a threshold effect

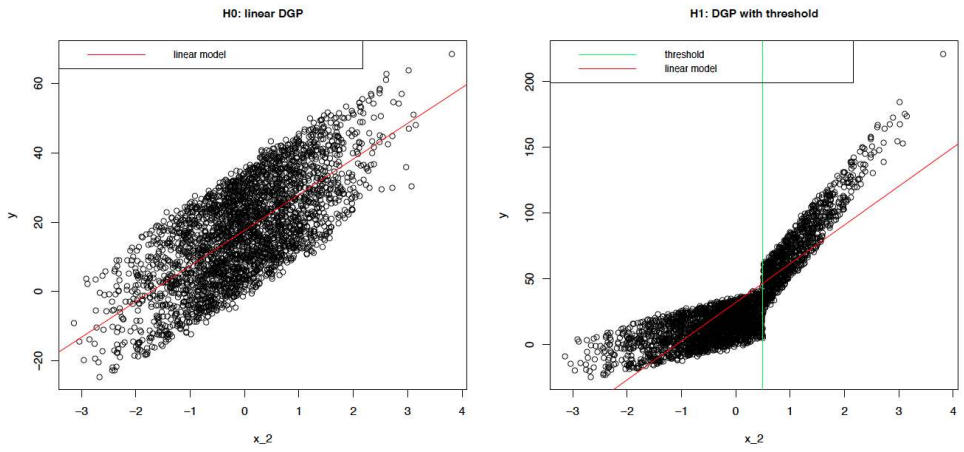


Table 9: Summary statistics for Monte Carlo simulation: $\beta_2^{\text{below }\gamma} = 10$, $\beta_2^{\text{above }\gamma} = 11$, 250 trials, n = 100, T = 30

statistic	mean	median	min	max	sd	true value
$\hat{\gamma}$, H_0 true	0.03756	0.07293	-1.20858	1.33435	0.64044	no threshold
$\hat{\gamma}$, H_1 true	0.32218	0.45460	-0.44361	0.70942	0.25692	0.5
$\widehat{\beta_1}$ below $\hat{\gamma}$, H_0 true	0.99539	0.99949	0.83145	1.15356	0.04713	1
$\widehat{\beta_2}$ below $\hat{\gamma}$, H_0 true	10.0087	9.99988	9.53332	10.46534	0.09402	10
$\widehat{\beta_1}$ above $\hat{\gamma}$, H_0 true	0.99712	0.99692	0.81314	1.15545	0.05364	1
$\widehat{\beta_2}$ above $\hat{\gamma}$, H_0 true	9.99628	9.99957	9.57323	10.64663	0.10380	10
$\widehat{\beta_1}$ below $\hat{\gamma}$, H_1 true	0.99877	1.00067	0.90480	1.10827	0.035614	1
$\widehat{\beta_2}$ below $\hat{\gamma}$, H_1 true	10.00717	10.00707	9.84255	10.19661	0.05604	10
$\widehat{\beta_1}$ above $\hat{\gamma}$, H_1 true	1.00029	1.00088	0.86177	1.13281	0.04896	1
$\widehat{\beta_2}$ above $\hat{\gamma}$, H_1 true	11.04158	11.0476	10.63226	11.34449	0.115769	11
asy. p value of F_1, H_0 true	0.92212	0.94666	0.413333	1	0.07606	1
asy. p value of F_1, H_1 true	0.04410	0.02666	0	0.51	0.05578	0

Table 10: Summary statistics for Monte Carlo simulation: $\beta_2^{\text{below }\gamma} = 10$, $\beta_2^{\text{above }\gamma} = 20$, 250 trials, n = 100, T = 30

statistic	mean	median	min	max	sd	true value
$\hat{\gamma}$, H_0 true	-0.01167	-0.00082	-1.11151	1.17041	0.60848	no threshold
$\hat{\gamma}$, H_1 true	0.49973	0.49968	0.49292	0.50606	0.00302	0.5
$\widehat{\beta_1}$ below $\hat{\gamma}$, H_0 true	1.00262	1.00321	0.86169	1.12447	0.04635	1
$\widehat{\beta_2}$ below $\hat{\gamma}$, H_0 true	9.99620	10.00642	9.65806	10.302	0.09588	10
$\widehat{\beta_1}$ above $\hat{\gamma}$, H_0 true	1.00473	1.01058	0.83525	1.12671	0.04741	1
$\widehat{\beta_2}$ above $\hat{\gamma}$, H_0 true	10.00502	9.99338	9.76529	10.35691	0.09899	10
$\widehat{\beta_1}$ below $\hat{\gamma}$, H_1 true	1.00096	1.00477	0.92660	1.07305	0.03086	1
$\widehat{\beta_2}$ below $\hat{\gamma}$, H_1 true	10.00471	10.00596	9.91846	10.12141	0.04553	10
$\widehat{\beta_1}$ above $\hat{\gamma}$, H_1 true	1.00644	1.00813	0.89841	1.11271	0.04702	1
$\widehat{\beta_2}$ above $\hat{\gamma}$, H_1 true	20.00944	20.00435	19.72721	20.32637	0.10032	20
asy. p value of F_1, H_0 true	0.92297	0.94	0.64333	1	0.07507	1
asy. p value of F_1, H_1 true	0	0	0	0	0	0

72 Figures 9-14 show kernel density plots of the different statistics, with the vertical lines indicating true values. Note that for the large threshold case with $\beta_2 = 20$ no kernel density for the F_1 statistic is displayed, since the bootstrap F_1 statistic never exceeded the actual statistic in any of the 300 bootstrap replications for the 250 datasets. Given the results of this exercise, I am reasonably confident in the estimator's ability to pick up structural breaks. Coefficient estimates are consistent for both large and small breaks, but thresholds are only estimated consistently for larger breaks. A doubling of the coefficient associated with one of the regressors after the threshold lets me estimate the threshold with great precision and confidence. For a 10% increase in slope on the other hand, the distribution of the threshold estimate has most of the observations around the true value, but the distribution is not centred on it, as it is for the larger threshold.

Figure 9: Kernel density plots of the threshold estimate under H_0 and H_1 with $\beta_2^{\text{below } \gamma} = 10$, $\beta_2^{\text{above } \gamma} = 11$, 250 trials, n = 100, T = 30

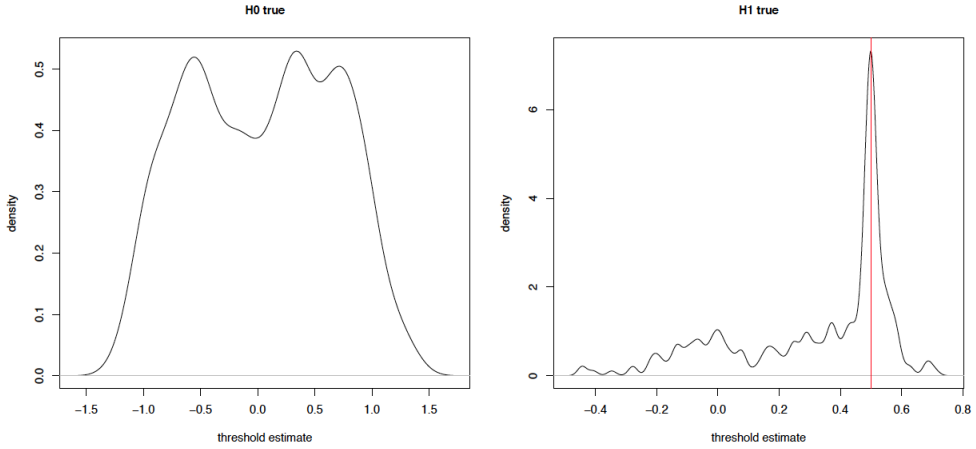


Figure 10: Kernel density plots of bootstrap F_1 statistic of the threshold estimate under H_0 and H_1 with $\beta_2^{\text{below } \gamma} = 10$, $\beta_2^{\text{above } \gamma} = 11$, 250 trials, n = 100, T = 30

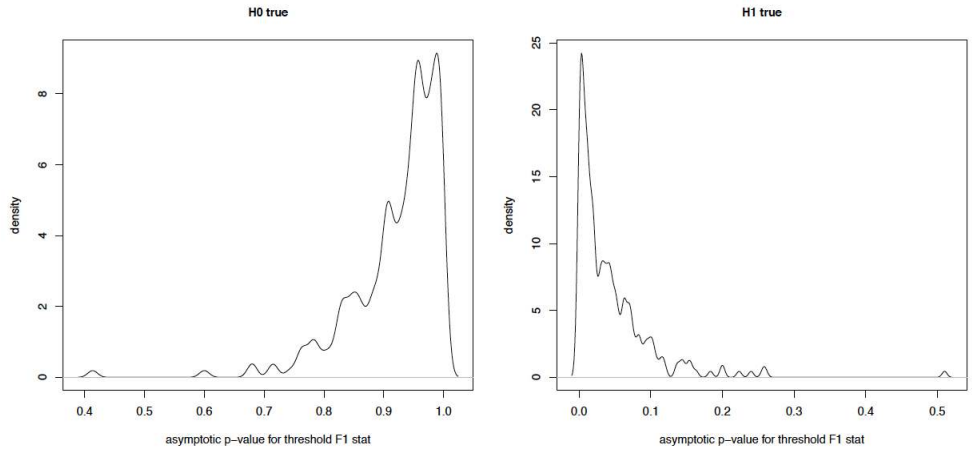


Figure 11: Kernel density plots of coefficient estimates under H_0 and H_1 with $\beta_2^{\text{below }\gamma} = 10$, $\beta_2^{\text{above }\gamma} = 11$, 250 trials, n = 100, T = 30

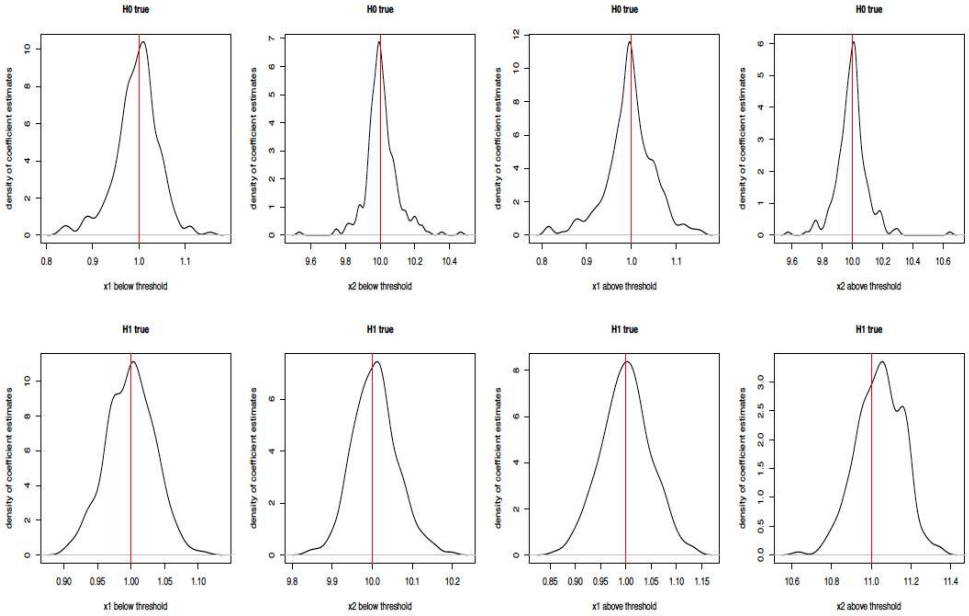


Figure 12: Kernel density plots of the threshold estimate under H_0 and H_1 with $\beta_2^{\text{below }\gamma} = 10$, $\beta_2^{\text{above }\gamma} = 20$, 250 trials, n = 100, T = 30

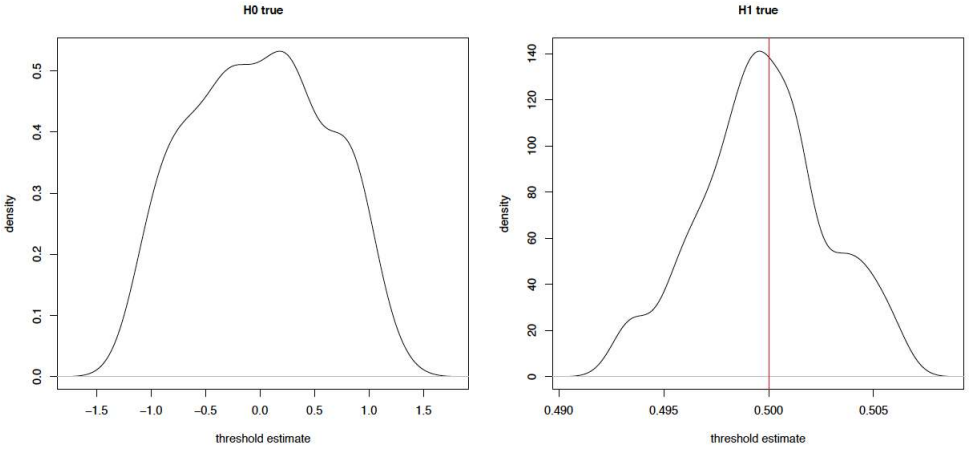


Figure 13: Kernel density plots of bootstrap F_1 statistic of the threshold estimate under H_0 and H_1 with $\beta_2^{\text{below } \gamma} = 10$, $\beta_2^{\text{above } \gamma} = 20$, 250 trials, n = 100, T = 30

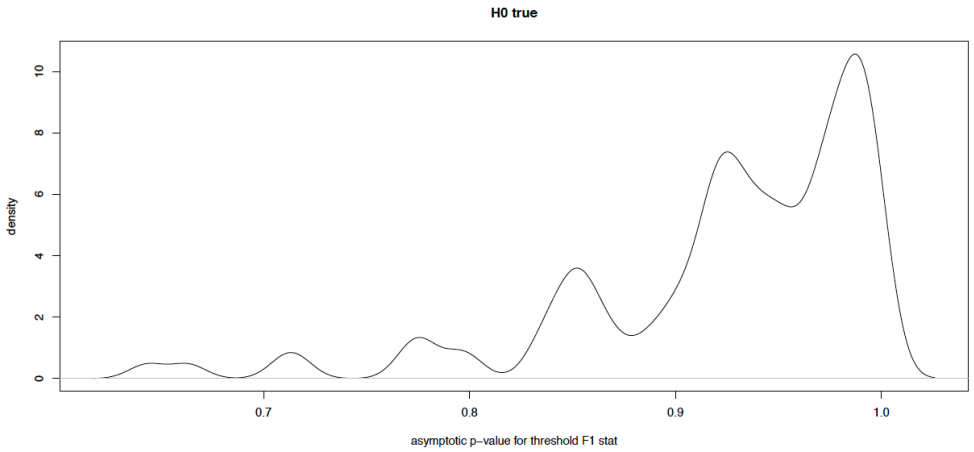
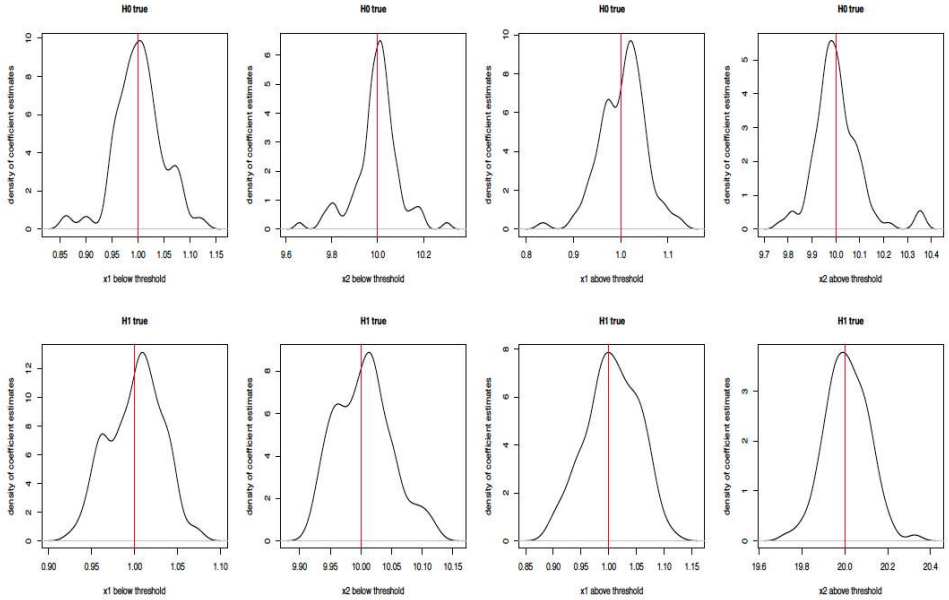


Figure 14: Kernel density plots of coefficient estimates under H_0 and H_1 with $\beta_2^{\text{below } \gamma} = 10$, $\beta_2^{\text{above } \gamma} = 20$, 250 trials, n = 100, T = 30



2.4.3. Applying PTR – debt thresholds

73 My story so far has emphasized the willingness of governments to repay as shaped by political constraints as an important determinant of sovereign debt defaults. Default risk, however, is likely non-linear. For high values of debt-to-GDP, further increases in debt are likely to make investors lose confidence in a country's ability to repay, even if defaults will lead to the government's ouster. To investigate the presence of a structural break in the relationship between default risk and my institutional variables depending on countries' debt levels, I implement the PTR estimator for long-term interest rates as dependent variable and debt-to-GDP as threshold variable. Specifically I have

$$LT\_rate_{i,t} = \begin{cases} \alpha_i + \mathbf{x}_{\mathbf{i,t}}^{\top}\beta_{\mathbf{1}} + \epsilon_{i,t}, & debt\_to\_gdp_{i,t} \leq \gamma, \\ \alpha_i + \mathbf{x}_{\mathbf{i,t}}^{\top}\beta_{\mathbf{2}} + \epsilon_{i,t}, & debt\_to\_gdp_{i,t} > \gamma, \end{cases}$$

74 where the vector of regressors $\mathbf{x}_{\mathbf{i,t}}$ is defined as in the baseline specifications. The estimated debt threshold is at 60.954% of GDP. However an asymptotic p-value for the F_1 statistic of .61 suggests that this structural break is not significant and a linear model with fixed effects is the better specification.[48]

Table 11: PTR estimates for debt threshold and long term interest rates

	(1) LT_rate FE	(2) LT_rate PTR: debt_to_gdp < 60.954%	(3) LT_rate PTR: debt_to_gdp > 60.954%
log_gdp_cap	-1.737**	-1.682*	-1.204
	(-2.76)	(-2.51)	(-1.18)
gdp_growth	-0.0825	-0.222**	0.131
	(-1.11)	(-3.26)	(1.31)
inflation	0.306***	0.253***	0.380***
	(3.90)	(3.88)	(3.85)
debt_to_gdp	0.0187	-0.0135	-0.0147
	(0.95)	(-0.67)	(-0.60)
CA_balance	-0.0423	-0.0822	0.140
	(-0.79)	(-1.61)	(1.28)
S	5.059	5.419**	-4.186
	(1.68)	(3.07)	(-1.31)
W	-5.960	-7.446*	6.154
	(-1.45)	(-2.03)	(1.08)
constant	21.84***	24.60***	17.54
	(4.02)	(4.08)	(1.85)
N	1158	793	365
R^2	0.3833	0.3324	0.5871

t statistics based on robust Standard Errors in parentheses
*$p < 0.05$,
**$p < 0.01$,
***$p < 0.001$

75 Table 11 presents the estimates based on the split sample, with column (1) replicating column (3) of Table 7 for comparison. Consider first column (3). Here my variables of interest have the "wrong" sign: increases in *s* are associated with lower interest rates and increases in *w* with higher rates. More strikingly however, not only are the coefficients on the institutional variables insignificant, but all economic controls except inflation have become insignificant as well. This suggests that for countries above a certain threshold of debt, investor perceptions of creditworthiness and therefore borrowing costs are not straightforwardly related to fundamentals. Turning to column (2), the economic controls are once again significant and have the correct signs: richer countries and countries growing more quickly[49] pay lower interest rates, whereas countries with higher inflation pay more. Debt-to-GDP ratio and Current Account balance remain insignificant, as in the baseline. The important difference concerns the coefficients on the

institutional variables. Both are now significant and have the right sign. Increases in the size of the Winning Coalition are associated with lower borrowing costs and increases in Selectorate size are associated with higher borrowing costs. Specifically, for countries below the debt threshold of 61%, an increase in Winning Coalition size of .5, corresponding roughly to the difference in Winning Coalition size that, for example, Poland has seen in its transition from communism to democracy, is associated with a 3.7% lower interest rate on long-term government obligations. Likewise, an increase in Selectorate size of .5 is associated with a 2.7% increase in the rate. This result fits my model's predictions well. For countries below a critical threshold of overall government debt to GDP, governments have more discretion in their default decisions. To what extent they use this discretion depends on the institutional constraints they face.

2.4.4. Applying PTR – share of external debt thresholds

76 Creditor identity does not play a part in my model. However, governments might be more inclined to violate the property rights of foreign creditors, who do not wield direct political influence domestically. If influential members of the Winning Coalition are simultaneously important creditors to the government, the government might try harder to repay debt than if most creditors sit abroad and only have the threat of capital market exclusion to enforce repayment. To examine this possibility, I will introduce the share of country's debt that is external as an additional regressor[50] and use the PTR estimator to check for threshold effects. Accordingly, my vector of regressors changes from the baseline to

$$\mathbf{x_{i,t}} = \begin{bmatrix} log\_gdp\_cap_{i,t} \\ gdp\_growth_{i,t} \\ inflation_{i,t} \\ debt\_to\_gdp_{i,t} \\ CA\_balance_{i,t} \\ share\_ext\_debt_{i,t} \\ S_{i,t} \\ W_{i,t} \end{bmatrix}.$$

77 I again use long-term interest rates as my left-hand side variable and use the following specification to implement PTR with share of external debt as threshold variable

$$LT\_rate_{i,t} = \begin{cases} \alpha_i + \mathbf{x_{i,t}^\top}\beta_1 + \epsilon_{i,t}, & share\_ext\_debt_{i,t} \leq \gamma, \\ \alpha_i + \mathbf{x_{i,t}^\top}\beta_2 + \epsilon_{i,t}, & share\_ext\_debt_{i,t} > \gamma. \end{cases}$$

78 The estimated threshold for share of external debt is 0.649. Contrary to the debt-to-GDP threshold examined above, this threshold is significant, if not highly so (p = 0.0725).

Table 12: PTR estimates for threshold of share of external debt and long term interest rates

	(1)	(2)	(3)
	LT_rate	LT_rate	LT_rate
	FE	PTR: share ext debt < 0.649	PTR: share ext debt > 0.649
log_gdp_cap	-3.102	-3.005*	0.925
	(-1.77)	(-2.74)	(0.17)
gdp_growth	0.00683	-0.289	0.175*
	(0.06)	(-1.82)	(2.23)
inflation	0.238**	0.441**	0.231***
	(3.29)	(3.20)	(4.90)
share_ext_debt	1.902	6.839**	-8.301
	(0.53)	(3.17)	(-0.70)
debt_to_gdp	0.0726*	0.00618	0.108**
	(2.38)	(0.16)	(2.89)
CA_balance	0.00280	-0.125	0.0819
	(0.03)	(-1.28)	(0.60)
S	4.709	2.200	7.061
	(1.55)	(1.62)	(1.05)
W	-6.528	-2.640	-7.305
	(-1.23)	(-1.60)	(-0.65)
constant	25.54	26.12**	2.386
	(1.98)	(2.93)	(0.06)
N	396	179	217
R^2	0.2158	0.2421	0.3741

t statistics based on robust Standard Errors in parentheses
$^{*}p < 0.05$,
$^{**}p < 0.01$,
$^{***}p < 0.001$

79 Table 12 presents the results. First note that introducing the extra regressor severely cuts down the number of usable observations, which may account for the imprecise estimates. For the economic controls, inflation is significant with the correct sign for the whole sample as well as for the two subsamples above and below the threshold. Richer countries pay significantly lower interest rates only for countries below the threshold of external debt. Growth is significant only for countries above the threshold, albeit with the incorrect sign.[51] Note also that the debt-to-GDP ratio a significant predictor of higher rates for all countries, once the share of external debt is accounted for[52] and even more so for the subsample of countries with 65% and more of external debt. This probably reflects the fact that richer countries, who usually have a large market for government domestic debt, pay lower interest rates even though they generally able to shoulder heavier debt burdens. Looking only at countries with higher external shares then captures poorer countries, where debt accumulation is seen as detrimental to repayment prospects by investors and therefore penalised with higher interest rates. Current Account balances are insignificant for the whole sample, as well as, somewhat surprisingly, for the subsample with a larger share of external debt. The institutional variables have the correct signs in all three specifications, but only come close to significance ($p \approx .12$ for both s and w) for the subsample of countries with a lower share of external debt. Thus if anything, institutions affect long-term interest rates more in the expected fashion when more debt is issued under domestic jurisdiction. While I do not attach too much

importance to this result, it suggests that creditor identity does not matter greatly for the way s and w influence perceived credit risk.

NOTES

21. Bueno de Mesquita et al. (2003), p. 79-87.
22. Bueno de Mesquita et al. (2003), p. 80.
23. The Bolsheviks held one of the first elections under universal suffrage in 1917, Bueno de Mesquita et al. (2003), p. 7; Iran held its last presidential election in 2009.
24. Bueno de Mesquita et al. (2003), p. 211.
25. The table summarizes Bueno de Mesquita et al. (2003), p. 211-216. Notation: $S_{i,t} = s$ in country i at time t & similarlr for $W_{i,t}$.
26. Background on Chile: http://www.state.gov/r/pa/ei/bgn/1981.htm
background on Peru: http://www.state.gov/r/pa/ei/bgn/35762.htm
27. Background on Saudi-Arabia: http://www.state.gov/r/pa/ei/bgn/3584.htm
28. Background on Gabon: http://www.state.gov/r/pa/ei/bgn/2826.htm
29. African Elections Database, http://africanelections.tripod.com/ga.html
30. Polity IV country report for Gabon, http://systemicpeace.org/polity/polity06.htm
31. For my regressions, I use the natural logarithm of GDP per capita. I decided against using the PPP correction, since especially for the repayment of foreign debt, what matters is not domestic purchasing power of goods and services produced domestically, but their value on Dollars.
32. I will not take debt composition into account in my baseline regressions, but discuss it in a separate section.
33. Panizza (2008), p. 4.
34. Again, external debt is defined as debt issued under foreign jurisdiction.
35. I am greatly indebted to Ugo Panizza, who kindly agreed to share the data.
36. See J.P. Morgan (1999) for details.
37. http://www2.standardandpoors.com/spf/pdf/fixedincome/SP_CreditRatingsGuide.pdf
38. http://www.moodys.com/researchdocumentcontentpage.aspx?docid=PBC 109490
39. http://www.fitchratings.com/creditdesk/public/ratings defintions/index.cfm
40. The fixed effects transformation is available for the logistic distribution for functional form reasons, but not for the Probit model, see Cameron ans Triveli (2005), p. 796.
41. Technically, my ratings variables are not continuous, as they are averages constructed from categorical country ratings. I nevertheless treat them as continuous.
42. Countries *could* try to offset the reversal of their Capital Account by using foreign currency reserves. This, however, would make the country vulnerable to a speculative attack, thereby making a sharp adjustment in the Current Account inevitable eventually. See Calvo (1998).
43. The coefficient is significant at the 5 percent level for the random effects Probit and the fixed effects Logit specifications and significant at the 1 percent level for the random effects Logit specification.
44. Although Winning Coalition size is significant at the ten percent level.
45. p = 0.088 for Selectorate size.

46. When I examine the effect of creditor identity later however, I do not find evidence to support this argument.

47. Hansen considers only balanced panels. I have written code that allows estimating threshold models using unbalanced panels, but it is unknow whether the asymptotic arguments establishing the validity of inference about the threshold in Hansen (1999) extend to the unbalanced case.

48. Given that the validity of bootstrap inference for the significance of the threshold is not guaranteed for unbalanced panels, this should not be viewed as definitive evidence against structural breaks. Drukker et al. (2005), who implement PTR for the unbalanced case, suggest using a Bayesian Information Criterion (BIC) akin to the procedure used in Time Series Econometrics for model selection. See Gonzalo and Pitarakis (2002) for a discussion of this approach.

49. Growth is now significant at the 1% level, whereas it was insignificant in the baseline.

50. As discussed, I do not have data on creditor identity. I wil use the data on juridiction of debet issuance instead.

51. One possibility is that, since countries with a larger share of external debt are predominantly developing and emerging countries, the significance of the growth rate reflects growth factored into the interest rate, rather than credit risk.

52. Compare this to column (1) of Table 11, where debt-to-GDP was insignificant.

Conclusion

1 My thesis has investigated the implications of political constraints on government discretion for sovereign borrowing and default. This topic has current relevance as democratically elected governments across Europe try to convince their populations that averting defaults is worth tremendous costs. Further, the empirical evidence on defaults points to the willingness of countries to repay, as distinct from their economic ability to do so, as an important factor in bringing about defaults. Some countries default at very low debt levels that have not been difficult do manage for other countries. I have argued that a common explanation can be found for these two facts in countries' political institutions. These institutions function as a transmission mechanism that convert the economic costs of defaults into political costs for governments. In a theoretical model of the political economy of default, I have sketched the workings of this mechanism. I have concluded that governments that depend for support on small groups of supporters drawn from a large population of potential backers can be more certain of continued loyalty than governments dependent on large groups. More loyal support translates into greater government discretion to default. To test my theoretical hypothesis, I have used a number of dependent variables, ranging from government debt crises over long-term interest rates on government bonds to sovereign ratings. The results were mixed, but suggest that enlarging the pool of potential backers, which results in greater government discretion in my model, increases the likelihood of external debt crises. Splitting the sample using the a fixed-effects panel threshold estimator, I found evidence of the hypothesized relationship for long-term interest rates in the case of countries with debt burdens below a threshold of around 61% of GDP. I interpreted this as reasonable, since government discretion is more likely to play a role when governments have "economic room" to exercise it, i.e. when policy choice is not eliminated by large debt burdens.

2 Given the highly political nature of default decisions, further research in this area needs to emphasize the link from economic to political costs. Using the Selectorate theory was a first crude step in this direction, but far more work is needed. Models must move away from the quasi-static framework I have employed and fully endogenize taxation and the political costs of servicing debt in a dynamic framework, possibly accounting for politicians facing term-limits. Preferences over tax rates necessary for the repayment of debt play a key role in this regard, which implies that the income distribution, which may not necessarily coincide with the distribution of political influence in an economy, also

matters. Countries politically dominated by wealthy interests may be more ready to repay when the high taxes necessary for this fall on a disenfranchised poor majority without wealth at stake. Above all, improved, preferably non-categorical measures of institutions are needed to subject political economy models to more rigorous empirical tests.

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Annexe

A. Variable descriptions

1 The appendix lists all variables, or component variables in the case of the institutional variables *w* and *s*, together with sources. Detailed descriptions, the wording of which is taken, if possible, directly from the original sources, are also given.

Economic variables – dependent

name:*external_debt_cris*

source: Reinhart, Camen M. and Kenneth S. Rogoff, From Financial Crash to Debt Crisis, NBER Working Paper 15795, March 2010. Forthcoming in American Economic Review

http://terpconnect.umd.edu/~creinhar/Courses.html

description: External debt crisis: Failure by the government to meet a principal or interest payment on the due date (or within the specified grace period) for its external debt obligations. Episodes also include instances rescheduled debt is ultimately extinguished in terms less favourable than the initial obligation.

External debt is defined as debt issued under another country's jurisdiction, typically (but not always) denominated in foreign currency.

Note: while time of default is accurately classified as a crisis year, there are also a large number of cases where the final resolution with the creditors (if it ever did take place) seems indeterminate. Therefore, R&R also work with a crisis dummy that only picks up the first year.

name:*domestic_debt_*cris

source: Reinhart, Camen M. and Kenneth S. Rogoff, From Financial Crash to Debt Crisis, NBER Working Paper 15795, March 2010. Forthcoming in American Economic Review

http://terpconnect.umd.edu/~creinhar/Courses.html

description: Domestic debt crisis: Same definition as for external debt crisis applies. In addition, domestic debt crises have also involved the freezing of bank deposits, and or forcible conversions of such deposits from Dollars to local currency.

Domestic debt is defined as debt issued under a country's own legal jurisdiction.

Note: At best there is partial documentation on recent domestic defaults provided by S&P. Historically, domestic debt crises are difficult to date and for many cases it is impossible to ascertain the date of final resolution.

name:*LT_rate*

source: International Monetary Fund *International Financial Statistics*

http://www.imfstatistics.org/imf/

description: Long term interest rates: Yield on long term government bonds. Maturities are mostly 10 years, but yields on 15-year bonds are included as well.

name:*EMBI*

source: J.P. Morgan Emerging Market Research

http://www.jpmorgan.com/pages/jpmorgan/investbk/solutions/research/EMBI

description: Emerging Market Bond Index (EMBI) Global spreads. The EMBI Global Tracks total returns for U.S. dollar-denominated debt instruments issued by emerging market sovereign and quasi-sovereign entities, including Brady bonds, loans and Eurobonds. Only issues with a face value outstanding of 500$ U.S. or more are included. Spreads are over the theoretical zero coupon yield on U.S. treasury securities.

name:*LCR*

source: for Moody's: Moody's Global Credit Research, Sovereign Default and Recovery Rates 1983-2007, March 2008 and Moody's website. for S&P: Standard & Poor's RatingsDirect, Sovereign Ratings History Since 1975, January 2007 and S&P website. For Fitch: Fitch Ratings, Complete Sovereign Ratings History, April 2011

general: Cbonds.Info - CIS - Fixed income markets in Russia and CIS

http://v2.moodys.com/cust/content/content.ashx?source=StaticContent/Free%20Pages/Credit%20Policy%20Research/documents/current/2007100000482445.pdf

http://www.moodys.com/

http://www2.standardandpoors.com/spf/pdf/fixedincome/KRsovereignSovRatingsHistorySince1975.pdf

http://www.standardandpoors.com/home/en/eu

http://www.fitchratings.com/web_content/ratings/sovereign-ratings_history.xls

http://www.cbonds.info/cis/eng/ratings/history.phtml

description: Local Currency Rating: Issuer Ratings of sovereign borrower's securities issued in local currency based on the ratings of the agencies Moody's, Standard and Poor's and Fitch. The agency letter ratings were first converted into numerical values using the metric in Table 1, also used in: Robert Gaillard, *Fitch, Moody's and S&P's Sovereign Ratings and EMBI Global Spreads: Lessons from 1993-2007*, International Research Journal of Finance and Economics, Issue 26 (2009), pp. 41-59, http://www.eurojournals.com/irjfe 26 04.pdf.

With these numerical transformations and letting $F_{i,t}$, $M_{i,t}$, and $S_{i,t}$ be the numerical values of the Fitch, Moody's and S&P's ratings respectively, the LCR variable for country i at time t is created as:

$$FCR_{i,t} = \frac{F_{i,t} + M_{i,t} + S_{i,t}}{I_{\{0,1,\cdots,23\}}(F_{i,t}) + I_{\{0,1,\cdots,20\}}(M_{i,t}) + I_{\{0,1,\cdots,22\}}(S_{i,t})},$$

where $I_{\{0,1,\cdots,n\}}(J_{i,t})$ is an indicator function that takes on a value of 1 if rating agency J has assigned a rating for country i in year t and 0 otherwise.

Table 1: Linear Transformation of Letter Ratings into Numeric Values

Fitch		Moody's		S&P's	
Rating	Numeric	Rating	Numeric	Rating	Numeric
AAA	23	Aaa	20	AAA	22
AA+	22	Aa1	19	AA+	21
AA	21	Aa2	18	AA	20
AA-	20	Aa3	17	AA-	19
A+	19	A1	16	A+	18
A	18	A2	15	A	17
A-	17	A3	14	A-	16
BBB+	16	Baa1	13	BBB+	15
BBB	15	Baa2	12	BBB	14
BBB-	14	Baa3	11	BBB-	13
BB+	13	Ba1	10	BB+	12
BB	12	Ba2	9	BB	11
BB-	11	Ba3	8	BB-	10
B+	10	B1	7	B+	9
B	9	B2	6	B	8
B-	8	B3	5	B-	7
CCC+	7	Caa1	4	CCC+	6
CCC	6	Caa2	3	CCC	5
CCC-	5	Caa3	2	CCC-	4
CC	4	Ca	1	CC	3
C	3	C	0	C	2
DDD	2			SD	1
DD	1			D	0
D	0				

name:*FCR*

source: same as for *LCR*

description: Foreign Currency Rating: Issuer Ratings of sovereign borrower's securities issued in foreign currency (usually $US) based on the ratings of the agencies Moody's, Standard and Poor's and Fitch. Same procedure was used to convert letter ratings into numerical values as for *LCR*

Economic variables – independent

name:*gpd_cap* and *log_gdp_cap*

source: World Bank Development Indicators, November 2010. Compiled for *STATA*. Catini, Giulia, Ugo Panizza and Carol Saade (2010), "Macro Data 4 Stata"

http://www.graduateinstitute.ch/md4stata

description:*gpd_cap* is nominal GDP per capita in current $US. *log_gdp_cap* is the natural log of *gpd_cap*.

name:*ppp_gpd_cap* and *log_ppp_gdp_cap*

source: World Bank Development Indicators, November 2010. Compiled for *STATA*. Catini, Giulia, Ugo Panizza and Carol Saade (2010), "Macro Data 4 Stata"

http://www.graduateinstitute.ch/md4stata

description:*ppp_gpd_cap* is PPP adjusted GDP per capita in $ international. *log_ppp_gdp_cap* is the natural log of *ppp_gpd_cap*.

name:*inflation*

source: World Bank *World Development Indicators*, International Monetary Fund *In- ternational Financial Statistics* and data files

http://data.worldbank.org/indicator/FP.CPI.TOTL.ZG

description: Inflation as measured by the consumer price index reflects the annual percentage change in the cost to the average consumer of acquiring a basket of goods and services that may be fixed or changed at specified intervals, such as yearly. The Laspeyres formula is generally used.

name:*debt_to_gdp*

source: S. Ali Abbas, Nazim Belhocine, Asmaa ElGanainy, and Mark Horton, 2010. *A Historical Public Debt Database*, IMF Working Paper WP/10/245

http://www.imf.org/external/pubs/ft/wp/2010/wp10245.pdf

description: Total (domestic plus external) gross government debt/GDP.

name:*share_ext_debt*

source: "Macro Data 4 Stata" and Ugo Panizza (2007) "Domestic and External Public Debt in Developing Countries" UNCTAD discussion paper

http://www.graduateinstitute.ch/md4stata

description: Share of gross central government debt classified as external debt. External debt is defined as debt issued in foreign countries and under the jurisdiction of a foreign court.

name:*CA_balance*

source: World Bank WDI; International Monetary Fund, Balance of Payments Statistics Yearbook and data files, and World Bank and OECD GDP estimates.

http://data.worldbank.org/indicator/BN.CAB.XOKA.GD.ZS

description: Current account balance. The sum of net exports of goods, services, net income, and net current transfers.

Political variables

name:*Legselec*

source: Cross-National Time Series Data Archive

http://www.databanks.sitehosting.net/Default.htm

description: Legislative selection. The coding of this variable is as follows:

(0) None. No legislature exists.

(1) Nonelective. Examples would be the selection of legislators by the effective, executive or by means of heredity or ascription.

(2) Elective. Legislators (or members of the lower house in a bicameral system) are selected by means of either direct or indirect popular election.

name:*Regtype*

source: Cross-National Time Series Data Archive

http://www.databanks.sitehosting.net/Default.htm

description: Type of Regime. The coding of this variable is as follows:

(1) Civilian. Any government controlled by a nonmilitary component of the nation's population

(2) Military-Civilian. Outwardly civilian government effectively controlled by a military elite. Civilians hold only those posts (up to and including that of Chief of State) for which their services are deemed necessary for successful conduct of government operations. An example would be retention of the Emperor and selected civilian cabinet members during the period of Japanese military hegemony between 1932 and 1945.

(3) Military. Direct rule by the military, usually (but not necessarily) following a military coup d'état. The governing structure may vary from utilization of the military chain of command under conditions of martial law to the institution of an ad hoc administrative hierarchy with at least an upper echelon staffed by military personnel.

(4) Other. All regimes not falling into one or another of the foregoing categories, including instances in which a country, save for reasons of exogenous influence, lacks an effective national government. An example of the latter would be Switzerland between 1815 and 1848.

name:*XRCOMP*

source: Polity IV Project, Political Regime Characteristics and Transitions, 1800-2009

http://www.systemicpeace.org/polity/polity4.htm

description: Competitiveness of Executive Recruitment. Competitiveness refers to the extent that prevailing modes of advancement give subordinates equal opportunities to become superordinates. For example, selection of chief executives through popular elections matching two or more viable parties or candidates is regarded as competitive. Coding is:

(1) Selection: Chief executives are determined by hereditary succession, designation, or by a combination of both, as in monarchies whose chief minister is chosen by king or court. Examples of pure designative selection are rigged, unopposed elections; repeated replacement of presidents before their terms end; recurrent military selection of civilian executives; selection within an institutionalized single party; recurrent incumbent selection of successors; repeated election boycotts by the major opposition parties, etc.

(2) Dual/Transitional: Dual executives in which one is chosen by hereditary succession, the other by competitive election. Also used for transitional arrangements between selection (ascription and/or designation) and competitive election.

(3) Election: Chief executives are typically chosen in or through competitive elections matching two or more major parties or candidates. (Elections may be popular or by an elected assembly.)

name:*XROPEN*

source: Polity IV Project, Political Regime Characteristics and Transitions, 1800-2009

http://www.systemicpeace.org/polity/polity4.htm

description: Openness of Executive Recruitment. Recruitment of the chief executive is "open" to the extent that all the politically active population has an opportunity, in principle, to attain the position through a regularized process. Coding is:

(1) Closed: Chief executives are determined by hereditary succession, e.g. kings, emperors, beys, emirs, etc. who assume executive powers by right of descent. An executive selected by other means may proclaim himself a monarch but the polity he governs is not coded "closed" unless a relative actually succeeds him as ruler.

(2) Dual Executive-Designation: Hereditary succession plus executive or court selection of an effective chief minister.

(3) Dual Executive-Election: Hereditary succession plus electoral selection of an effective chief minister.

(4) Open: Chief executives are chosen by elite designation, competitive election, or transitional arrangements between designation and election.

name:*PARCOMP*

source: Polity IV Project, Political Regime Characteristics and Transitions, 1800-2009

http://www.systemicpeace.org/polity/polity4.htm

description: Competitiveness of Participation. The competitiveness of participation refers to the extent to which alternative preferences for policy and leadership can be pursued in the political arena. Coding is:

(1) Repressed: No significant oppositional activity is permitted outside the ranks of the regime and ruling party. Totalitarian party systems, authoritarian military dictatorships, and despotic monarchies are typically coded here. However, the mere existence of these structures is not sufficient for a Repressed coding. The regime's institutional structure must also be matched by its demonstrated ability to repress oppositional competition.

(2) Suppressed: Some organized, political competition occurs outside government, without serious factionalism; but the regime systematically and sharply limits its form, extent, or both in ways that exclude substantial groups (20% or more of the adult population) from participation. Suppressed competition is distinguished from Factional competition (below) by the systematic, persisting nature of the restrictions: large classes of people, groups, or types of peaceful political competition are continuously excluded from the political process. As an operational rule, the banning of a political party which received more than 10% of the vote in a recent national election is sufficient evidence that competition is "suppressed." However, other information is required to determine whether the appropriate coding is (2) Suppressed or (3) Factional competition. This category is also used to characterize transitions between Factional and Repressed competition. Examples of "suppression" are:

1. Prohibiting some kinds of political organizations, either by type or group of people involved (e.g., no national political parties or no ethnic political organizations).
2. Prohibiting some kinds of political action (e.g., Communist parties may organize but are prohibited from competing in elections).
3. Systematic harassment of political opposition (leaders killed, jailed, or sent into exile; candidates regularly ruled off ballots; opposition media banned, etc.). This is evidence for either Factional, Suppressed, or Repressed, depending on the nature of the regime, the opposition, and the persistence of political groups.

Note: A newly enacted right to engage in political activities is most likely a change from category 1 to 2.

(3) Factional: Polities with parochial or ethnic-based political factions that regularly compete for political influence in order to promote particularist agendas and favor group members to the detriment of common, secular, or cross-cutting agendas.

(4) Transitional: Any transitional arrangement from Restricted or Factional patterns to fully Competitive patterns, or vice versa. Transitional arrangements are accommodative of competing, parochial interests but have not fully linked parochial with broader, general interests. Sectarian and secular interest groups coexist.

(5) Competitive: There are relatively stable and enduring, secular political groups which regularly compete for political influence at the national level; ruling groups and coalitions regularly, voluntarily transfer central power to competing groups. Competition among groups seldom involves coercion or disruption. Small parties or political groups may be restricted in the Competitive pattern.

Summary statistics

In Table 2 I present summary statistics for the variables used in my estimations. For the long term rates, I removed two observations for Slovenia in 1991 and 1992, where interest rates where above 180 percent – more than three times the largest of the remaining observations. I also removed outliers for inflation (annual rates above 500 percent, the 99 th percentile being 340 percent).

Table 2: Summary Statistics for variables used in Section 3

Variable		Mean	St. Dev	Min	Max	Observations
domestic_debt_cris	overall	.028169	.1654721	0	1	$N = 4970$
	between		.0685398	0	.3802817	$n = 70$
	within		.1508294	-.3521127	1.014085	$T = 71$
external_debt_cris	overall	.1539235	.3609118	0	1	$N = 4970$
	between		.1657389	0	.8028169	$n = 70$
	within		.3212085	-.6488934	1.139839	$T = 71$
debt_cris	overall	.162173	.3686466	0	1	$N = 4970$
	between		.1702132	0	.8028169	$n = 70$
	within		.3276216	-.6406439	1.148089	$T = 71$
LT_rate	overall	8.594301	8.885409	1.012	269.992	$N = 2097$
	between		6.29382	3.234333	45.36992	$n = 68$
	within		7.654364	-32.96862	233.2164	$T = 30.8382$
EMBI	overall	550.0519	695.6955	24.073	5791.555	$N = 412$
	between		426.2763	84.0285	2289.967	$n = 45$
	within		7515.8194	-837.1688	4634.194	$T = 9.15556$
FCR	overall	14.80007	5.334591	1	22	$N = 2465$
	between		4.927301	4	22	$n = 141$
	within		1.508584	6.89729	24.03155	$T = 17.4823$
LCR	overall	15.41648	5.265098	1	23	$N = 1798$
	between		5.100411	5.1	22.05556	$n = 137$
	within		1.368917	5.273624	22.91648	$T = 13.1241$
log_gdp_cap	overall	7.222429	1.632906	3.57	11.68	$N = 7430$
	between		1.427495	4.653226	10.7925	$n = 196$
	within		.8393198	3.941804	11.03193	$T = 37.9082$
gdp_growth	overall	3.952863	6.321493	-51.03086	106.2798	$N = 7168$
	between		2.278743	-1.029824	17.2285	$n = 196$
	within		6.027874	-50.38488	108.729	$T = 36.5714$
inflation	overall	35.05297	497.7004	-100	24411.03	$N = 6166$
	between		8106.0846	-.3031222	795.1036	$n = 176$
	within		486.4569	-762.7776	23811.37	$T = 35.0341$
debt_to_gdp	overall	58.92104	58.01662	.0039091	2092.922	$N = 5967$
	between		44.35931	1.180731	280.0909	$n = 173$
	within		43.35264	-157.0157	1908.037	$T = 34.4913$
CA_balance	overall	-3.557435	10.63462	-240.4958	56.69755	$N = 4941$
	between		8.211064	-38.49955	37.87944	$n = 178$
	within		8.41726	-265.3427	49.86824	$T = 27.7584$
share_ext_debt	overall	.7467947	.2420255	.0275312	1.000003	$N = 3755$
	between		.1903437	.1759504	1	$n = 123$
	within		.1631684	.0165136	1.347958	$T = 30.5285$
W	overall	.5999312	.2994965	0	1	$N = 7993$
	between		.2337312	.152439	1	$n = 185$
	within		.1728198	-.1869541	1.197492	$T = 43.2054$
S	overall	.8696579	.320819	0	1	$N = 8213$
	between		.1765471	.1147541	1	$n = 185$
	within		.268374	-.1139487	1.619658	$T = 44.3946$

B. Algebra for the model

C. R code for the PTR-estimator