ESSAYS ON DEBTS AND CONSTITUTIONS

by

Emanuel Kohlscheen

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ABSTRACT

This thesis includes two essays on sovereign debt and one on subnational governments' debts within a federation. In the two first essays, simple constitutional rules - that define how economic interactions unfold - are found to influence the outcome in important ways. The third essay analyzes the effects of short-term trade financing on the terms of an external debt renegotiation.

Sovereign Risk: Constitutions Rule analyzes the executive's choice of whether to reschedule external debt as the outcome of an intra-governmental negotiation. It shows that the form of government set in the Constitution can drive a country's debt rescheduling propensity. The executive's necessity of a confidence vote from the legislature may explain why some democracies do not renegotiate their foreign obligations. In the empirical section, the paper finds that parliamentary democracies (where such confidence rules exist) are indeed less prone to reschedule their foreign liabilities and accumulate arrears on these. Some parliamentary democracies have been able to significantly reduce their debt/GNP ratio without any 'credit incidents'. The empirical results are not sensitive to the classification of borderline regime cases or the quality of democracy and persist even if Latin American countries are excluded from the sample. Moreover, countries with stronger political checks on the executive and lower executive turnover are found to have a lower debt rescheduling propensity.

Do Constitutional Side Payments Induce Subnational Bailouts? looks at the effects of federal revenue sharing on subnational borrowing and debt bailouts. While federal revenue sharing has an ambiguous effect on aggregate subnational borrowing, it drives the demand for a bailout among politicians with subnational constituencies if local and federal revenues are shared on different terms. In case only federal revenues are shared, a pro-bailout coalition is formed by states that are net recipients of the revenue sharing fund and by states with high debt relative to their expected future tax base. In this situation, it is no longer necessary that the median state

debt to expected tax base ratio be to the right of the mean for a bailout to be approved by a simple majority vote among state representatives. The predictions of the model rationalize the treatment of state debts by the Brazilian Senate in the late 1980s and 1990s.

Sovereign Debt Recontracting: The Role of Trade Credit and Reserves introduces short-term trade credit into a sovereign debt model. The model highlights the distinction between gross and net international reserve positions. Borrowed reserves may provide net wealth and liquidity services during a negotiation. Gross reserves are found to strengthen the bargaining position of a country by shielding it from a cut-off from short-term trade finance, thereby diminishing its degree of impatience to conclude a renegotiation. Nevertheless, competitive banks do lend to accumulate borrowed reserves, which also provide partial insurance against the consumption risk associated with uncertain output.

aos meus pais

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TABLE OF CONTENTS

Chapter 1

Introduction

The cruzado[1] *and the repayment moratorium, however irrational and disastrous, are still reversible errors. They leave scars, but are not life threatening. Serious, indeed, is the hovering sword of Damocles that our Constitutional Assembly has placed above the 8.5 million square kilometers of Brazil.*[2]

Mario Henrique Simonsen (1935-1997)

Debt crises have caused substantial economic disruptions in a number of countries in the developing world, time and time again, be it on the sub-national, the domestic or the international level. The effects typically go far beyond the epicenter of credit markets and the recurrence of such events tends to cut investors' horizons short. Long-term credit markets, which are key for a number of investment projects, are not able to find the environment in which they may thrive. After crises, cosmetic changes and 'never again' pledges have been made, only to unravel again a few years later. This thesis argues that the Constitutional vein goes a long way in explaining this pattern of recurrence in a large number of developing countries.

Observable economic outcomes are often no more than the result of deep underlying structures - all too often ignored by economists. In many cases, these structures

[1] *Inflation stabilization plan which included a general price freeze.*
[2] *Translated from Sarmento, Werlang and Alberta (2002, p. 158).*

can be traced back to historical accidents. Many of these structural rules - as those mentioned in this thesis - have been engraved into Constitutions and persist for long periods of time, conditioning economic fortunes. Constitutional rules constitute the channel granting first-order economic relevance to events of the distant past. They are one link that reconnects economic theory with history.

The democratization observed in the developing world during the last decade has not been without effects on credit markets. In particular, many democratic transitions in presidential democracies have been associated with non-negligible disruptions in credit markets. This has been the case during presidential elections in 1995 in Mexico, 1997 in South Korea, 1999 in Argentina and 2002 in Brazil to name a few cases. In some episodes, credit markets were adversely affected by the electoral process even though external debt was primarily owed by private borrowers. As shown by Tirole (2003), however, international lending to developing countries can be seen as a dual agency problem in which the government of the borrowing country is always part of the contract, be it explicitly or implicitly, as in principle it holds the prerogative of centralizing all operations involving foreign exchange. The repayment of external debt therefore requires the implicit consent of the government of the borrowing country.

Chapter 2 (*Sovereign Risk: Constitutions Rule*) takes a closer look at the role played by the borrowing government. It does so by drawing on two basic observations on debt defaults. First, as the default contingency is generally not contemplated by lawmakers, the decision is left to the executive in charge. Second, the default decision is typically not just the result of a feasibility constraint but requires a purposeful choice since, for strategic reasons, it is not optimal to wait until reserves are completely depleted to halt repayments. The essay looks at the institutions by which a default decision is reached. In particular, it highlights the effects of a confidence requirement on the executive for the decision to service external debt. The confidence requirement has the effect of granting greater stability and predictability to international debt contracts (but may also imply greater rigidity in general and/or lead to larger governments, as shown by Persson and Tabellini (2003)). The mechanism rationalizes the observation that parliamentary democracies have rarely resorted to rescheduling their foreign obligations, despite the shorter office terms of

their executives. Seen from another angle, the chapter shows that North and Weingast's (1989) account on the effect of the evolution of institutions in 17th century England on credit markets - which emphasizes the role of checks and balances on the sovereign - gives substantial mileage if applied to the contemporary developing world.

Chapter 3 turns to sub-national governments. It argues that the debt bailout problem of sub-national governments should be analyzed in conjunction with the revenue sharing rules that may shape the incentives of politicians aiming at being reelected by local constituencies. These rules may drive debt accumulation and the demand for a debt bailout by the national government. It is even possible that representatives of states without any debt might provide the political clout to a pro-bailout movement. In other words, politicians with constituencies relying heavily on transfers of a (Constitutionally) pre-determined share of federal revenues should not be expected to oppose measures that ultimately increase the size of the pot, as for example the bailout of sub-national governments' debts. This may be a severe obstacle in the quest for diminishing regional income disparities. The unfortunate heritage of an unequal regional income distribution may well be to soften the budget constraints in a decentralized democracy. The regulation of state debts should take this effect into account, so as not to undermine the credibility of the budget separation between different tiers of government. While the chapter provides an application to the case of Brazil, the implications of the theory extend to any country where the revenues come from different tax bases or are shared on different terms at the different government levels.

While Chapters 2 and 3 look at political games that could lead to a debt crisis, the focus of the last chapter (coauthored with Stephen O'Connell) is on events that have to be sorted out once a default has occurred.[3] The game is now played by the borrower and its creditors, represented by a single lead bank. The framework used is that of alternating offers proposed by Rubinstein (1982), with the outside option of walking away from the negotiation table. The novelty of this essay is the

[3]Naturally, with rational players, the understanding of the post-default game leads to actions ahead of the default.

introduction of short-term trade finance into a sovereign debt model, which leads to positive borrowed reserve holdings. The trade credit rationale requires much less from discontent creditors than for instance, the trade sanction model proposed by Bulow and Rogoff (1989), since all that creditors effectively do during a default is to stop rolling over short-term trade credits. Export seizing gun-boats are never deployed as both parties have an incentive to remain on the negotiation table to avoid deadweight losses. The outcome of the renegotiation process turns out to critically depend on the potential supplier of short-term trade finance. The availability of sources for trade finance affects the borrower's relative degree of impatience to reach a deal and therefore determines his share of the pie. The face value of debts in default might be of lesser relevance, as the effective debt value is capped by the maximum amount the country can be bargained into repaying. On top of guaranteeing the borrower's liquidity, gross reserve holdings constitute a channel for risk shifting. As the game is assumed to unfold in a perfect information environment where threat points are clearly defined, agreement is already reached after the first offer and sanctions are never exercised in equilibrium, although they do have an important role in shaping the equilibrium outcome.

The long and bumpy road of economic development is a path-dependent process. Elements as the form of government laid out in the Constitution, the number of states in a federation and their form of financing, or even the accumulated stock of international reserves, can be decisive factors during periods of economic distress. Choices at critical moments may lead to long-lasting effects that are not necessarily fully understood at the time when they are made. The challenge for the observer then is to understand the mechanisms. Hopefully, such understanding may help us find solutions that refrain from making the economic development road more bumpy than need be.

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Chapter 2

Sovereign Risk: Constitutions Rule *

1 Introduction

The incidence of external debt crises seems to follow an endemic pattern. A number of countries have repeatedly ended up in the unpleasant list of problem debtors. Lindert and Morton (1989) already noted that *There is a striking pattern of statistical significance. In either worldwide lending crisis (the 1930s and 1980-86), the problem debtors tended to be those who had problems earlier.* Other studies of the incidence of credit disruptions have tried to map the endemic areas using regional dummy variables - especially for Latin America. Reinhart, Rogoff and Savastano (2003) recast the light on the pattern of reincidence of credit disruptions in some countries and even coined the term '*serial defaulters*' to describe countries that have frequently resorted to defaults to reduce their debt stocks.

The aim of this paper is to examine whether the institutional setting in borrowing countries affect their external debt policies and may explain the above pattern. I build on the basic observation that the decision on debt service is typically left to the

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executive, and not contemplated by the legislature. This stands in clear contrast to monetary policy which many countries have delegated to committees. Debt policy is not necessarily at the discretion of one agent or group however. The interaction of the executive with the legislature may affect the policy chosen, in particular if the legislature can credibly pose a threat to the very survival of the executive, as is the case in parliamentary democracies.[1]

The paper presents a theory predicting less credit disruptions in countries where the executive requires the confidence of the legislature to remain in office. It finds empirical support for the hypothesis that, among developing countries, parliamentary democracies have a lower propensity to reschedule or accumulate arrears on their external liabilities. These findings are not sensitive to the classification of borderline regime cases, the quality of democracy and persist if Latin American countries are excluded from the sample. More generally, I find that the rescheduling propensity of a country is reduced by within regime institutional features as the checks and balances on the executive posed by political veto players and lower executive turnover. The results of the paper might be seen as being in line with Reinhart, Rogoff and Savastano in that they point out that history is of importance for debt policy. Instead of focusing on the economic record of a country, however, I find that one important channel through which history shapes debt policy is given by the form of government laid out at the time when the Constitution was written.

The model highlights two differences between forms of government that might drive the frequency of debt renegotiations. First, parliamentary and presidential regimes give rise to different micro-political games leading to different probabilities of policy reversals. Second, as these micro-political games are conditioned by strikingly different threat points, parliamentary and presidential regimes lead to different sets of enforceable relations between the executive and its support basis in the legislature, thereby affecting the policy outcome. More specifically, an executive needing the continuous assent of a legislative majority is likely to consider policy proposals by their impact on his probability of retaining office. In particular, a halt to the servicing of foreign obligations may restrict the sources of funding and over-

[1] I follow the regime classification of Persson and Tabellini (2003) which relies on the executive's necessity for a confidence vote to characterize a parliamentary regime.

all economic efficiency in ways likely to be acknowledged and possibly exploited by political contenders and interest groups.

Interestingly, executive terms in democracies where the survival of the executive hinges on the assent of the legislature (henceforth parliamentary democracies) are typically shorter and show greater variation than in presidential democracies.[2] This might lead to an expected greater likelihood of default on debt repayments in such countries, as economic models generally predict that governments with a higher likelihood of being replaced are more prone to implement measures implying short-term relief. The confidence requirement rationalizes the fact that parliamentary countries have resorted to debt reschedulings with lesser frequency in spite of their shorter average office terms, since it gives the executive a strong motivation: the ability to remain in office. This check makes default a less likely equilibrium outcome in a parliamentary democracy.

In the absence of a perfect commitment technology, institutions can play a role in enhancing the credibility of repayment promises. Such effects in 17th century Britain have been well documented by North and Weingast (1989):

These changes [the redesign of fiscal and governmental institutions] reflected an explicit attempt to make credible the government's ability to honor its commitments. Explicit limits on the Crown's ability unilaterally *to alter the terms of its agreements played a key role here, for after the Glorious Revolution the Crown had to obtain Parliamentary assent to change in its agreements. As Parliamentarians represented wealth holders, its increased role markedly reduced the kings ability to renege.* p. 804. and *...The Crown now had to deal with a parliament on an equal footing-indeed, the latter clearly had the advantage with its now credible threat of dethroning a sovereign who stepped too far out of line.... In combination, these changes greatly enhanced the predictability of government decisions.* p. 829.

Relation to the literature. By and large, the recent external debt literature has focused on the inability to repay rationale to explain sovereign defaults, assuming debt policy to be the result of decisions taken by a benevolent infinite-horizon

[2] For the sample of developing democracies of this paper the average term in a presidential regime is 4.05 years with a standard deviation of 1.85 (N=78). The corresponding figures for parliamentary countries are 3.53 and 2.08 (N=89). The null hypothesis of equal means can be rejected at the 95% confidence level.

planner.[3] The main point of this paper is that one gains in understanding by looking at the institutional setup where a decision is taken. A decision to reschedule external debt is rarely uncontroversial. An indication that there are different assessments of the optimal debt policy for a country at a given time is given by the fact there have been instances when the announcement of default coincided with the inauguration speech of presidents (as in Peru 1989 and the recent case of Argentina - where the announcement came too late for many observers). Further, for strategic reasons, it is generally not optimal for countries to completely exhaust their reserves (see Kohlscheen and O'Connell (2003)). However, if a default is triggered at a positive level of reserves, this suggests that it requires a purposeful action rather than being the passive result of a feasibility constraint. The hypothesis of the paper is that, given the differences in preferred debt policies, the institutional setting affects the frequency at which a country resorts to reschedulings.

A few studies have incorporated political features in the debt literature. In an influential paper, Alesina and Drazen (1991) showed that rational politicians could engage in wasteful wars of attrition leading to delays in the stabilization of the debt dynamics. In their model, a divided government leads to a political stalemate due to conflicts over the distribution of the adjustment burden. This paper contrasts with that of Alesina and Drazen by stressing the commitment enhancing checks on the executive present within a divided government. Chang (2002) modelled the sovereign default decision as a game between (a better informed) government and private agents, where the government announces its intended policy and the population may reverse the decision. I model the default decision as the result of a negotiating process within the political system. A somewhat related paper is Riboni (2003) which explores the role of committees and separation of powers in enhancing commitment in a post election bargaining game. In his model, however, the agenda setter's identity is fixed over time, while in this paper the main reason for risk premia on debt is the prospect of a change of the agenda setter.

On the empirical front, Berg and Sachs (1988) estimated a debt rescheduling probit based on structural variables for a cross section of 35 countries. Countries with higher income inequality were found to be more likely to engage in debt rescheduling.

[3] One exception is Tirole (2003).

However, institutional features were not included and the rescheduling decision was not explicitly analyzed. Block and Vaaler (2003) find that presidential elections are associated with an average one notch downgrading in the country's sovereign debt rating and that risk spreads on bonds rise in pre-election periods. They argue that sovereigns should preferably avoid issuing bonds in the six months ahead of (presidential) elections to avoid paying the election premium. As the executive in a parliamentary regime may influence the timing of an election, thereby creating an endogeneity problem, their research excluded parliamentary countries. In contrast, in this study, the distinction between forms of government lies at the center of the analysis. To the best of my knowledge, no study has explicitly treated the difference between political systems in this context.

Outline. As the aim of the paper is to focus on institutional features, I depart from the altruistic, infinite horizon decision maker assumption pervading most of the sovereign debt literature. Section 2 compares debt policy when the policy decision is delegated to an incumbent whose survival depends on the approval of a veto player (a parliamentary regime) to the outcome when the incumbent does not face any such immediate threat to his survival in power and remains in office irrespective of the policy preferences of other politicians (a presidential regime). I also analyze the effect of term limits in presidential democracies and extend the model to allow for different motivations of politicians, as well as campaign contributions by interest groups.

As the predictions of institutional modelling might be quite sensitive to the details of the model, the ultimate appeal of an hypothesis, such as the one in this paper, must be empirically established. This is done in sections 3 and 4, based on a sample covering 59 countries from 1976 to 1999. Using probit and tobit analysis, I find support for most of the theoretical predictions.

2 Debt Policy with Delegation

For political institutions to play an interesting role, some heterogeneity must lead to a conflict of interests. It is clear that, in the limit, for sufficiently low (high) levels of net external debt repayments all economic agents might favor debt servicing

(default). For intermediate levels of net debt repayments (that are likely to occur unless rational international investors are infinitely risk averse) debt policy involves the resolution of such conflict of interests. In this section, I show that in this range the mapping of net debt repayments to the probability of default is a function of the institutions through which a decision is reached.

I shall analyze the default decision (henceforth debt policy) in an economy when the electorate consists of two types of voters: stakeholders, who own shares in the sector bearing an efficiency cost from default, and peasants. Peasants are only affected by the impact of debt policy on the relative price of their endowment (that could be inelastically supplied labor). The costs of default endure as long as the relations with creditors are not normalized.

Let Δ^J denote the utility gain conditioned on the continuation of debt service relative to default for an agent of type $J \epsilon \{S, P\}$, where S denotes a stakeholder and P a peasant. I will assume that $\Delta^S \geq 0$ and $\Delta^P \leq 0$, i.e., a stakeholder's utility conditioned on the continuation of debt service exceeds his utility under default, while the opposite is true for a peasant.[4] In Appendix A, I show that although a debt overhang situation could invert this assumption, rational investors would never let debt levels reach such situation. On some points, I will also make the (most reasonable) assumption that the absolute value of policy stakes are larger for a stakeholder than for a peasant (i.e. $|\Delta^S| > |\Delta^P|$). Let θ represent the share of stakeholders in the electorate. The efficient policy would be to service debt if and only if the net gains from servicing debt are non-negative, i.e. $\Delta = \theta\Delta^S + (1-\theta)\Delta^P \geq 0$.

[4] Since peasants do not internalize the effect of debt policy on asset prices, I will assume them to be less keen on debt servicing. To see this, suppose that voters are in the last period of their lives. While stakeholders, by holding long-lived assets, are interested in the long term consequences of policy decisions taken today, peasants are only interested in the spot market price of their current endowment, which is related to the aggregate supply of tradeable goods in the economy. Under reasonable conditions, the peasant prefers the policy leading to a booming economy today, i.e., that simply maximizes the output net of international debt-related transfers. If debt policy were decided by direct democracy, their optimal strategy would be to vote for a debt servicing policy only as long as the net repayments of tradeable goods to creditors did not exceed the efficiency loss from a default strategy. Stakeholders are less myopic since debt policy has the potential of depressing the price of their source of income (i.e., the proceeds to be obtained from the sale of the asset), and are therefore likely to be more inclined to favor debt servicing than their fellow peasants, even if debt servicing implies net repayments of tradeable goods in excess of current period efficiency losses.

Given these assumptions about the conflicting interests over debt policies, I next ask whose preference prevails. In practice, societies delegate debt policy decisions to policy makers. As this introduces a principal-agent relationship, the policy outcome may critically hinge on the motivation of the politicians deciding over policy. In Section 2.2, I start out with the assumption that citizen-candidate politicians are mainly motivated by their ability to influence policy. Later, in Section 2.3, I introduce office rents as an additional motivation.

On debt policy issues, electoral promises are likely not to be perfectly enforceable, so that politicians might be tempted to behave opportunistically, announcing whatever policy platform that maximizes their chances of election.[5] In case the distribution of preferences of the electorate is known, there is likely to be a pooling of (possibly irrelevant) platforms. In such a context, or alternatively when the electoral process is decided on issues orthogonal to debt policy, an election is equivalent to a random draw of a politician for the purposes treated in this paper. This is

[5] The results of the paper could easily be extended to the case where a fraction of the candidates makes sincere campaign commitments. However, this would come at the cost of blurring results without providing substantial additional insights.

It is not rare that debt policies conflict with previous statements of politicians and most economists would probably agree that there is an imperfect commitment value in campaign statements regarding debt policies (specially given the fact that statements are rarely conditional). Candidates might actually have incentives to signal their debt policy preference strategically, given the impact of such an announcement on stock prices and campaign contributions. In this sense, the Argentinian elections of 1999 were particularly revealing. On the day after the elections, the New York Times summarized:

... Polls indicated that Mr. de la Rua and Mr. Duhalde were in a close race until three months ago. Then, trying to energize the traditional labor base of the Justicialist Party, which was founded by Juan Domingo Peron, Mr. Duhalde lunged toward traditional Peronist populism. Complaining about Argentina's mounting foreign debt, he suggested a worldwide one-year suspension of debt-servicing by third world countries. It was a line that used to win applause in the 1980's. This year, the response was an 8 percent fall in the Argentine stock market, which forced Mr. Duhalde to beat a hasty retreat.

With Mr. Duhalde looking reckless and capricious, his poll ratings plunged in early July and he never recovered. ...

The suspension of repayments came 2 years later, after the resignation of the popularly elected president, and was announced during the inauguration speech of the short-lived presidency of Rodrigues Saa. The already depressed stock markets fell by 8% on the reopening day after the announcement.

Another article in 1999 read as follows: *Ever since Gen. Juan Domingo Peron remade Argentine political campaigns in the 1940's and 1950's, the tough talk has been as traditional as drinking gourds of mate tea with the masses. Presidential candidates question why the country should repay its international debt. They offer populist oratory challenging world capitalism. Then they govern more moderately once they take office.*

why I start by abstracting from the pre-electoral stage. In Section 2.4 however, I shall explicitly analyze a pre-election game by introducing a role for campaign contributions into the model.

2.1 Form of Government

Let m denote the number of elected (groups of) politicians, where I only consider those politicians that could potentially become heads of the executive. Let a parliamentary decision structure be defined as follows:

> *I. Nature selects a senior and a junior coalition partner from the pool of m politicians to form a government.*
>
> *II. Senior coalition member proposes a binary debt policy z to junior (service ($z = 1$) or default ($z = 0$)).*
>
> *III. Junior coalition member accepts proposal of senior or walks away. If he walks away, the game returns to step I.*
>
> I*V. Policy is implemented*

Note that since the government formation stage is immaterial for my analysis, I choose to abstract from it by assuming government formation to be random. The senior and junior member could be interpreted as the prime-minister and his support basis in the legislature, respectively. In other words, m is not simply the number of parties. In particular, in a parliamentary system the prime-minister and his party in parliament count as two (the senior and the junior coalition member in the model).

The main feature of an equivalent presidential game is the absence of steps II and III. The survival of the senior executive does not hinge on the approval by another player (or group). Typically, dismissal only occurs for criminal activities. It might be argued that the legislature could punish presidential actions it is not pleased by through voting against bill proposals of the presidency. Such threats, however, turn out not to be subgame perfect: once debt policy has been implemented, representatives will vote taking debt policy as a bygone since there is no direct way of credibly linking the issues. This is not the case in a parliamentary regime where the threat of unseating the prime-minister is credible. Since the implementation of a default

reveals the type of the senior coalition member, the junior member might want to replace him by a politician that will seek normalization of international flows.

As usual, the SPNE is found by solving backwards. After computing their utilities in the two possible outcomes in stage IV, politicians will act to achieve their highest payoff in the preceding stages.

2.2 Policy-Motivated Politicians

2.2.1 Single Veto Player

Proposition 1: If $m \geq 3$, $\theta \in (1/2, 1)$ and there are at least two candidates favoring default, a parliamentary game will lead to a strictly lower positive probability of default than a presidential one. II) If $m \geq 3$ and there is one candidate favoring default, the probability of default in a parliamentary game is nil.

Proof. When politicians are purely policy-motivated, a decision can only be reached by consensus in a parliamentary game. Differing policy preferences within the government lead to government dissolution, followed by new government formation. The probability of default at any given time will be given by the probability that both members within a lasting government favor a default. Hence, the probability of default will be given by

$$\pi = \frac{(1-\theta)\left((1-\theta)\, m - 1\right)}{\left((1-\theta)^2 + \theta^2\right) m - 1}$$

if at least 2 politicians favor default. If only one politician favors default, the continuity of debt service is at no risk, since the lonely politician will certainly be overruled. In a presidential game, the probability of default is $(1-\theta)$ independently of m and the presence of a single politician favoring default is sufficient to cause a political risk to securities issued abroad. The results follow from direct comparison. ■

2.2.2 Multiple Veto Players

The observation generalizes to the case of multiple veto players checking the executive. Suppose that instead of one, there are two junior coalition members who

may withdraw their support for the executive. In this case, we obtain the following result:

Proposition 2:I) If $m \geq 6$, $\theta \in (1/2, 1)$ and there are at least 3 candidates favoring default, a parliamentary game will lead to a strictly lower positive probability of default than a presidential one. II) If $m \geq 5$ and there are less than 3 candidates favoring default, the probability of default in a parliamentary game is nil.

Proof. Now

$$\pi = \frac{(1-\theta)\left((1-\theta)\,m-1\right)\left((1-\theta)\,m-2\right)}{(1-\theta)\left((1-\theta)\,m-1\right)\left((1-\theta)\,m-2\right)+\theta\left(\theta m-1\right)\left(\theta m-2\right)}$$

if at least 3 politicians favor default. It is easily checked that $\pi < (1-\theta)\ \forall\,\theta \in (1/2, 1)$ and $m \geq 6$. ■

2.2.3 Allowing for Side Payments

In Propositions 1 and 2, I did not permit the parties of a government coalition to compensate politicians with conflicting interests through counterbalancing offers. If such side payments within the coalition are possible however, politicians might be "bought out" of their ex ante preferences. In the case that the stakes for a stakeholder politician are higher than for a peasant ($|\Delta^S| > |\Delta^P|$), the sufficient conditions for a lower default propensity in a parliamentary game are substantially weakened. In order to gauge the effects of side payments, step II in the parliamentary game is replaced by:

II b. Senior coalition member proposes a binary debt policy z to junior and a transfer $b \geq 0$ conditional on support.

Note that b cannot be made conditional on type, since type is not observable ex ante. This implies that both types would extract transfers when acting as junior coalition members. Further, implicit in this step is the assumption that transfers can be undone if the support is withdrawn. This could for instance be the concession of jurisdiction in a given policy area (ministry) for the coalition member. Transfers in specie are not an alternative, since once transfers have occurred, nothing precludes the first politician from requesting a second transfer or act according to his preferred

policy anyway. Conversely, if the policy is decided upon before the transfer, the second politician would find it optimal to default on the transfer. Hence, only a compensation instrument directly tied to the survival of the executive would be credible.

Allowing for side payments within the coalition, I obtain the following result:

Proposition 3: Assume that politicians are risk-neutral, $m \geq 3$**,** $\theta \in (0,1)$ **and** $|\Delta^S| \geq |\Delta^P|$ **I) If at least two candidates favor default and** $|\Delta^S| \geq \frac{m-1}{m(1-\theta)}|\Delta^P|$**, a parliamentary game leads to a strictly lower positive probability of default than a presidential one. If** $|\Delta^S| < \frac{m-1}{m(1-\theta)}|\Delta^P|$**, proposition 1) applies. II) If one candidate favors default, the probability of default in a parliamentary game is nil.**

Proof. For a stakeholder politician acting as a senior coalition member, making a transfer b that is accepted by a peasant politician gives him the value $|\Delta^S| - b$ (relative to the default outcome). Optimality of the offer requires b to be such that the utility of making the side payment and servicing debt dominates the expected utility of not offering a side payment. The latter is determined by the sum of the probability of the junior coalition member being a stakeholder and the probability of debt servicing conditioned on a government dissolution in the first stage, i.e. $|\Delta^S| - b \geq \frac{\theta m-1}{m-1}|\Delta^S| + \frac{m(1-\theta)}{m-1}(1-\pi)|\Delta^S|$. Further, an acceptable offer for a peasant must satisfy the condition $b - |\Delta^P| \geq -(1-\pi)|\Delta^P|$. From this expressions it is clear that making the minimum acceptable offer $b = \pi|\Delta^P|$ is optimal if and only if $|\Delta^S| \geq \frac{m-1}{m(1-\theta)}|\Delta^P|$. The offer b will be accepted with probability 1. Similarly, for a senior peasant, $b = (1-\pi)|\Delta^S|$ if and only if $|\Delta^P| \geq \frac{m-1}{m\theta}|\Delta^S|$. But this contradicts the assumption that $|\Delta^S| > |\Delta^P|$. Hence, only a senior stakeholder will make offers. If $|\Delta^S| \geq \frac{m-1}{m(1-\theta)}|\Delta^P|$, the likelihood of default will be given by the probability of an all-peasant-coalition, i.e.,

$$\pi = \frac{(1-\theta)((1-\theta)m-1)}{m-1-(1-\theta)\theta m}$$

if there are at least 2 of them. But $\pi < (1-\theta)\ \forall\, m \geq 3$. The second statement of the proposition follows since when b is optimally set at zero the games with steps II and IIb are equivalent.

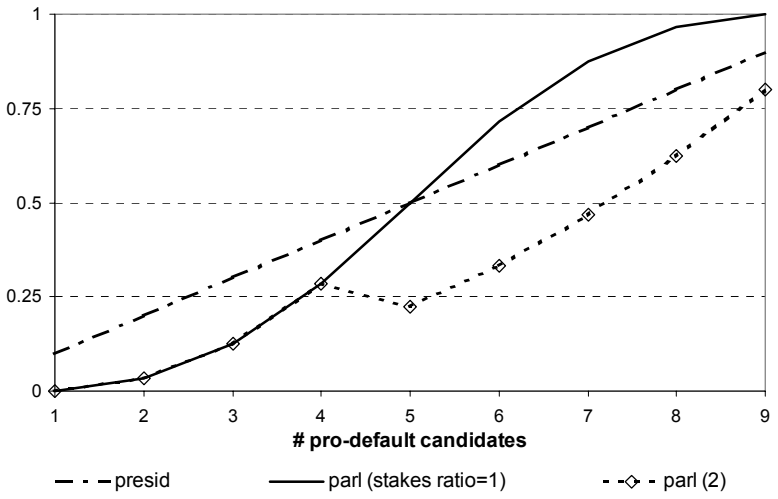

Figure 2.1: Default probability (m=10)

If there is only one pro-default candidate, he will certainly be overruled. ■

Figure 2.1 plots the probability of default as a function of the number of candidates favoring a default. If the stakes for both types are identical, the parliamentary regime renders a lower default propensity if and only if $\theta > 1/2$ (Proposition 1). However, if for instance the stakes of the pro-service politician (stakeholder) are twice as high as those of the pro-default type (peasant), the parliamentary default propensity will be lower irrespective of the proportion of politicians that are stakeholders.

Notice that propositions 1 to 3 hold despite the fact that the parliamentary game leads to a higher expected turnover of the executive within a given period.[6]

2.2.4 Conditional Parliamentary Democracy

Consider the alternative case where a government dissolution is followed by the non-democratic appointment of an executive. I call this regime a *conditional parliamen-*

[6] By a factor of $\frac{1}{1-2\theta(1-\theta)}$, $\frac{1}{1-3\theta(1-\theta)}$ and $\frac{1}{1-\theta(1-\theta)}$ in the cases of propositions 1, 2 and 3 respectively.

tary democracy. It has been argued that some countries in the developing world, notably Turkey in the 1980s, may have functioned under such implicit threat. I assess the effect of such non-democratic glimpses by substituting step III by the following condition.

III b. Junior coalition member accepts proposal of senior or walks away. If he walks away an unchecked government is appointed to complete the term.

Proposition 4: In a conditional parliamentary democracy, I) proposition 1.I) applies. II) If one candidate favors default, a parliamentary game leads to a strictly lower positive probability of default than a presidential one.

Proof. If at least two candidates favor default, the probability of default will be given by

$$\pi = \frac{(1-\theta)\left((1-\theta)\,m-1\right)}{m-1} + \left[1 - \frac{(1-\theta)\left((1-\theta)\,m-1\right)}{m-1} - \frac{\theta\left(\theta m-1\right)}{m-1}\right](1-\theta)$$

where the first term is the probability of an all-peasant coalition and the last term accounts for the case of government dissolution in the first stage. If $m \geq 3$ and $\theta \in (1/2, 1)$, we get $\pi < (1-\theta)$.

If there is only one candidate favoring default, we have

$$\pi = \left[1 - \frac{\theta\left(\theta m-1\right)}{m-1}\right](1-\theta)$$

Also in this case $\pi < (1-\theta)$. ■

Note that the restriction on θ does not become stronger. The parliamentary decision structure leads to a strictly lower probability of default if the conditions of proposition 1 are satisfied even if it is common knowledge that an eventual government dissolution would be followed by the closure of the parliament.

2.3 Office Rents

In this section, I shall check how the results are affected if politicians receive rents while in office. Since the assumption of such rents is highly plausible, I consider this to be the benchmark case for the empirical section. Assume that the junior

coalition member receives rents r while the senior receives R for being part of the government. Also, to ensure a meaningful exercise, $|\Delta^P| < r < |\Delta^S|$.[7] The previous subsection already dealt with the case where politicians care most about the policy outcome ($r < |\Delta^P| < |\Delta^S|$), i.e. when the junior coalition member office rents are lower than the stakes of a peasant. If on the other hand $|\Delta^P| < |\Delta^S| < r$, we would be in the region where rents are the overwhelming motivation for office. In such a scenario, a junior politician does not care sufficiently about the policy implemented and will acquiesce to all policy proposals put forward by the senior coalition member, thereby rendering the check irrelevant. Hence, for the purposes of this paper, a parliamentary system with high rents is equivalent to a presidential system.

Proposition 5: Assume politicians are risk-neutral, $\theta \epsilon (0,1)$ and $|\Delta^P| < r < \theta|\Delta^S|$. I) If $R > \frac{(1-\theta)m-1}{\theta m}|\Delta^P|$ the probability of default in a parliamentary game is nil. II) If $R \leq \frac{(1-\theta)m-1}{\theta m}|\Delta^P|$ the probability of default in a parliamentary game is positive and strictly lower than in a presidential one.

Proof. i) The restriction $r < \theta|\Delta^S|$ rules out the uninteresting case where any proposal is accepted. From the payoff structure depicted in Figure 1a, it is easily seen that for both types of politicians, it is optimal to propose debt service ($z = 1$) when acting as a senior coalition member if and only if $R > \frac{(1-\theta)m-1}{\theta m}|\Delta^P|$: for a senior stakeholder proposing $z = 1$ is the strictly dominant strategy since it assures the maximum payoff $|\Delta^S|+R$. For a senior peasant proposing $z = 1$ assures $R-|\Delta^P|$, while proposing $z = 0$ gives payoffs $-(1-\pi)|\Delta^P|$ or R, with probabilities $\frac{\theta m}{m-1}$ and $\frac{(1-\theta)m-1}{m-1}$ respectively. Hence, proposing $z = 1$ is the dominant strategy as long as $R > \frac{(1-\theta)m-1}{\theta m}|\Delta^P|$. As both types propose debt servicing, $\pi = 0$ and the proposal is never rejected.

ii) If the senior coalition member rents do not exceed $\frac{(1-\theta)m-1}{\theta m}|\Delta^P|$, the optimal strategy for a senior peasant is to propose default. A junior stakeholder would reject such proposal as long as $r < (1-\pi)\,|\Delta^S|$. A senior peasant still proposes debt servicing which is always accepted. The probability of default, π, will be given

[7] Note that the range of parameters where this case is relevant could be extended if one assumes politicians to maximize a weighted average of their own utility and the utility of citizens of their type.

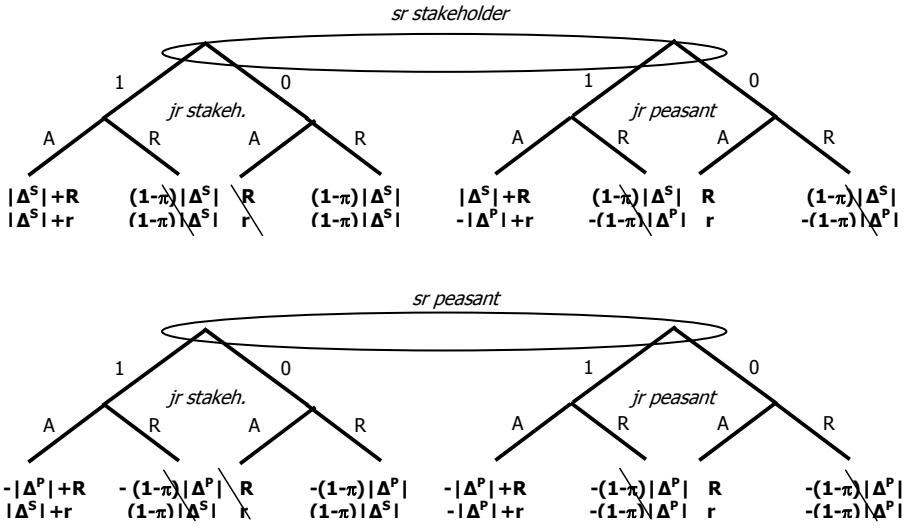

Figure 2.2: The rescheduling game in the presence of office rents

by the expression

$$\pi = \frac{(1-\theta)\left((1-\theta)\,m-1\right)}{m-1-(1-\theta)\,\theta m}$$

which is lower than $(1-\theta)$. ■

The above results hinge on the inability of coalition members to credibly signal their types before policy is chosen (as in Alesina and Drazen (1991)). Note that this inability creates a potential inefficiency in the case when both coalition members are peasants. This is caused by the credible threat of unseating the government posed by the stakeholder in case a default is proposed. The results would not change if we gave coalition members the ability to signal their types to each other before the policy proposal is made, since stakeholders would have incentives to introduce noise into the signalling device.[8]

[8] To check for robustness, it is interesting to see what happens if we allow government members to signal their types to each other by taking a straw vote before the policy proposal is put forward. Clearly, stakeholders as a group have an incentive to introduce noise in the signalling mechanism by resorting to uninformative strategies, since the absence of a reliable signalling mechanism ensures their preferred policy outcome, irrespective of the government composition. This could, for instance, be done by mimicking the peasants' signalling strategy. Since the signal is not informative in this case, the senior peasant continues to always propose debt servicing. Stakeholders prefer to follow a non-informative strategy in the straw vote before being elected. This is not reversed once

2.4 Popular Elections and Campaign Contributions

Up to this point, I have largely abstracted from the pre-electoral game, as I have given agents no chance of learning the types of politicians before they are elected. I now deal with this aspect by explicitly introducing the popular voting stage into the game. Assume that within each group of voters, a fraction ρ is rational, whereas the remaining are noise voters who can be affected by campaign ads (as in Baron (1994) and Grossman and Helpman (1996)). Rational voters of type J maximize

$$u^J(z) = V^J(z) + D\widetilde{\delta}$$

whereas the noise voter's utility is given by

$$u^J(z) = h\left(e_i - \overline{e}\right) + D\widetilde{\delta}$$

where e_i represents the effort on candidate's i campaign, D is a dummy variable taking the value of 1 for candidate 1 and $\widetilde{\delta}$ is a realization of the random variable $\delta \epsilon U\left[-\frac{1}{2\phi}, \frac{1}{2\phi}\right]$. The random variable is intended to represent the unknown popularity of a candidate which is drawn from the known uniform distribution. To simplify the expressions, I assume that only two candidates participate in elections. Contestants are chosen from the pool of politicians in a first round.

I also assume that it is easier for stakeholders to overcome the free-riding problem (see Olson (1965)) and organize in a lobby that is able to make campaign contributions. Hence, an additional player is introduced into the game, who has the objective function

$$L = (1-\pi)\, V^S(z=1) + \pi V^S(z=0) - \left(\sum e_i\right)^2$$

, where π denotes the probability of default.

The first two terms represent the interests of individual stakeholders (i.e., their expected value), while the last term represents the lobby's disutility cost of campaign

in office since sincere straw voting or mimicking yields their preferred policy outcome ($z = 1$). Note also that even if both coalition members were for some reason precluded from voting strategically in the straw vote, so that coalition members would know each others type, the probability of default in a parliamentary country would simply be given by $\pi = \frac{(1-\theta)((1-\theta)m-1)}{m-1}$ which is positive but still strictly lower than its presidential equivalent.

effort for one or more candidates running an election.[9]

The game can now be divided into pre- and post-electoral stages. The timing is as follows:

Pre-election game:

PRE I. politicians simultaneously announce their policy platforms $z_{prom} \in \{0; 1\}$.

PRE II. stakeholder lobby makes campaign contributions.

PRE III. Popular vote elects parliament (or president).

Post-election game:

POST I. Nature selects a senior and a junior coalition partner from the pool of elected politicians to form a government.

POST II. Senior coalition member proposes a binary debt policy z *to junior (service* ($z = 1$) *or default* ($z = 0$)*).*

POST III. Junior coalition member accepts proposal of senior or walks away. If he walks away, the game returns to POST I.

POST IV. Policy is implemented.

In a presidential game, steps POST I to III are eliminated.

It is easily seen that in a parliamentary country satisfying the conditions of Proposition 5.I) the introduction of the lobby would not have any effect. Since π is always zero, the optimal campaign effort exerted by the lobby is $e_i = 0$: there is no point in engaging in a costly campaign for a given candidate as ultimately the policy implemented does not hinge on which candidate wins the election.

The question becomes more interesting in a presidential country where candidates may run for reelection and the incumbent does so.[10] This gives the electorate

[9] Since the lobby is risk neutral and the disutility of campaign effort does not hinge on how it is distributed across the candidates, a lobby will find it optimal to invest all its effort in one campaign only.

[10] Since the only way of learning a candidate's type is by having him implement policy, there would be no campaign contributions if none of the candidates had held office before. This is the case because we assume the lobby to have no informational advantage allowing it to identify the types of the candidates.

the possibility of using retrospective strategies. Suppose that the incumbent politicians discount a future term in office sufficiently to still implement their preferred policy during their first term (i.e. $\beta \leq \frac{8}{\theta(h\phi)^2|\Delta^S|}\frac{|\Delta^P|}{R+\theta|\Delta^P|}$, as shown in Appendix B). If an incumbent did not default in his first term, the lobby will solve

$$\max_{e_i} E[L] = (p + (1-p)\theta)|\Delta^S| - \left(\sum_{j=i,c} e_j\right)^2$$

where p represents the probability of reelection of the incumbent, given that there was no default in period $t-1$. We have $p = prob[(\rho\theta I[\widetilde{\delta} \leq (1-\theta)|\Delta^S|] + \rho(1-\theta) I[\widetilde{\delta} \leq -(1-\theta)|\Delta^P|] + (1-\rho) I[\widetilde{\delta} \leq h(e_i - \overline{e})] \geq \frac{1}{2}]$ where I is an indicator variable.

If noise voters are pivotal (e.g. $\rho \leq 0.5$), the probability of reelection will be $p = \frac{1+h\phi e_i}{2}$ and the lobby will make an effort

$$e_i = \frac{(1-\theta)h\phi}{4}|\Delta^S|$$

for the campaign of the incumbent. Hence, the presence of the stakeholder lobby gives the debt servicing candidate an electoral advantage which is reflected in the fact that his probability of reelection exceeds 50%. Specifically,

$$p = \frac{1}{2} + \frac{(1-\theta)(h\phi)^2}{8}|\Delta^S|$$

If, on the other hand, an incumbent does default in his first term, the lobby will make campaign contributions of $e_c = \frac{\theta h\phi}{4}|\Delta^S|$ to the contestant.

The findings of this section are summarized in the below proposition:

Proposition 6: If noise voters can be pivotal and the conditions of Proposition 5.I) are met, a stakeholder lobby makes no campaign effort in a parliamentary regime. The stakeholder lobby does make contributions in a presidential election, but only if the incumbent participates. This causes a debt-servicing-incumbent-advantage.

The presence of the lobby thus creates an incentive for reelection candidates to service debt in a presidential country with noise voters. A default could attract the votes of rational peasants in the next election (if the economic conditions at the

time still make them prefer such a policy), but at the same time chases away the votes of noise voters. Hence, whether a default is likely when the president may run for reelection critically depends on the persistence of economic conditions and on which group of voters is perceived to be pivotal.

2.5 Welfare Analysis

A few lines on the efficiency of policies under the different institutional arrangements might be worthwhile. First, in the absence of a compensation mechanism, debt policy will always pick a winning and a losing group if Δ^S and Δ^P have distinct signs. Depending on the policy decision structure, defaults may either be too frequent or too rare relative to the first best in the long run. Note that a default is socially desirable if (and only if)

$$\Delta = \theta\Delta^S + (1-\theta)\,\Delta^P < 0 \tag{2.1}$$

If types were separable, it would be straightforward that an internal transfer mechanism across groups conditioned on policy could be Pareto improving. In case condition (2.1) holds, a constitutional transfer from peasants to stakeholders conditioned on default could attain Pareto optimality under both forms of government.

If however condition (2.1) does not hold in a presidential country, a constitutional transfer from stakeholders to peasants conditioned on debt repayment would be a way of attaining the first best outcome and at the same time reduce the risk premia of international contracts. No such transfer would be needed in this case in a parliamentary country if the conditions of Proposition 5 were met (i.e. $\pi = 0$).[11]

Although a presidential country exhibits a larger default propensity in general, it is not ruled out that a president may keep debt service promises even if the first best policy is default. This occurs when a stakeholder holds power and the aggregate stakes held in debt servicing by stakeholders as a group ($\theta\Delta^S$) are too small relative to the loss imposed by such policy on peasants. Further, a parliamentary country might service debt when rescheduling would be efficient.

[11] Under the veil of ignorance, a risk neutral agent would prefer to be born in a parliamentary country if and only if $E[\Delta] > 0$ in the absence of compensation mechanisms.

2.6 Discussion and Testable Implications

This section has shown how the vote of confidence procedure entailed in parliamentary regimes can act as an implicit commitment device in international debt contracts. First, the confidence requirement makes it more difficult for the executive in charge to change the status quo as veto players are introduced in the game. By itself, this effect could cut in both directions in terms of the likelihood of default, however, depending on the proportion of pro-service and pro-default politicians. It is the interaction of the confidence requirement with the magnitude of the stakes involved that leads parliamentary countries to default with lesser frequency than an equivalent presidential country. The intuition is simple. In a presidential country, a politician with relatively low stakes in the debt policy issue might want to go for his gain from a default, in addition to earning his regular office rents. In the parliamentary case, however, going for such policy may put the office rents at risk if the government support basis could be negatively affected by the policy. Further, the check works on a continuous basis in a parliamentary as opposed to a presidential regime, where it is stronger in periods immediately preceding elections.

The stylized models considered here may give too favorable a view of veto players. An alternative hypothesis is that veto players make it difficult to implement budget cuts in the times when they are most needed (as in the war of attrition model of Alesina and Drazen (1991)). This might come to the disadvantage of international contracts if, as is often the case, budget cuts are a precondition for repayments.

Thus, the question of the effect of the political system on foreign debt policy is ultimately an empirical one. What testable implications can we derive from the theory? Propositions 1 to 4 rely on necessary conditions for m. Note however that the condition $m \geq 3$ is rather loose, since the prime-minister and his support basis in the legislature count as two players - even if they belong to the same party. Basically, a sufficient condition for the requirement to be met is that there is an alternative party that could possibly contest the incumbent. This means that we want to exclude non-democratic regimes from the sample.

Moreover, when politicians are purely-policy motivated and there is no possibility of side-payments within the coalition, the theoretical predictions also contain a necessary condition on θ, i.e., the share of politicians favoring debt servicing. Ideally,

one would also want to control for this share and the relative stakes of politicians in debt policy. But credibly identifying the incentives shaping debt policy preferences of politicians running for office and weighting the chance of each of them becoming a policymaker for a cross-section of countries would be a daunting task. Note, however, that when side payments are allowed within the governing coalition or in the case that politicians do obtain office rents (Propositions 3 and 5, respectively) the restriction on θ is not present. I consider these conditions to be highly plausible.

The theory gives four hypotheses to take to the data. The first is that parliamentary countries are less prone to reschedule their external obligations or accumulate arrears in repayments, *ceteris paribus*.[12] The second hypothesis is that more constrained executives are less likely to resort to debt rescheduling. Third, default is less likely with coalition governments. Last, in presidential countries where stakeholders may make campaign contributions and a substantial share of the electorate is uninformed about the effects of debt policy, default is more likely if the current incumbent cannot run for reelection than when he does.

3 Data

3.1 Sample Selection

When taking the model to the data, I impose some restrictions on the sample to focus on the countries for which the model is more likely to apply: namely, democratic developing economies not effectively excluded from private international debt markets.

I start by excluding all countries without a sovereign credit rating assigned at any time up to June 2002 by Moody's or Standard & Poor's. Presumably, such countries have not been particularly active in private markets and could primarily be involved in operations with multilateral institutions. The political interactions in

[12] This hypothesis needs the qualification that the rents of a junior coalition member are not too high, i.e., do not exceed the policy stakes of a stakeholder.

The differences between regimes fade away if office rents are the main motivation for remaining in office. While there is evidence of rents being higher in developing countries, it is not obvious that they will be the overwhelming reason for a junior coalition member, however, once the contributions of interest groups to the stakes of politicians are taken into account.

official lending relations might be much less clear-cut. Admittedly, there might be a sample selection problem: it is possible that this criterion itself is a function of the default propensity. In particular, if the theory is right, excluded countries should be predominantly presidential or have unchecked executives. However, including countries that have been inactive in private lending would introduce a severe bias, since some countries might not reschedule their debts simply because they were not able to borrow in the first place. The criterion still allows the inclusion of the vast majority of middle-income countries for which data are available.

I also exclude the countries for which the (lagged) credit rating is above A1/A+. A credit rating in the four highest notches is unlikely to be associated with a significant risk of default. This restriction basically eliminates developed economies. Since the vast majority of developed economies are parliamentary democracies, this may well bias the results so that reschedulings are too often found in parliamentary countries. As the focus is deliberately on developing economies, this bias might be worthwhile. Any inference should be limited to this set of countries, however. Excluding non-borrowers and high-rated countries, I am left with a potential sample of 72 countries.

Since the model is designed for democracies, non democratic regimes are also excluded. To determine whether a country is classified as a democracy, I take the average of Freedom's House political rights and civil liberties indices that goes from 1 (free) to 7 (non free) for each year. Then, I classify a country as democratic if the simple average of the two indexes is below 5 in a given year. Country-year observations that do not meet this criterion are eliminated. The broad pattern of the results does not change when I move this threshold to 4. The fraction of countries in the sample failing this broad democracy criterion falls from an average of 49% in the second half of the 1970s, to 39% in the 1980s and 24% in the 1990s. According to this criterion, for instance, Indonesia fails the democracy test all the time until 1999. Going in the opposite direction, Malaysia became non democratic in 1998, Pakistan in 1999 and Russia in 2000.[13] 64 countries pass this test for at least some years since 1976. Another five countries are excluded because of missing data.

[13] I also exclude the observations for the three countries that have qualified for the Heavily Indebted Poor Country debt relief initiative after 1995.

All in all, the total number of countries in the sample is 59, with geographical coverage as follows: 23 Latin American, 18 (mostly Eastern) European, 13 Asian and 5 African countries. The countries and years in the sample are listed at the end of the paper.

3.2 Dependent Variables

The baseline dependent variable is a binary indicator, taking a value of one if a debt rescheduling agreement has been reached in a given year. This variable is taken as a proxy for sovereign default.[14] Rescheduling agreements between debtors and official creditors are usually reached within the forum of the Paris Club. Debt towards private creditors is typically renegotiated in the so called London Club. The workings of the Paris Club have been described by Sevigny (1990) and more recently at the home page of the institution. According to the latter source, the general principles are case by case analysis, consensus among creditors, conditionality, solidarity and comparability of treatment for non-official creditors.[15] On conditionality, the text reads: *Paris Club creditors reschedule a country's debt to respond to a situation of imminent default, and in the context of the debtor's taking adequate measures to correct the situation through an IMF program.*[16] IMF agreements started to be required as a precondition in the 1960s. As most rules, this also has its exceptions.

I considered the debt relief agreements reached with commercial banks and official creditors between 1980 and 2000 listed in the World Bank's Global Development Finance 2001.[17] To be on the conservative side, debt buyback and voluntary

[14] The study of Manasse, Roubini and Schimmelpfenning (2003) also includes the use of IMF funds relative to the country's quota as an indicator of debt distress. This comes at the cost of including episodes not clearly related to debt problems. I consider that for the purposes of this paper, it would be inadequate to include the use of IMF resources, as these do not imply any discontinuation in debt service. In Section 4.3, I check for robustness by instead using the ratio of arrears on debt repayments relative to the debt stock as the dependent variable.

[15] The principle of comparability of treatment between different creditors requires the country to seek rescheduling agreements on comparable terms with all other creditor groups, except multilateral institutions.

[16] *http://www.clubdeparis.org/en/presentation/. Sevigny considers imminent default as one of the basic principles.*

[17] Tables A2.2 and A3.2. Observations also listed in Table A3.1 are excluded. (pp.157-182). For the time span previous to 1980, I considered all Paris Club agreements plus defaults and reschedulings listed in Lindert and Morton (1989), pp. 92-98. Lindert and Morton's study adds

debt swaps operations were not considered as they are presumably performed on a voluntary basis. Further, I did not consider the few episodes not associated with repayment arrears.[18] While I note that the simple event of a rescheduling does not necessarily imply negative returns,[19] it does constitute a change in the original terms of the contract.

3.3 Institutional Variables

3.3.1 Form of Government

The theoretical model relied on the existence of a credible threat to "unseat" the executive. Persson and Tabellini (2003) take the confidence requirement on the executive as the dividing line between presidential and parliamentary regimes. I use their classification, taking the confidence requirement as a *proxy* for the credibility of the threat of unseating the executive. According to this criterion, 28 of the 59 countries in the sample are parliamentary. To check for sensitivity, I use an alternative classification taken from the Database of Political Institutions classifying countries to be presidential, semi-presidential or parliamentary. For the first two classes, I let the presidential dummy take the value of 1 and for the last 0. The list of countries and their respective classifications is presented in Table 1. The classification coincides for as many as 52 of the 59 countries. Five of the seven countries where the two classifications clash are situated in Eastern Europe. The executive requires a vote of confidence in all of these. However, DPI classifies Bulgaria, Lithuania, Moldova and Poland as presidential and Estonia as semi-presidential. Pakistan is classified as presidential according to the Persson and Tabellini criterion and parliamentary during most of the time by DPI. South Africa is considered a parliamentary country

the episodes of Bangladesh 1974, Chile 1961, 1963, 1975, Gabon 1978, Ghana 1966, 1968, 1970, 1974, Haiti 1965, India 1969, 1972, 1976, Jamaica 1970, 1979, Liberia 1963, 1968, Pakistan 1973, Philippines 1969, Turkey 1963, Uruguay 1965, Venezuela 1960, Yugoslavia 1965 and 1969. (most of them not included in the sample of this paper). Further, episodes listed in Cline (1984), p. 224, were checked. This added Argentina and Peru in 1976.

[18] It should be mentioned that the GDF is based on year end positions. Nothing precludes the onset of arrears and a rescheduling agreement to occur within the same year.

[19] In fact Lindert and Morton (1989) showed that a buy and hold strategy still gave returns to bonds of developing countries exceeding the returns of US bonds in the 1930s, in spite of frequent defaults.

according to the vote of confidence requirement, while DPI considers it to be semi-presidential. Since most Eastern European countries were not democracies before 1990, my prior is that the results should not be greatly affected by the classification in the long panel.

3.3.2 Veto Players

Presidential (and parliamentary) regimes vary substantially in the degree of discretion given to the executive (see for instance Shugart and Carey (1992) for a comparison of variations of presidential powers in Latin America) and, in particular in the number of veto players that can directly interfere in policy. Henisz (2000) constructed a quantitative measure of political constraints that embeds diminishing returns to additional veto points, based on a spatial model of political interactions. The basic rationale is that adding more veto players to the political game makes it likely that the marginal veto player has less impact on policy since his preference may well be absorbed by the preferences of previous veto players (for a detailed theoretical discussion see Tsebelis (2002)). Henisz's *Political Constraint Index* (POLCON) is based on the number of branches possessing veto power over policy, adjusting for the level of alignment of each branch with the executive. A zero score depicts an unconstrained executive and a score of one the most constrained. I use the POLCONiii index which considers the political alignment of the legislative chambers with the executive. A high opposition in the legislature may be taken as an additional proxy for the "threat of being dethroned" (the first being the confidence requirement dummy).

3.4 Control Variables

As economic control variables I use a number of variables that have been previously used in the literature on debt rescheduling (for a complete survey see Babbel (1996)), namely, the debt to GNP, reserves to imports and debt service to exports ratios and economic growth. All explanatory variables are lagged. I also construct a variable (polturn) to proxy for political instability. This variable measures the number of changes of the person in charge of the executive in the last 10 years. Since the DPI dataset starts from 1975, the inclusion of this variable limits the time span of the

panel.

A number of alternative explanatory variables were tested, namely, central government budget deficits, level of GDP per capita, current account deficits, the growth rate of exports, a dummy variable taking the value of one for the twelve accession candidates to the European Union in the 1990s[20] and the export of goods and services to the GNP ratio (to proxy for the degree of openness). None of these variables has a p-value below 0.4 with the expected sign when added to the baseline specification (expression 1a).

Economic data are from the World Bank's Development Indicators CD-ROM and Global Development Finance and the IMF's International Financial Statistics.[21]

4 Empirical Evidence

I identify a total of 123 debt rescheduling episodes involving democratic countries between 1976 and 1999. 22 episodes took place in parliamentary countries (8 of these involving Jamaica). The year 2000 would add another 3 cases, none of them involving a parliamentary democracy. The table below presents a summary. The lower half lists only non Latin American observations since it might be suspected that the difference could be driven by the negative correlation of the parliamentary regime and the Latin American dummies. The unconditional probability of a parliamentary country rescheduling its external obligations in any given year during the period was 4.4%, as compared to 19.6% for presidential countries. Excluding Latin America, the contrast remains: 3.3% vs. 18.8%.

[20] Starting in 1991, when the EU signed the first agreements with Hungary and Poland.

[21] Data for Cyprus, Greece, Israel, Russia and Slovenia were complemented with information from the US State Department Country Reports and EIU.

Rescheduling Incidence vs. Form of Government

	obs	reschedulings	countries	resch countries
presidential	516	101	31	23
parliamentary	495	22	28	5
non LatAm pres	160	30	13	7[22]
non LatAm parl	364	12	23	3

4.1 Incidence of Rescheduling Agreements

I now ask whether this difference persists after controlling for liquidity and solvency variables used in previous empirical studies. For this purpose, I run a pooled probit regression, where the dependent variable is the rescheduling dummy. The baseline specification has data for 59 countries with an average time span of 11 years. I do not treat for attrition in the panel.

To eliminate countries in long term default and possibly not active in the debt markets, I exclude the observations for countries that had accumulated arrears on principal in excess of 20% of the outstanding medium and long term debt stock in years t-2 and t-3 without having reached a rescheduling agreement up to year t-1. Failure to eliminate these observations might bias the results, suggesting for instance that a high debt service to export ratio is not conducive to a rescheduling agreement (it turns out however that the coefficients of interest are not affected by this exclusion). I also eliminate observations for countries that rescheduled foreign obligations in the previous year. While this comes at the risk of excluding relevant episodes it avoids the possibility of double counting if a rescheduling is made through more than one agreement AND arrears were not cleared in the first round. Inspection shows that the results are not sensitive to the length of this window.

As the focus of this paper lies on the effect of domestic factors, rather than predictive power, a time dummy for each year is included to control for changing conditions in international markets, such as international interest rates, oil prices, and less measurable variables such as shifts in risk aversion, multilateral institutions' "bail-out propensity" and contagion effects. Note that fixed effects may not be included as the stringent conditions for a full fledged unobserved effects probit or

[22] Indonesia would have been the eighth case if the sample had been extended to include 2000.

logit analysis are not met.[23] Specifically, while strict exogeneity might be plausible for some of the institutional variables in question, it will never hold for the ratio variables: a rescheduling agreement today will have a direct impact on the ratio variables in the following periods.

Dynamic completeness of the specification cannot be rejected at the usual confidence levels, allowing for standard inference procedures.[24] It seems particularly plausible for the types of variables used: little would be gained from including additional lags for ratio variables once more recent observations of these are available (i.e., the ratio of reserves to imports or debt to GNP two years ago adds little to the prediction of rescheduling agreements if last year's ratio is available).

The regression results are shown in the tables at the end of the paper. Tables 1a, 1b and 1c use the regime classification based on the confidence requirement, following Persson and Tabellini (2003). First, note that all economic variables have the expected sign: external debt reschedulings are more likely in countries with a high debt service to exports ratio, a high debt to GNP ratio, a low reserve to imports ratio and a low growth rate.[25] One might conjecture that the effect of the level of indebtness on the rescheduling propensity is not linear: the effect of a marginal increase in debt on the rescheduling propensity might be higher for higher levels of debt. To deal with this possibility, a quadratic term of the debt/GNP ratio was included in the specifications. Table 1b reports the results when the debt/GNP ratio observations were trimmed at the 95th percentile. In general, the quadratic

[23] I am constrained by the time invariability of the form of government dummy and the fact that the fixed-effect probit lacks a consistent estimator. Bertschek and Lechner (1998) did propose GMM estimators for the probit model based on panel data. However, their estimators rely on strict exogeneity.

[24] Specifically, I test for dynamic completeness by estimating

$$P(y_{it} = 1|x_{it}, \widehat{u}_{i,t-1}) = \Phi(x_{it}\beta + \gamma_1 \widehat{u}_{i,t-1})$$

where $\widehat{u}_{i,t-1}$ is the estimated lagged residual of the pooled probit of regression 1.a. The p-value for the hypothesis $H_o : \gamma_1 = 0$ is 0.527, implying that the null hypothesis cannot be rejected. For a discussion the reader is referred to Wooldridge (2002).

[25] The main effect of including a dummy variable indicating whether the country has rescheduled its debts in the last 10 years (as a proxy for country specific effects) is to take away the statistical significance of the Latin America dummy variable when the form of government is not ommitted (see Table 1c). This inclusion might introduce a bias in the estimation as the variable is correlated with the form of government dummy.

term turns out not to be statistically significant.[26]

Among the political explanatory variables, the parliamentary regime variable is significant at the 95% confidence level in 10 out of 12 specifications. This suggests the rejection of the hypothesis of no effect on the form of government on the rescheduling propensity. Parliamentary democracies are less prone to reschedule their foreign liabilities. To check the sensitivity of the results to individual groups, a groupwise deletion routine was implemented excluding one country at a time. The significance levels of the results were unaffected (e.g. always significant at the 99% confidence level in specification 1a). The computation of marginal effects suggests that at the mean of the covariates, the probability of rescheduling in a given year is reduced by 8.43% if the Constitution of a country contains the confidence requirement on the executive. Regressions 4 to 6 aim at checking whether the result is driven by Latin American countries. The parliamentary dummy continues giving a sizable effect which is significant at the 95% confidence level in most specifications even if Latin American countries are excluded from the sample. Moreover the effect of the confidence requirement is larger than that of the Latin America regional variable - which loses significance in the 1990s.

Further, the POLCONiii variable always has the sign predicted by the theory: more constrained executives are less likely to reschedule. It is statistically significant at the 90% confidence level in 9 of the 12 regressions where it was included (of which 7 at 95%). Finally, the executive turnover variable has the expected sign and is statistically significant in the regressions run for the 1990s. Countries with a higher political turnover have a higher rescheduling propensity. Table 1d is just a replication of the regressions of Table 1a using the DPI classification instead. By and large the results point in the same direction.

It might be conjectured that a check on the executive as concerns debt servicing might come from the judiciary. To check this hypothesis, I instead run the regressions using the POLCONv index, which also takes the alignment of the judiciary and sub-national governments with the executive into consideration (Table 2). By and large, the results do not change. When I used an index only considering the *de iure* and *de*

[26] With all observations included, the quadratic term becomes significant in a few specifications, but with a negative sign.

facto independence of the Supreme Court however, as computed by Feld and Voigt (2002), I found that the effect was not statistically significant, though I obtained the expected sign (i.e. countries with more independent Supreme Courts tend to reschedule less).

The conclusion from the results in Tables 1 and 2 is that parliamentary countries have indeed been less prone to reschedule their foreign obligations *ceteris paribus*. This result is not sensitive to the time period covered, the strictness of the democracy criterion or the classification of borderline political regimes. Further, reschedulings are less likely the lower the political turnover[27] and the higher the political opposition to the executive in the legislature. This casts some doubt on the war of attrition mechanism suggested by Alesina and Drazen (1991). It should be kept in mind that the case against veto players is based on the premise that the incumbent must change the status quo (and will do this in the right direction).

4.2 The Effect of Presidential Term Limits

In presidential democracies, Section 2.4 showed that reelection rules might affect debt policy. First, the implemented policy affects the probability of reelection of the incumbent. I call this the retrospective channel. Second, with rational expectations, the possibility of reelection could affect the policy implemented by an incumbent aiming at reelection. This is the expectation channel.

One estimation issue however is that reelection rules in the group of countries that this paper focuses on may well be endogenous. Carey (2002) provides an interesting account of changes in reelection rules in Latin America and sudden opinion reversals on the issue by incumbents dating back to the times of Simon Bolivar and Juan Domingo Perón. In more recent times, presidents who were not reelectible when taking office managed to change the Constitution and were reelected anyway. This was the case in Peru (1993), Argentina (1994), Brazil (1996) and Venezuela (1999). Other countries, as the Dominican Republic, Nicaragua and Paraguay introduced

[27] Amador (2003) argues that higher political turnover should decrease the likelihood of repudiation as the borrower becomes less capable to accumulate buffer stock savings and operate on a cash in advance basis as in Bulow and Rogoff (1989). I find that political turnover per se increases the likelihood of default.

restrictions on reelections during the same period. Presidential reelections were also banned in South Korea in 1987. In Peru, the president ran for a second reelection in 2000, even though the Constitution forbade it. Although this latter case was probably an exception, term limits may be altered at a lower cost than, for instance, the form of government if there is a legislative super-majority for changing the Constitution. Therefore, I consider it more appropriate to treat written reelection rules as indicators of additional hurdles that must be surpassed for a successful reelection bid, rather than taking them to be necessarily binding.

I identified 86 presidential elections in democratic countries (i.e., countries with an average Gastil index below 5) during the time span covered in this paper by complementing the WB DPI dataset with information obtained from the Journal of Democracy and Election World.[28] 19 of the 86 elections succeeded terms in which there had been an onset of arrears on external debt repayments.[29] The sample has 13 cases of reelection of incumbents. 12 of the 13 officials who were successful in their reelection bids did not accumulate arrears on external debt repayments in their first term in office.[30] This seems to be in line with the *debt-servicing-incumbent-advantage* predicted by the theory in the presence of a stakeholder lobby.

The effect of legal term limits on policy via the expectation channel seems to be weaker. Although I found no unconditional effect of term limits on policy when including the reelection dummy among the explanatory variables, I did find that presidents who were re-electible did not accumulate arrears in the last two years of their term in office when I restricted the sample to countries with an average Gastil index below 4 (34 observations). I also found that the legal possibility of reelection increased the likelihood of arrears at the beginning of a term, although this effect is not statistically significant (p-value=0.109). Hence, there is some weak indication that the effect of legal term limits is to shift the timing of default towards

[28] http://muse.jhu.edu/journals/journal_of_democracy and http://www.electionworld.org respectively.

[29] Where the onset of arrears is defined as a dummy variable indicating an increase in the ratio of arrears/outstanding debt of at least 1%, given that the ratio was not already above 1% in the last year.

[30] The exception was the reelection of Ukraine's president in 1999. Two heads of state among the 12 remaining ones managed to change the Constitution during their first term, in order to become reelectible.

the beginning of the term - when reelection prospects are more heavily discounted by the incumbent. Executives that may run for reelection and do not default at the beginning of their term do not default towards the end of their term either and therefore have higher re-election probabilities (as indicated by the previous paragraph).

4.3 Debt Service Arrears

Table 3 shows the results of a censored tobit regression where the dependent variable is the increase in the ratio of arrears on long term debt to the volume of outstanding obligations. Notice that this sample is somewhat different from that in the previous section. First, I am now restricted to the countries reporting to the GDF. Further, in contrast to the previous section, I do not exclude country-year observations after the onset of arrears, so that each year when the country is accumulating arrears is considered.[31] As for (lagged) explanatory variables, the debt service to export ratio is replaced by the export growth value, since the former variable could be misleading: observed low debt service might simply be the result of a choice not to pay.

The signs of the economic variables are comparable to those obtained using the rescheduling dummy as the dependent variable. The parliamentary regime dummy has the expected sign and is significant in most cases. Also in line with previous results, if anything, more constrained governments are less likely to accumulate arrears on repayments, although this effect is significant only in half of the cases.

4.4 Secondary market

I also take a look at secondary market returns of external bonds issued by emerging economies. For this, I take the monthly returns of the EMBI indices computed by JP Morgan. The index includes liquid external-currency-denominated bonds. The small size of the sample makes it meaningless to run a regression with the usual controls. This is to say that this subsection should only be taken as an additional

[31] Hence, I do not need to arbitrarily define which level of accumulation of arrears constitutes a default.

indication, rather than a conclusive test. Major changes in the international credit conditions should affect the prospective probability of repayment of a country and thus the index. In particular, it might more heavily affect those countries perceived as vulnerable.

Regressing the returns against monthly time dummies, I identify two shocks leading to generalized negative returns in the EMBI index in the 1990s. The first occurred in 1994, when the EMBI index was computed for only six countries - all of them presidential. The second occurred in October 1997, at the climax of the Southeast Asian debacle. By then, the coverage amounted to 20 countries. All but China and Nigeria had a Gastil index below 5. The monthly returns are shown in Figures 4 and 5, where October 1997 is time t.

All 18 countries recorded negative returns in October 1997. The mean return on bonds of parliamentary democracies was -5.8% vs. -10.5% for presidential (medians of -3.6% and -10.1% respectively). Equal means of the returns can be rejected at the 90% confidence level. In particular, the two countries experiencing the smallest negative external bond returns in October (Malaysia and Turkey) are the only ones classified as parliamentary by both the vote of confidence criteria and the DPI classification.

Dornbusch (2001) argues that the Malaysian response to the crisis cannot be fully understood without considering the struggle for power between the Prime Minister, his deputy and the finance minister. He also points out that the relatively smooth ride cannot be attributed to the imposition of capital controls. These were not introduced until September 1998. Although in this case the game seems to have been slightly different from that suggested in the theoretical section, an alternative government seems to have been a particularly credible threat in the episode, in spite of the following reversion to a less democratic environment (as measured by the Gastil index).

4.5 Debt Reversals

Reinhart, Rogoff and Savastano (2003) identify 22 episodes of sharp debt reductions between 1970 and 2000, defined as decreases in the external debt to GNP ratio of at least 25% in a three year interval. 13 of the 22 episodes involved countries qualifying

as democracies at the time, according to the broad democracy criterion used in this paper.[32] Only three of these were Latin American democracies.

In 10 out of these 13 episodes countries reduced their debt stocks resorting to debt default or restructuring. 9 of the 10 restructuring countries are presidential democracies. Jamaica is the only parliamentary case.[33] The three countries managing to reduce external debt without what the authors call a "credit incident" were Botswana in 1976, Papua New Guinea in 1992 and Thailand in 1998. One of the few things that these three countries have in common is that they are all parliamentary democracies. By and large, when looking at debt reversals, the same pattern that was present in the default table emerges:

Reductions in External Debt, 1970-2000

	obs	with "credit incident"	no default
presidential	9	9	none
parliamentary	4	1	3
non LatAm pres	6	6	none
non LatAm parl	3	none	3

4.6 Parliamentary Defaults

The theory also predicts that default is less likely under coalition governments, as the number of veto players increases. To test this hypothesis, I use the information contained in the World Bank DPI, which identifies coalition governments in the group of parliamentary democracies.[34] Only one of the 17 external debt reschedulings (i.e. 5.9%) involving a parliamentary democracy occurred when, according to the database, a coalition government was in place, namely Turkey in 1978. When taking the whole sample, I find that 28.9% of the parliamentary democracies were ruled by coalition governments.

[32] The incidents involving countries with an average Gastil index equal or above 5 were: Chile 1985, Gabon 1978, Iran 1993, Lebanon 1990, Malaysia 1986, Panama 1989, Paraguay 1987, South Korea 1985 and Swaziland 1985.

[33] Using the DPI criteria which classifies Bulgaria 1992 as presidential. The classification is unambiguous for the remaining countries.

[34] I consider a coalition government to be in power when the variable IPCOH takes on values 2 or 3. Note that to be consistent with the database, I consider the DPI based regime classification.

A closer look into the cases of debt rescheduling by parliamentary countries is revealing. If the theory applies, these are likely to be the cases where the institutional mechanisms alluded to in the paper are the weakest among parliamentary regimes.

In the last 25 years only three countries with undisputable parliamentary regimes rescheduled their foreign obligations: Jamaica, Trinidad and Tobago and Turkey. According to the rankings in Kaufmann et al. (2003), these countries are in positions 26, 19 and 25, respectively, among the 28 parliamentary countries of the panel, in terms of control of corruption.[35] As already mentioned, the theory states that the form of government is immaterial to the rescheduling propensity if the office rents of junior coalition members are the overwhelming reason for office. Moreover, in Jamaica, the party of the executive - whichever it was - has never controlled less than 70% of the parliament. Trinidad and Tobago underwent a rescheduling in 1988 at a time when the party of the prime minister controlled 33 of the 36 seats in the legislative house.[36]

The largest parliamentary democracy rescheduling its debts is Turkey, which defaulted on its external obligations in 1977 amidst a period of great political instability. The country had been governed by rapidly alternating coalitions in the previous years. General elections were anticipated from October to June. The default occurred in July amidst a political vacuum after the elections turned out to be indecisive. Celasun and Rodrik (1989) provide a detailed description of the Turkish default. Like Dornbusch (2001), the authors argue that the episode cannot be fully understood without a comprehension of the political scenario, although their focus is on economic issues.

5 Conclusion

Parliamentary democracies have a lower propensity to reschedule their debts and accumulate arrears on repayments. This is confirmed by the data even when developed economies - of which almost all are parliamentary democracies - are not considered.

[35] The point estimates refer to year 2002. The dataset is available at http://www.worldbank.org/wbi/governance.

[36] Although sacked cabinet members were forming a new party ... *to oppose what they regard as a dangerously authoritarian style of government.* (EIU Country Report No.3, 1988).

Furthermore, an increase in the number of veto players appears to reduce the likelihood of credit incidents. This suggests that North and Weingast's checks and balances interpretation extends to present day international debt contracts.

It is important to note that the theory does not say that a presidential democracy will necessarily default at lower repayment burdens than a parliamentary democracy. In principle, nothing precludes a president from holding on to a debt servicing strategy when this is already socially inefficient. In the long run or in a large cross-section of countries, however, there will be more changes in course in the political systems in which more power is vested in the executive and, in particular, debt service is at greater risk in the countries that lack a credible way of linking policy choices to the survival of the executive.

Credibility is a key issue in the debate on international credit flows. While this paper does not rule out that other mechanisms may have influenced the striking difference in debt service outcomes between regimes, it shows that the vote of confidence requirement does enhance the repayment commitment. Further, it rationalizes the fact that there are fewer debt reschedulings in parliamentary democracies in spite of the higher political turnover. Finally, the indications of within regime variation seem to be encouraging for further research on the institutional particularities of debtor countries.

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Appendix A

Assume instead that $\Delta^S < 0$ and $\Delta^P > 0$. If $r \geq \pi \left|\Delta^S\right|$ all senior proposals are accepted. If however $r < \pi \left|\Delta^S\right|$, it will be optimal for a stakeholder to reject $z = 1$. Moreover, a senior stakeholder always proposes $z = 0$, while a senior peasant will propose $z = 0$ if and only if $R \geq \frac{\theta(1-\pi)}{1-\frac{1}{m}} \left|\Delta^P\right| + \frac{1-\theta-\frac{1}{m}}{1-\frac{1}{m}} \left(\left|\Delta^P\right| + R\right)$. With risk-neutrality, and the condition $R \leq \left[\frac{1-\theta-\frac{1}{m}}{\theta}\right] |\Delta^P|$, default is always proposed. Hence, rational investors would never lend if repayment were to fall in this region, since default is certain.

Appendix B

If both types implemented the same policy during their first term, the lobby would not be able to learn the type of the incumbent, making no campaign contributions. The condition that makes it optimal for the stakeholder to propose debt servicing in his first term, given that a peasant proposes default, is

$$|\Delta^S| + \beta \left[p \left(|\Delta^S| + R\right) + (1-p)\,\theta|\Delta^S|\right] \geq \frac{\beta}{2} \left(\left(|\Delta^S| + R\right) + \theta|\Delta^S|\right)$$

which is always satisfied since $p \geq \frac{1}{2}$. Similarly, for the peasant to propose default, we need,

$$\beta \left[p'R - (1-p')\,\theta|\Delta^P|\right] \geq -|\Delta^P| + \frac{\beta}{2}\left(R - \theta|\Delta^P|\right)$$

which implies, $\beta \leq \frac{1}{(1-2p')}\frac{2|\Delta^P|}{R+\theta|\Delta^P|}$. Since

$$p' = \frac{1}{2} - \frac{\theta\,(h\phi)^2}{8}|\Delta^S|$$

, the technical condition reduces to $\beta \leq \frac{8}{\theta(h\phi)^2|\Delta^S|}\frac{|\Delta^P|}{R+\theta|\Delta^P|}$.

List of Countries

	PARL	PARL DPI*	rescheduled ?	from	to		PARL	PARL DPI	rescheduled ?	from	to
Argentina	0	0	y	1983	1999	Lebanon	0	0		1992	1992
Bahamas	1	2		1991	1997	Lithuania	1	0		1994	1999
Barbados	1	2		1976	1999	Malaysia	1	2		1976	1997
Belize	1	2		1985	1999	Malta	1	2		1976	1999
Bolivia	0	0	y	1978	1995	Mauritius	1	2		1977	1999
Botswana	1	2		1977	1999	Mexico	0	0	y	1980	1999
Brasil	0	0	y	1976	1999	Moldova	1	0		1995	1999
Bulgaria	1	0	y	1992	1999	Morocco	0	0	y	1977	1999
Chile	0	0	y	1988	1999	Nicaragua	0	0	y	1988	1988
Colombia	0	0	y	1976	1999	Pakistan	0	2		1976	1998
Costa Rica	0	0	y	1978	1999	Panama	0	0	y	1980	1999
Croatia **	0	0	y	1994	1999	Papua NG	1	2		1977	1999
Cyprus	0	0		1981	1999	Paraguay	0	0		1989	1999
Czech Rep.	1	2		1994	1999	Peru	0	0	y	1978	1999
Dominican	0	0	y	1976	1999	Philippines	0	0	y	1982	1999
Ecuador	0	0	y	1978	1999	Poland	1	0	y	1994	1999
Egypt	0	1	y	1976	1990	Romania	1	2		1992	1999
El Salvador	0	0	y	1977	1999	Russia	0	0	y	1993	1999
Estonia	1	1		1993	1999	Slovakia	1	2		1994	1999
Fiji	1	2		1980	1999	Slovenia	1	2		1995	1999
Greece	1	2		1991	1999	South Africa	1	1		1995	1999
Guatemala	0	0	y	1978	1999	South Korea	0	0		1979	1999
Honduras	0	0	y	1976	1999	Thailand	1	2		1979	1999
Hungary	1	2		1987	1999	Trinidad&T.	1	2	y	1979	1999
India	1	2		1976	1999	Tunisia	0	0		1989	1990
Indonesia	0	1		1999	1999	Turkey	1	2	y	1976	1999
Israel	1	2		1987	1999	Ukraine	0	0	y	1995	1999
Jamaica	1	2	y	1977	1999	Uruguay	0	0		1982	1999
Jordan	0	0	y	1991	1999	Venezuela	0	0	y	1976	1999
Latvia	1	2		1994	1999						

* 0 presidential - 1 semi-presidential - 2 parliamentary. Regime in which country is classified during most of the sampled time is reported.

** Croatia switched to a parliamentary regime in 2000.

Countries were excluded in years for which Gastil index < 5. Only in sample reschedulings with arrears reported.

Summary statistics
Data used in Probit

	# obs	average	std dev	min	max
RESC	726	0.094	0.292	0	1
RES/M	726	0.411	0.369	0.029	2.776
DEBTSER/X	726	0.216	0.156	0.003	0.874
DEBT/GNP	726	0.480	0.357	0.014	3.326
GDPGR	726	3.647	5.281	-30.900	38.200
LA	726	0.466	0.499	0	1
PARL	726	0.515	0.500	0	1
POLCONiii	724	0.351	0.165	0.000	0.655
POLTURN	477	0.196	0.123	0.000	0.600

Correlation matrix

	RESC	RES/M	DEBTSER/X	DEBT/GNP	GDPGR	LA	PARL	POLCONiii
RESC	1							
RES/M	-0.0868	1						
DEBTSER/X	0.2455	-0.0734	1					
DEBT/GNP	0.2832	-0.1637	0.3613	1				
GDPGR	-0.1051	0.1338	-0.0682	-0.0886	1			
LA	0.1732	-0.0112	0.225	0.0502	-0.0900	1		
PARL	-0.2363	0.0336	-0.3748	-0.2038	-0.0082	-0.5022	1	
POLCONiii	-0.1215	-0.0211	-0.0653	-0.1348	-0.0603	-0.1087	0.2106	1

724 obs

Data used in Tobit

	# obs	average	std dev	min	max
INC_ARREAR	809	0.006	0.021	0.000	0.359
RES/M	809	0.406	0.360	0.023	2.776
XGR	809	0.096	0.174	-0.405	2.379
DEBT/GNP	809	0.553	0.514	0.040	5.083
GDPGR	809	3.596	4.840	-14.869	38.201
LA	809	0.489	0.500	0	1
PARL	809	0.476	0.500	0	1
POLCONiii	807	0.346	0.165	0.000	0.655
POLTURN	540	0.197	0.124	0.000	0.600

Correlation matrix

	INC_ARREAR	RES/M	XGR	DEBT/GNP	GDPGR	LA	PARL	POLCONiii
INC_ARREAR	1							
RES/M	-0.0625	1						
XGR	-0.1444	-0.0107	1					
DEBT/GNP	0.1558	-0.1535	-0.0851	1				
GDPGR	-0.1856	0.1319	0.2642	-0.1008	1			
LA	0.1474	-0.0019	-0.0628	-0.0040	-0.1228	1		
PARL	-0.1630	0.0270	0.0337	-0.0886	0.0355	-0.4862	1	
POLCONiii	-0.0835	0.0038	-0.0141	-0.0808	-0.0131	-0.0701	0.2166	1

807 obs

Table 1a - Probit

Dependent variable: rescheduling dummy

	P & T classification							
	1a all	2a all	3a all	4a ex LA	5a ex LA	6a ex LA	7a Gstl<4	8a 90s
reserves/imports	-1.193	-0.915	-1.129	-3.509	-6.024	-5.488	-1.396	-0.811
	3.03***	2.40**	2.82***	3.54***	4.89***	4.08***	2.86***	1.540
debt service/exports	1.939	2.387	2.038	1.721	2.804	2.365	2.418	-0.540
	3.62***	4.69***	3.77***	1.540	2.34**	1.72*	3.66***	0.540
debt/GNP	0.773	0.727	0.721	0.842	0.843	0.822	0.864	0.927
	4.04***	3.87***	3.76***	3.20***	2.97***	2.49**	3.74***	2.94***
GDP growth	-0.043	-0.036	-0.042	-0.031	-0.028	-0.025	-0.076	-0.029
	2.82***	2.34**	2.77***	1.500	1.240	1.040	3.99***	1.560
LA	0.465	0.703	0.507				0.628	0.110
	2.46**	4.02***	2.68***				2.64***	0.420
parliamentary	**-0.836**		**-0.741**	**-1.067**		**-0.605**	**-1.008**	**-1.248**
	3.97* **		**3.45*** **	**3.72*** **		**1.610**	**4.27*** **	**4.21*** **
polcon		**-1.334**	**-0.931**		**-4.886**	**-4.392**	**-1.281**	**-2.023**
		2.62* **	**1.73***		**4.82*** **	**3.63*** **	**1.85***	**2.32*** **
executive turnover								**2.275**
								1.94*
Observations	650	648	648	288	286	286	478	364
Reschedulings	68	68	68	18	18	18	55	24
Pseudo R2	0.319	0.298	0.327	0.356	0.448	0.463	0.399	0.347
Log likelihood	-148.35	-152.82	-146.48	-43.33	-37.13	-36.06	-102.62	-57.73

* significant at 90%; ** significant at 95%; *** significant at 99%. Robust z-statistics are presented. Constant and yea dummies included in all regressions.

Alternative explanatory variables tested: budget surplus (z=0.19), GDP p.c. 1975 (-0.55), current account surplus (0.78), EU candidate dummy (-1.05), export growth (0.85), export of goods and services/GNP (-0.47), debtser**2 (0.22).

Table 1b - Probit

Dependent variable: rescheduling dummy

	P & T classification							
	1b all	2b all	3b all	4b ex LA	5b ex LA	6b ex LA	7b Gstl<4	8b 90s
reserves/imports	-0.859	-0.652	-0.836	-3.983	-5.630	-5.166	-1.217	-0.801
	2.16**	1.71*	2.06**	3.72***	4.52***	3.85***	2.43**	1.480
debt service/exports	2.332	2.722	2.340	2.506	3.171	2.831	3.142	-0.807
	3.96***	5.00***	3.94***	1.84*	2.63***	2.01**	4.03***	0.750
debt/GNP	-0.920	-0.938	-0.581	-2.285	-1.366	-1.345	0.783	2.047
	0.580	0.610	0.350	0.850	0.520	0.480	0.360	2.38**
(debt/GNP)**2	1.743	1.836	1.440	2.585	1.813	1.711	0.576	-0.574
	1.420	1.540	1.120	1.270	0.910	0.810	0.330	1.390
GDP growth	-0.051	-0.043	-0.052	-0.028	-0.031	-0.028	-0.093	-0.033
	2.98***	2.65***	3.03***	1.110	1.070	0.960	4.32***	1.69*
LA	0.415	0.695	0.428				0.490	0.082
	1.96*	3.60***	2.05**				1.640	0.310
parliamentary	**-0.879**		**-0.820**	**-0.838**		**-0.535**	**-1.222**	**-1.277**
	3.42* **		**3.11*** **	**2.52** **		**1.310**	**4.06*** **	**4.23*** **
polcon		**-0.949**	**-0.625**		**-4.056**	**-3.661**	**-1.008**	**-2.139**
		1.570	**0.960**		**3.40*** **	**2.58*** **	**1.240**	**2.46** **
executive turnover								**2.008**
								1.68*
Observations	526	524	524	219	217	217	377	364
Reschedulings	55	55	55	15	15	15	44	19
Pseudo R2	0.321	0.292	0.324	0.358	0.411	0.425	0.408	0.357
Log likelihood	-119.73	-124.67	-118.93	-35.13	-32.12	-31.37	-80.42	-56.84

* significant at 90%; ** significant at 95%; *** significant at 99%. Robust z-statistics are presented. Constant and year dummies included in all regressions.

Table 1c - Probit

Dependent variable: rescheduling dummy

	P & T classification							
	1c all	2c all	3c all	4c ex LA	5c ex LA	6c ex LA	7c Gstl<4	8c 90s
resch previous 10yrs	1.022	0.991	0.998	2.236	1.764	2.161	1.147	1.298
	4.49***	4.69***	4.45***	4.54***	3.85***	4.11***	4.63***	4.05***
reserves/imports	-1.187	-0.936	-1.147	-4.520	-6.650	-6.246	-1.386	-0.921
	2.72***	2.22**	2.61***	3.29***	4.38***	3.62***	2.52**	1.76*
debt service/exports	1.478	1.831	1.539	2.230	3.024	2.489	1.752	-1.194
	2.67***	3.49***	2.76***	1.260	1.90*	1.280	2.63***	1.110
debt/GNP	0.530	0.500	0.482	0.867	0.738	0.497	0.591	0.719
	2.66***	2.63***	2.39**	3.04***	2.44**	1.160	2.42**	1.98**
GDP growth	-0.048	-0.039	-0.048	-0.027	-0.024	-0.020	-0.086	-0.032
	3.32***	2.67***	3.25***	1.000	0.920	0.630	4.49***	1.570
LA	0.130	0.400	0.178				0.251	-0.608
	0.610	2.16**	0.840				0.950	1.93*
parliamentary	**-0.822**		**-0.744**	**-1.487**		**-1.193**	**-0.924**	**-1.320**
	3.85* **		**3.39*** **	**4.00*** **		**2.78*** **	**3.52*** **	**3.75*** **
polcon		**-1.122**	**-0.712**		**-4.485**	**-3.798**	**-0.831**	**-1.743**
		2.21**	**1.320**		**4.89*** **	**3.53*** **	**1.180**	**1.85***
executive turnover								**3.294**
								2.25**
Observations	650	648	648	288	286	286	478	364
Reschedulings	68	68	68	18	18	18	55	24
Pseudo R2	0.374	0.353	0.378	0.555	0.569	0.607	0.452	0.416
Log likelihood	-136.398	-140.847	-135.409	-29.963	-28.993	-26.442	-93.427	-51.682

* significant at 90%; ** significant at 95%; *** significant at 99%. Robust z-statistics are presented. Constant and year dummies included in all regressions.

Alternative explanatory variables tested: budget surplus (z=0.75), GDP p.c. 1975 (0.04), current account surplus (1.42), EU candidate dummy (-0.70), export growth (0.70), export of goods and services/GNP (0.55).

Table 1d - Probit

Dependent variable: rescheduling dummy

	DPI classification							
	1d all	2d all	3d all	4d ex LA	5d ex LA	6d ex LA	7d Gstl<4	8d 90s
reserves/imports	-1.420	-0.915	-1.368	-4.034	-6.024	-5.907	-1.654	-1.243
	3.32***	2.40**	3.14***	2.90***	4.89***	3.67***	3.11***	2.10**
debt service/exports	1.984	2.387	2.056	4.747	2.804	4.804	2.549	0.546
	3.57***	4.69***	3.71***	3.26***	2.34**	2.84***	3.75***	0.570
debt/GNP	0.811	0.727	0.761	0.712	0.843	0.540	0.889	0.864
	4.17***	3.87***	3.92***	2.35**	2.97***	1.280	3.74***	2.58***
GDP growth	-0.034	-0.036	-0.036	-0.012	-0.028	-0.011	-0.069	-0.016
	2.33**	2.34**	2.42**	0.570	1.240	0.420	3.77***	0.930
LA	0.570	0.703	0.580				0.744	0.071
	2.99***	4.02***	3.01***				3.13***	0.240
parliamentary	**-1.010**		**-0.957**	**-2.349**		**-1.949**	**-1.163**	**-1.784**
	5.18* **		**4.89*** **	**4.74*** **		**3.74*** **	**5.02*** **	**4.59*** **
polcon		**-1.334**	**-0.768**		**-4.886**	**-3.900**	**-1.269**	**-2.054**
		2.62* **	**1.460**		**4.82*** **	**2.96*** **	**1.84***	**2.43** **
executive turnover								**2.501**
								2.00 **
Observations	650	648	648	288	286	286	478	364
Reschedulings	68	68	68	18	18	18	55	24
Pseudo R2	0.337	0.298	0.345	0.452	0.448	0.524	0.415	0.390
Log likelihood	-144.47	-152.82	-142.44	-36.88	-37.13	-32.02	-99.77	-53.92

* significant at 90%; ** significant at 95%; *** significant at 99%. Robust z-statistics are presented. Constant and year dummies included in all regressions.

Table 2 - Probit

Dependent variable: rescheduling dummy

	P & T classification								
	1	2	3	4	5	6	7	8	9
	all	all	all	ex LA	ex LA	ex LA	Gstl<4	90s	90s
reserves/imports	-1.193	-1.021	-1.156	-3.509	-3.939	-3.626	-1.443	-0.395	-0.259
	3.03***	2.59***	2.86***	3.54***	3.60***	3.38***	3.04***	0.750	0.420
debt service/exports	1.939	1.800	1.739	1.721	2.114	1.642	2.015	-1.357	0.102
	3.62***	3.33***	3.16***	1.540	1.69*	1.220	2.91***	1.170	0.090
debt/GNP	0.773	0.687	0.716	0.842	0.898	0.883	0.820	1.064	0.958
	4.04***	3.42***	3.58***	3.20***	3.11***	2.80***	3.48***	2.99***	2.28**
GDP growth	-0.043	-0.034	-0.040	-0.031	-0.019	-0.015	-0.073	-0.029	-0.028
	2.82***	2.37**	2.69***	1.500	0.840	0.650	3.95***	1.72*	1.070
LA	0.465	0.830	0.605				0.811	0.215	-0.271
	2.46**	4.70***	3.04***				3.11***	0.770	0.730
parliamentary	**-0.836**		**-0.578**	**-1.067**		**-0.598**	**-0.789**	**-1.045**	**-1.846**
	3.97* **		**2.36** **	**3.72*** **		**1.68***	**2.83*** **	**3.19*** **	**4.74*** **
polcon v		**-0.761**	**-0.428**		**-3.334**	**-2.891**	**-0.203**	**-1.376**	
		2.20 **	**1.100**		**5.45*** **	**4.22*** **	**0.440**	**2.51** **	
de facto judicial indep									**-1.795**
									1.630
executive turnover								**2.123**	**2.546**
								1.87*	**1.66***
Observations	650	586	586	288	270	270	422	330	175
Reschedulings	68	68	68	18	18	18	55	24	24
Pseudo R2	0.319	0.295	0.309	0.356	0.418	0.435	0.435	0.335	0.327
Log likelihood	-148.35	-148.37	-145.35	-43.33	-38.48	-37.35	-101.94	-57.18	-32.83

* significant at 90%; ** significant at 95%; *** significant at 99%. Robust z-statistics are presented. Constant and year dummies included in all regressions.

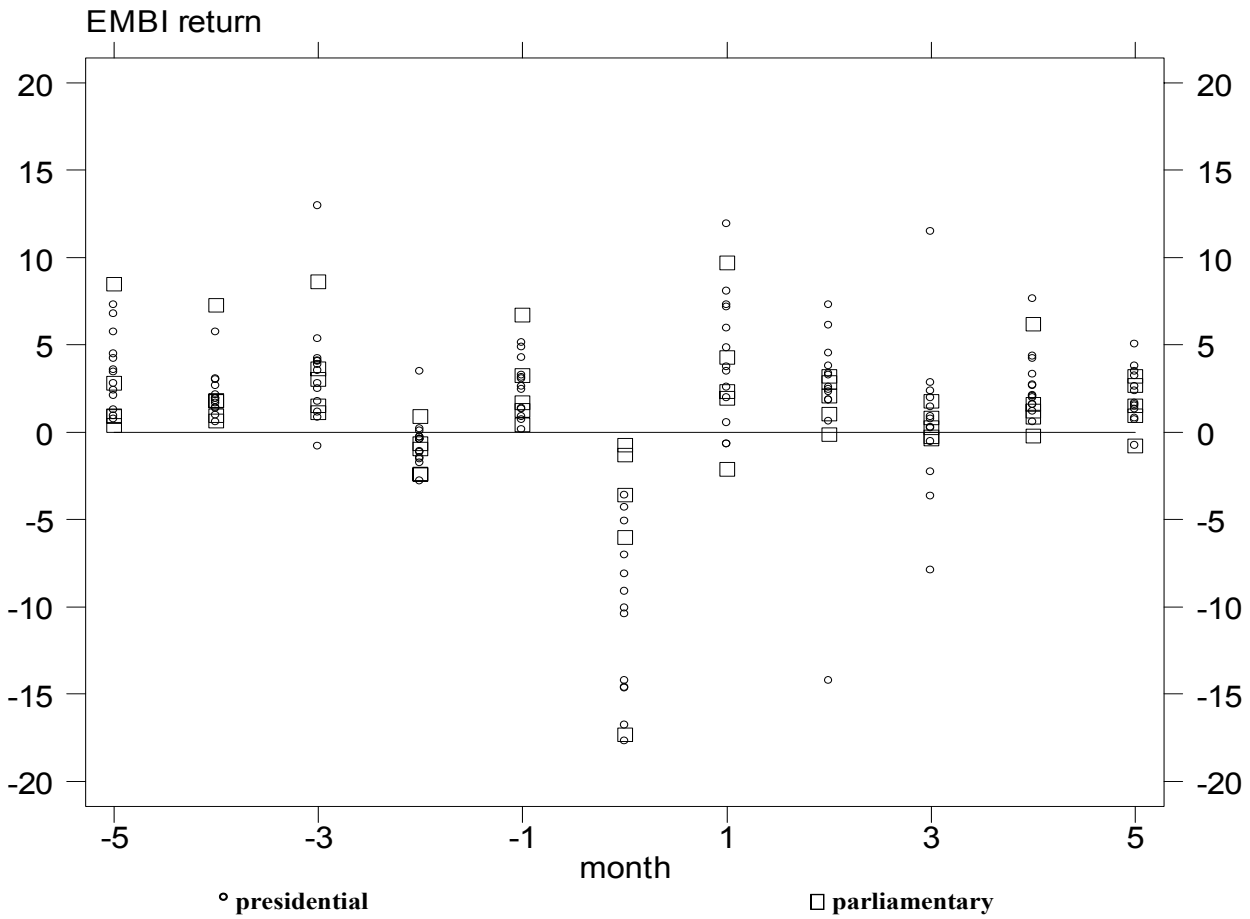
Table 3 - Censored Tobit

Dependent variable: increase in arrears/LT debt

	P & T classification						DPI classification					
	1	2	3	4	5	6	1	2	3	4	5	6
	all	all	all	ex LA	Gstl<4	90s	all	all	all	ex LA	Gstl<4	90s
reserves/imports	-0.002	-0.002	-0.002	-0.003	-0.002	-0.002	-0.002	-0.002	-0.002	-0.001	-0.002	-0.002
	1.42	1.55	1.47	1.71*	1.53	1.55	1.43	1.55	1.48	0.55	1.53	1.38
export growth	-0.012	-0.013	-0.013	-0.020	-0.016	-0.015	-0.013	-0.013	-0.013	-0.021	-0.018	-0.018
	1.69*	1.71*	1.72*	0.97	1.50	0.89	1.71*	1.71*	1.75*	1.05	1.60	0.98
debt/GNP	0.003	0.003	0.003	0.002	0.002	0.008	0.003	0.003	0.003	0.002	0.002	0.007
	2.21**	2.30**	2.20**	1.62	1.73*	1.65*	2.36**	2.30**	2.33**	1.72*	1.81*	1.67*
GDP growth	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
	2.60***	2.51**	2.60***	2.43**	2.95***	2.36**	2.50**	2.51**	2.52**	2.42**	2.92***	2.39**
LA	0.003	0.005	0.003		0.002	-0.001	0.002	0.005	0.002		0.001	-0.003
	1.70*	2.71***	1.76*		1.16	0.71	1.05	2.71***	0.98		0.47	1.28
parliamentary	**-0.004**		**-0.004**	**0.001**	**-0.005**	**0.000**	**-0.007**		**-0.007**	**-0.007**	**-0.008**	**-0.006**
	3.51* **		**3.27*** **	**0.20**	**3.36*** **	**0.21**	**4.18*** **		**3.94*** **	**2.01** **	**3.73*** **	**2.14** **
polcon		**-0.007**	**-0.005**	**-0.017**	**-0.009**	**-0.007**		**-0.007**	**-0.004**	**-0.008**	**-0.009**	**-0.006**
		1.80*	**1.27**	**3.54*** **	**1.83***	**0.96**		**1.80***	**0.90**	**1.03**	**1.88***	**0.82**
executive turnover						**0.002**						**0.007**
						0.36						**1.17**
Observations	798	796	796	405	662	396	798	796	796	405	662	396
Uncensored	254	254	254	69	211	97	254	254	254	69	211	97
Wald	103.2	99.44	104.78	29.77	95.8	26.16	98.91	99.44	102.25	30	96.03	27.57
Log likelihood	-3007.36	-2996.79	-2993.99	-2071.15	-2524.46	-1756.81	-3001.24	-2996.79	-2987.66	-2067.43	-2517.29	-1752.59

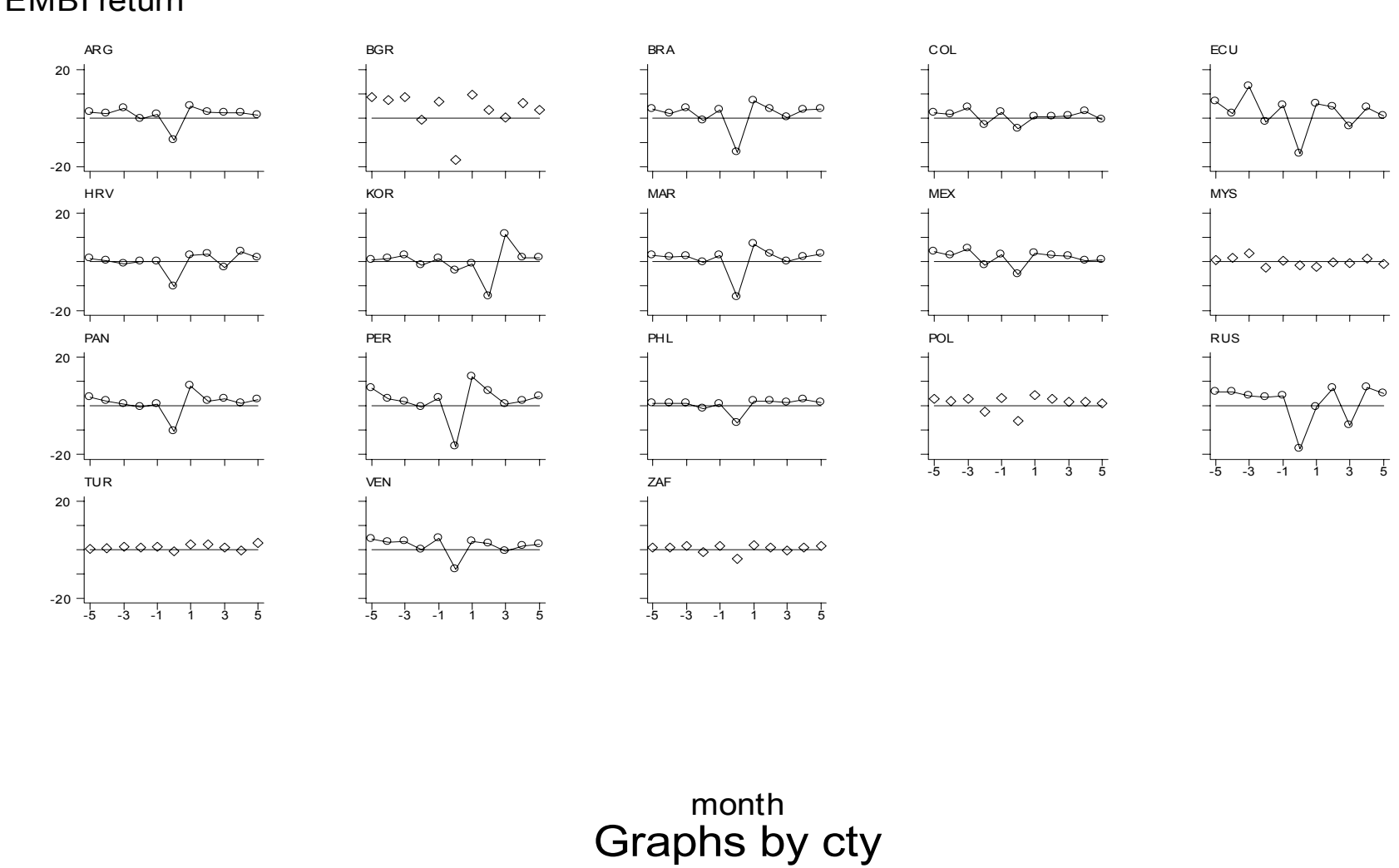
* significant at 90%; ** significant at 95%; *** significant at 99%. Robust z-statistics are presented. Constant and year dummies included in all regressions.

Figure III



cty	Oct-97
TUR	-0.74
MYS	-1.29
ZAF	-3.61
KOR	-3.66
COL	-4.34
MEX	-5.11
POL	-6.03
PHL	-7.08
VEN	-8.16
ARG	-9.16
HRV	-10.11
PAN	-10.44
BRA	-14.25
MAR	-14.64
ECU	-14.67
PER	-16.83
BGR	-17.34
RUS	-17.73
mean PARL	-5.80
median PARL	-3.61
mean PRES	-10.48
median PRES	-10.11

Figure IV


EMBI return
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Chapter 3

Do Constitutional Side Payments Induce Subnational Bailouts? *

1 Introduction

Major Latin American economies have undergone several rounds of bailouts of subnational sovereign debts in the last decade. The Brazilian federal government assumed the debts of the states in 1989, 1993 and 1997. In Argentina, seven provinces were granted a debt bailout between 1992 and 1994 and the central government took over deficit-ridden public pension funds of 11 provinces between 1994 and 1996. Bailout type operations also occurred in 1995 and 2001. Not all operations were explicit, however,[1] and, in some instances, hyperinflation may have been the ultimate bailout that eroded debt stocks. While bailouts of subnational entities are far from restricted to the developing world[2] and could be efficient ex post, the above

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[1] An indication in this direction is the fact that the total deficit of Mexican states has exceeded the sum of increases in indebtness and changes in liquid assets for each and every year since 1989 (Giugale et al.(2001)).

[2] Section 105 of the Australian Constitution explicitly gives the Parliament the prerrogative to assume state debts. State liabilities were in fact centralized in 1927, when the Loan Council was established (Courchene (1999)). In Germany, the Länder of Saarland and Bremen had a bailout commanded by the Constitutional Court in 1992. Seitz (1999) argues that the Länder

mentioned recurrence of episodes in certain countries is striking.

In an attempt to address the perceived soft budget constraints - reinforced by recurring bailouts - several countries have changed the institutional setting for subnational borrowing in the last years. After the financial meltdown at the end of 2001, Argentina's Congress approved a law containing a commitment to the creation of a federal fiscal body and coordination mechanisms for provincial indebtness.[3] In fact, provinces already had to obtain the authorization of *Ministerio de Economía* to perform certain credit operations. However, the Ministry did not actively use the instrument actively, choosing to follow a hands-off approach letting markets discipline borrowers (Webb (2000)).[4] Brazil and Mexico passed laws containing explicit no bailout provisions. Brazil's *Lei de Responsabilidade Fiscal*, enacted in 2000, went as far as precluding any further credit operation between units of the federation. State banks were also privatized or had their credit relations with subnational governments curtailed. Brazilian states are now required to submit new bond issuances to the sequential approval of the Ministry of Finance and the Senate. The Ministry of Finance is only allowed to forward the request to the Senate together with its assessment and vote recommendation if a list of expenditure and indebtness criteria is met.[5]

There is a growing body of literature relating fiscal institutions to fiscal performance. A prominent set of studies can be found in the Poterba and von Hagen (1999) volume. However, the formal treatments have chosen to treat the bailout problem and revenue sharing mechanisms as separate issues. This is hardly surprising given that in most OECD countries the rules for revenue sharing are sufficiently complex in themselves. This paper tries to explore the interrelation between bailouts

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were *too small to fail*, in the sense that their political support was cheap given their political over representation.

[3] Article 7 of Ley 25.570, enacted on May 3rd, 2002.

[4] This may well have been justifiable given that the control is imperfect, since its coverage is not comprehensive. Some authors have argued that a hands-off approach might reduce the perception of federal government backing. This argument seems to be weak since under the Argentinian institutional setting, the hands-off approach in fact meant the approval of all requests.

[5] "Golden rule" limits of indebtness for states and municipalities were defined through the Senate Resolution 40/2001. It establishes that the consolidated net debt shall not exceed two times the net current revenues for states and 1.2 times the net current revenues for municipalities. The President of the Republic may submit a request for the revision of the limits to the Senate in cases of economic instability or changes in monetary or exchange rate policies.

of subnational governments and federal revenue sharing. The basic idea is that the (relatively simple) revenue sharing mechanisms engraved in the Constitution of some Latin American countries might drive the incentives of those who would naturally oppose a bailout policy in the absence of such mechanism.[6]

A subnational debt bailout implies that taxation is shifted from the state to the national level.[7] When the Constitution mandates that a fraction of federal revenues be automatically distributed to the states, federal revenues must be increased by more than the stock of debts shifted to the Union to keep debt servicing current. These excess revenues accruing to the states according to the formula set in the Constitution act as side payments conditioned on a bailout being approved. As transfers are a direct function of federal revenues, states with low debts - that would naturally oppose a shift of the repayment burden of subnational sovereign debt to the central government - might not do so, as this shift ultimately increases their source of income. Hence, in the presence of federal revenue sharing, a debt/GDP distribution skewed to the right is no longer a necessary condition for a bailout to be supported by a majority of states.

The implications of the model may well go beyond Latin American federations. Rodden (2003a) gives an account of the failed attempt of a group of US states to shift its debts to the central government in the early 1840s. He concludes that *"..., one of the best explanations for the defeat of the assumption movement may simply be in the numbers-the majority of states did not have large debts, and outside of Maryland and Pennsylvania, most of the debtor states had small populations."* With no help from a revenue sharing mechanism, the interested parties may have found themselves unable to set up the sizable compensations to less indebted states that would have been needed to make the proposal politically feasible (see Wibbels (2003) for a detailed discussion of the episode).

[6] The discussion of the equity merits of the mechanism is beyond the scope of this paper, which focuses on the incentives it induces. In Argentina, per capita GDP in the province of Buenos Aires is 2.2 times the figure of the province of Jujuy. In Brazil, the average citizen of São Paulo state is a whopping 6.2 times richer than the average citizen of Maranhão, suggesting that there might well be a case for active regional redistribution. As a comparison, the high/low ratio in Canada is 2.

[7] Unless the federal government has the flexibility and willingness to cut back on its expenditures to *fully* absorb the cost of the increased debt burden deriving from it.

Since revenue sharing is the central piece of the paper, a few lines on its implementation should be worthwhile. Argentina's Federation fixed the shares of federal revenues transferred to its 23 provinces in 1988 through *Ley de Coparticipaciones*, after a sweeping victory of the Justicialist party in the provincial gubernatorial elections.[8] The law was promoted to the constitutional level in 1994. 56.66% of the federal revenues collected under the Federal Tax Sharing Agreement are automatically transferred to the provinces while 1% goes to a provincial crisis fund. The origin of the transfer mechanism dates back to 1934. Any alteration of the shares requires the unanimous consent of the president, the Congress and no less than *all* 23 governors and Buenos Aires.

Brazil mainly assured transfers mainly to its poorer regions by writing the rules of the transfers of federal revenues to the states in its 1988 Constitution.[9] 44% of the revenues of the income and the industrial product tax go to a fund where 85% are earmarked for states and municipalities of the relatively poorer North, Northeast and Midwestern regions. Another 3% are allocated to investments in these regions. Within each group, the share of each state is defined by a formula based on per capita GDP, population and area.

Occasionally agreements to reduce the amount to be shared have been reached. The Argentinian central government managed to obtain a 15% reduction in transfers in 1992 and 1993 in meetings with provincial governors. In Brazil, the central government proposed a constitutional amendment where states temporarily waived their right over 20% of their constitutional transfers. The amendment was approved during the launching phase of the Real Plan in 1994 and the reduction was in effect until the end of 1999.

Relation to the literature. Initially drawing mostly on experiences of centrally planned economies, a literature on soft budget constraints has developed. A comprehensive survey of this literature can be found in Kornai et al. (2002). Within this strand, Qian and Roland (1998) studied the problem of bailouts in a federation

[8] The law was approved after the Justicialists (Peronists) obtained 17 of the 22 provincial governorships in the 1987 election, including Buenos Aires. An account of the historical evolution of the arrangement is given by Saiegh and Tommasi (1998).

[9] Poor regions are politically overrepresented in both legislative houses in Argentina and Brazil. In Brazil, the system was introduced by the 1967 Constitution, enacted under the militar regime.

with three types of agents: entrepreneurs, local governments and the central government. Their model highlights the role of fiscal competition among subnational governments in hardening budget constraints for entrepreneurs. An accommodating central government controlling monetary policy may react to the strategic underprovision of public goods by local governments with money creation and distribution of seigniorage. In their model however, a bailout is extended by the central government even if $n-1$ federation units would lose from it, i.e., the political incentives for providing a bailout are not considered.

Another strand of the literature has analyzed interregional transfers in federations. Boadway and Flatters (1982) provide a discussion of the equity and efficiency aspects of a tax equalization system. Although in many countries the primary motivation for revenue sharing seems to be based on equity considerations, most of the literature highlights its potential for efficiency gains via risk sharing (see Persson and Tabellini (1996a), Bucovetsky (1998), Aronsson and Wikström (2003) among others). However, Persson and Tabellini (1996b) pointed out that risk sharing may not be perfectly separable from redistributive aspects if fiscal instruments are limited. The model of Dixit and Londegran (1998) also emphasized redistributive aspects at play within a federation.

This paper explores the intersection of these two strands. Specifically, we look at the bailout problem in an economy possessing federal revenue-sharing, finding that the mechanism affects the outcome in important ways. I analyze the effects of federal revenue sharing on borrowing in the absence of a credible no-bailout commitment and on the credibility of such a pledge itself. The credibility is taken to be conditioned on the demand for such action among federation members. An application of the theory to the institutional setup of the Brazilian federation is shown.

Outline. The aim of the paper is to focus on the cases where a no bailout commitment is perceived as weak ex ante. Section 2 provides a brief account of the negotiations leading to the comprehensive Brazilian bailout of state debts in 1997. Although previous bailouts were followed by statements that such episodes would not be repeated, I argue that there are reasons to believe that such promises lacked credibility since they were not accompanied by institutional reforms. Section

3 presents a model where benevolent politicians with subnational constituencies may decide to transfer state debts to the federal level by a simple majority vote. The effects of this expectation on borrowing are analyzed. Furthermore, the conditions for a pro-default vote for each state are nailed down, highlighting the effect of the revenue sharing mechanism. Section 4 provides an example. Section 5 shows the model to be consistent with some patterns observed in the Brazilian Senate. Section 6 concludes.

2 Background: The Brazilian Renegotiation of State Debts in 1997

The Brazilian Federal Constitution of 1988 - enacted after the end of military rule - was more precise in establishing rights than duties. Among other things, it granted disproportional benefits to public employees that could not be dismissed and were given a generous pension system. Partly as a result of this, the local governments spent an ever increasing share of their budget on wage and pension bills.[10] Furthermore, the 1988 Constitution did not do a great deal to correct the vertical fiscal imbalance in the Brazilian Federation. While state government expenditures accounted for 54% of public consumption in 1996, their participation in revenues amounted to 28%. With the end of rampant inflation in 1994, public deficits that were hidden, among other things due to the continuous erosion of public wages and postponement of payments to contractors, came to the surface.[11] The sky high real interest rates that contained the initial consumption boom of the Real Plan would not help alleviate the problem either. Real interest rates on state debts occasionally reached 40%. This combination proved to be explosive and the majority of states soon found themselves in financial straits. They knocked on the same door as they had done before. Initially the central government responded by extending a credit

[10] The wide cross-sectional variation suggests that this was probably not the only reason, however. In the coastal state of Espírito Santo, the personnel bills alone grew larger than state revenues leading to arrears in wages.

[11] By then, end of term public wage hikes were a widespread practice among outgoing governors. Inflation would make the adjustment for incoming governors easy (public wage reductions and dismissal of public servants were unconstitutional).

line to the financially distressed states through one of its financial institutions, at a 40.6% interest rate. This proved to be a short term solution though.

On April 24th, 1996, 25 state governors, with heterogeneous agendas, went to Brasília to request the renegotiation of their debts.[12] The initial response of the central government to a general bailout was negative. President Cardoso expressed that extending credit and renegotiating state debts would be equivalent *...to give the governors more rope to hang themselves.* Several senators and governors of poorer states voiced their demand for a generalization of the bailout, as the central government engaged in talks with the most indebted states. Pressure grew and stakes were raised in October when governors met in São Paulo and threatened to bypass the Ministry of Finance and take the issue directly to the Senate, where they expected to obtain more concessionary terms. The central government eventually gave in, putting its weight on the long term fiscal adjustment, the compliance with golden rules and reining in the activities of state banks, setting the stage for an institutional overhaul.

Agreement protocols were signed by the states and the Ministry of Finance throughout 1997. However, the Brazilian Constitution sets that the Federal Senate shall *"establish total limits and conditions for the entire amount of the debt of the states, the Federal District and the municipalities"* (Article 52, §IX). In fact, governors had been eager to remind the federal government of the Senate's jurisdiction over the issue at a very early stage. Therefore, the agreements required the Senate's approval as well as the approval of state legislatures to be sanctioned. The protocols typically established that the Union would swap the state's obligations for a 30 year loan made to the state by the National Treasury at a subsidized rate. Assets to be privatized by states were given as guarantees.[13] Under the agreement protocol states would also commit to comply with fiscal targets that would later be incorporated into *Lei de Responsabilidade Fiscal.*[14] The state of São Paulo held 59% of the

[12] The governor of Paraná for instance insisted that the negotiation should be made on a case by case basis. The governor of Rio Grande do Sul, who was already in an advanced stage of discussions with the federal government, wanted to turn the focus to the administrative reform.

[13] Bevilaqua (2000) computes that the 1989, 1993 and 1997 bailout operations amounted to respectively 10.5, 39.4 and 89.3 billion Reais at December 1998 values (1 US$ = 1.23 R$) respectively.

[14] The need to rein in personnel expenditures was also addressed by establishing that they should not exceed 60% of the revenues. The administrative reforms that followed gave the governors some

debt to be renegotiated and was therefore perceived as the pivotal case.

After six months of going back and forth between the Senate's floor and its *Comissão de Assuntos Econômicos*, the agreement allowing the state of São Paulo to renegotiate its debt with the Union was approved on November 20th through a symbolic vote, setting the precedent for other states that would follow. Only two senators voted against the bill: a representative of the state of Paraná who was affiliated to the party of the central government (PSDB) and a representative of the Federal District, who was in the ranks of the main opposition party (PT).[15]

3 A Model with Bailout Risk

3.1 The Institutional Setting

Two features seem to be central in the episode of the previous section: (i) the decisive role of political actors with state level constituencies and, (ii) the necessity of approval of any deal by the Senate, where all federation units are equally represented.

In the model, I will assume that the decision to extend a bailout is taken by a simple majority vote by state governors. This is meant to be an approximation of agreements reached within the informal governor meeting forum or the Senate, where each state/province is represented by three senators.[16]

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means of achieving this aim.

[15] In principle, the partisan alignment of the actors involved could be relevant in the decision to extend a bailout. This does not seem to have been the case however. The striking feature of the political process in Brazil is the lack of party loyalty (see Rodden (2003b)). In my view, party discipline is likely to be even weaker when issues involve strong regional considerations.

[16] As Senators and governors have the same constituency their interests overlap to a great extent. The Senate seems to play a smaller role for this issue in the case of Argentina, where provincial governors tend to dominate the stage. President meetings with governors before proposals are sent to the legislature are a well known feature of the political process in Argentina and Brazil. Informal agreements have been the norm (with the major exception of the fiscal pacts of 1992, 1993 and 1999 in Argentina). This forum is relevant since in both countries state governors have a considerable influence over the representatives in the two legislative chambers. This is especially clear in Argentina, where governors have a decisive role in the formation of party lists, which define the parliamentarians that may seek reelection (see De Luca, Jones and Tula (2000)).

3.2 The Structure of the Model

Consider a two-period economy with a federal government, henceforth called the Union, and n states. Each state is inhabited by one representative agent. All federation units are managed by benevolent governors maximizing the welfare function of their constituency, with $u'(c_t) > 0$ and $u''(c_t) \leq 0$. The governor of province i thus maximizes the welfare function $u(c_1^i)+\beta E u(c_2^i)$, where c_t^i represents the consumption of the citizen in state i. In each period, state i receives an endowment y_t^i from the distribution $F[\underline{y}, \overline{y}]$. States may issue $b_2^i \leq \underline{y}$ one period non-contingent bonds in a competitive market at price q (which is just the inverse of the gross market interest rate). Bonds are redeemed with the proceeds accruing from a proportional taxation on the endowment in period 2 (τ^i). I abstract from principal-agent problems by assuming that proceeds from debt issuance are transferred to the population of the state.[17] The only purpose of taxation at the state level is to repay debt.[18] There is no debt at the beginning of period 1. The golden rule $b_2^i \leq \underline{y}$ ensures solvency in all states of the world, so that there are no risk premia in the model.[19]

Assume that a share μ of national revenues are pooled in a tax sharing fund. State i has a claim on a share σ^i of the fund with $\sum_{i=1}^n \sigma^i = 1$.

In period 2 states have a window of opportunity to shift their liabilities to the federal level with probability π. Hence, a perfectly credible ex ante no bailout commitment is the particular case where $\pi = 0$.

The timing within a period is as follows

I. y_t^i s are observed

II. (period 2 only) with probability π a binding simple majority referendum is held among state governors to decide whether state debts will be shifted to the

[17] The results do not change if I substitute this assumption by a two stage game where governors maximize the proceeds accruing to their states in the first stage and decide on the distribution of income in the second.

[18] What is important in the model is that increased federal debt service expenditures are met by an increase in taxation. This could be due to downward rigidities in federal government expenditures, for instance as a result of a substantial share of federal tax revenues being earmarked for specific uses. Fig. 3 suggests this to have been the case in Brazil in the 1990s: contrary to the revenues of subnational governments, federal revenues as a share of GDP increased markedly between 96 and 99.

[19] This will also be the case if, alternatively, investors expect the federal government to come forth with the payment in case a state does not settle its liability in period 2.

Union. I define the binary variable z where 0 corresponds to no bailout and 1 to bailout.

III. endowments are taxed at the rate $\tau + \tau^i$ and outstanding debt and transfers are paid out

IV. b^i_{t+1} is issued

V. consumption takes place

3.3 (Soft) Budget Constraints

The Union's budget constraint in period 2 will be given by

$$z\left(\sum_{i=1}^{n} b_2^i + \sum_{j=1}^{n} \sigma^j \mu \tau_2 \sum_{i=1}^{n} y_2^i\right) = \tau_2 \sum_{i=1}^{n} y_2^i$$

However, the revenue sharing fund implies that the Union can only use a fraction $(1-\mu)$ of the tax proceeds to honor its debts. The above expression can be rewritten as

$$z\sum_{i=1}^{n} b_2^i = (1-\mu)\,\tau_2 \sum_{i=1}^{n} y_2^i$$

while the state budget constraint will be given by

$$(1-z)\, b_2^i = \tau_2^i y_2^i$$

Note that μ does not appear in the subnational budget constraints. This is the case because revenue sharing does not apply for state specific taxes. For individuals, the constraint at time 2 is

$$c_2^i = \left(1 - \tau_2 - \tau_2^i\right) y_2^i + \sigma^i \mu \tau_2 \sum_{i=1}^{n} y_2^i$$

Since I will focus on a two period economy starting out with no debt, $\tau_1 = \tau_1^i = 0$ and $q_2 = 0$. There are no taxes in the first period and the price of debt issued in period 2 is zero.

3.4 The Optimal Borrowing Strategy

Let λ denote the prior probability of a bailout happening in period 2 (that will be a function of π). λ is taken as parametric since one governor alone cannot affect the outcome. In period 1, the state governor solves

$$\max_{b_2^i} u\left(y_1^i + qb_2^i\right) + (1-\lambda)\,\beta E u\left[\left(1-\tau_2^i\right) y_2^i\right]$$
$$+\lambda\beta E u\left[(1-\tau_2)\, y_2^i + \sigma^i \mu \tau_2 \sum_{i=1}^{n} y_2^i\right]$$

knowing that taxes are set by the budget constraints of the different tiers of government. Substituting for taxes, and taking the first order condition I get

$$qu'\left(y_1^i + qb_2^i\right) = (1-\lambda)\,\beta E u'\left(y_2^i - b_2^i\right) +$$

$$\lambda\beta E\left(\frac{y_2^i}{(1-\mu)\sum_{i=1}^{n} y_2^i} - \frac{\sigma^i\mu}{(1-\mu)}\right) u'\left[\left(1 - \frac{\sum_{i=1}^{n} b_2^i}{(1-\mu)\sum_{i=1}^{n} y_2^i}\right) y_2^i + \sigma^i\mu\frac{\sum_{i=1}^{n} b_2^i}{(1-\mu)}\right]$$

To obtain clearer predictions about the amount of borrowing, I need to specify the utility function. I use the quadratic utility function

$$u(c_t) = c_t - \frac{\gamma}{2}c_t^2 \tag{3.1}$$

where I should ensure that $0 \leq \gamma < \frac{1}{c_t}$ so that $u'(c_t) > 0$ and $u''(c_t) \leq 0$. Note that only the results of this subsection hinge on this specific functional form.

3.4.1 Risk Neutrality

With risk neutrality ($\gamma = 0$) we have

$$sgn\left[\frac{\partial U_i}{\partial b_i}\right] = sgn\left[1 - E\left[\frac{y_2^i}{\sum_{i=1}^{n} y_2^i}\right] - \mu\left(1-\sigma^i\right) + \frac{(1-\mu)\,(q-\beta)}{\beta\lambda}\right] \tag{3.2}$$

If there are no risk premia q equals β so that the last term is eliminated. In the absence of revenue sharing ($\mu = 0$) the derivative is positive and all states will borrow

up to their credit ceiling with certainty, since the second term, which represents the state's share in the expected tax base is less than 1. This is the well known manifestation of the common-pool problem.

Revenue sharing could, at least in principle, revert the sign of the derivative for large states if μ is sufficiently high and the participation rate of the state in the revenue sharing fund, σ^i, is small.

Not surprisingly, the last term says that the scope for a reduction in borrowing would increase if there were positive risk premia on issuances (i.e. $q < \beta$).

3.4.2 Risk Aversion

What predictions can be derived under risk aversion ? Substituting expression (3.1) in the first order condition and assuming that y_2 is i.i.d., so that $E\sum_{i=1}^{n} y_2^i = nEy$, we obtain the optimal amount of borrowing in period 1:

$$b_2^i = \frac{C - qy_1^i + \beta\lambda\left(\frac{\frac{1}{n}-\sigma^i\mu}{1-\mu}\right)^2 E\sum_{j\neq i} b_2^j}{q^2 + \beta - \beta\lambda\left(1 - \left(\frac{\frac{1}{n}-\sigma^i\mu}{1-\mu}\right)^2\right)} \tag{3.3}$$

where C is a constant defined by

$$C = \frac{q}{\gamma} - \beta\left(\frac{1}{\gamma} - Ey\right)\left(1 - \lambda\left(1 - \frac{\frac{1}{n} - \sigma^i\mu}{1-\mu}\right)\right)$$

It is easily seen that if there is a credible ex ante no bailout commitment ($\lambda = 0$) and $q = \beta$, the above expression reduces to

$$b_2^i = \frac{Ey - y_1^i}{1+\beta}$$

This tells us that borrowing is a function of the steepness of the expected income profile of the state and patience.[20] States expecting a high growth rate and impatient states borrow more.[21] If the commitment is credible, the revenue sharing arrangement has no effect on borrowing whatsoever.

[20] That might be a function of governor reelection prospects.

[21] Note that if I relax the condition $q = \beta$, borrowing will also be a function of the relative risk aversion.

If the promise is not credible however ($\lambda > 0$), the situation changes: expression (3.3) shows that state borrowing varies with σ^i. Note that in contrast to the risk neutral case, state borrowing now also depends on expected aggregate borrowing. The expectation of a bailout in period 2 generates two effects: a common-pool problem acting to increase borrowing and a contention effect since states anticipate that they might have to bear the burden of the remaining states in case of a bailout.

3.5 To Bailout or Not to Bailout

How is the prior probability of a bailout λ determined ? State governors in period 1 know that in period 2 each benevolent governor will prefer

$$z \,\epsilon\, \{0,1\} = \arg\max \left(1 - z\tau_2 - (1-z)\,\tau_2^i\right) y_2^i + z\sigma^i \mu \tau_2 \sum_{i=1}^{n} y_2^i$$

After plugging in the budget constraints for the two levels of government I find that the optimal strategy will be to favor a bailout if and only if

$$\frac{b_2^i}{y_2^i} > \frac{1}{(1-\mu)} \left[1 - \mu \frac{\sigma^i}{y_2^i / \sum_{i=1}^{n} y_2^i}\right] \frac{\sum_{i=1}^{n} b_2^i}{\sum_{i=1}^{n} y_2^i} \tag{3.4}$$

According to this expression, demand for a bailout comes from states with a relatively high indebtness and a high participation rate in the distribution of federal revenues relative to their share in expected income.[22] Once μ has been set (written in the Constitution) and the overall subnational indebtness is known, the above expression says that these two state specific statistics are sufficient to define the vote of a state.

In the absence of revenue sharing, a governor votes for a bailout if the relative indebtness of his state is above average. His demand for a bailout increases if there is revenue sharing ($\mu > 0$) and his share exceeds his participation in expected income.

Let I be a binary indicator variable. Since a bailout is determined by simple majority, it is straightforward that the endogenous prior probability of a bailout, λ,

[22] Notice that all that is necessary in this section is $u'(c_t) > 0$.

will be given by

$$\lambda = \pi.prob\left(\sum_{i=1}^{n} I\left[\frac{y_2^i}{\sum_{i=1}^{n} y_2^i} < (1-\mu)\frac{b_2^i}{\sum_{i=1}^{n} b_2^i} + \mu\sigma^i\right] > \frac{n}{2}\right) \tag{3.5}$$

As b_2^i and σ^i are already given at the beginning of period 2, the occurrence of a bailout will critically depend on the expected distribution of income (the tax base) in period 2.

Note that there are two aspects making bailout uncertain, so that non-large states are not automatically led to borrow up to their credit ceiling in period 1. First, there is the risk of there being no window of opportunity to shift debts to the federal tier in period 2. This could, for instance, be considered as a function of the varying political clout of the central government. Second, even if the window of opportunity does occur in period 2, there is the possibility that the expected distribution of the tax base is such that a bailout proposal is rejected.

The model can be described by the system of equations (3.3) and (3.5).

4 Governor Coalitions

Table 1 shows the relative amount of state debts that were renegotiated in the comprehensive Brazilian bailout of 1997. Poorer states, relying more heavily on Constitutional transfers, had a relatively lower debt burden to transfer to the Union as a share of GDP; in fact, more than 90% of the rescheduled amount benefited the four largest states of the federation.[23]

As an example, I build on a stylized case. Consider there to be θn (possibly heterogeneous) borrowing states in the center and $(1-\theta)\,n$ symmetric states in the periphery. The peripheral states do not emit bonds. However, they receive all proceeds from the revenue sharing pool, i.e. $\sigma^i = \frac{1}{(1-\theta)n}$ and $b_2^i = 0$ if state i is peripheral and $\sigma^i = 0$ if it is central. For a central state, expression (3.2) becomes

$$sgn\left[\frac{\partial U_i}{\partial b_i}\right] = sgn\left[1 - E\left[\frac{y_2^i}{\sum_{i=1}^{n} y_2^i}\right] - \mu\right]$$

[23] That account for 65% of GDP, 47% of the population, 15% (4/27) of the seats in Senate and 39% of the seats in Congress.

Hence, an increasing contribution to the revenue sharing pool will restrain aggregate borrowing. However, this effect will solely be driven by the very large central states (i.e., those with a participation in the tax base exceeding $1-\mu$). To see this, suppose that there is only one central state representing 50% of expected future income and that μ is 0.5. At this point, the state would be indifferent to the amount borrowed. Assume that it issues 1 Real in the first period. If debt is shifted to the federal government in period 2, it would only have to pay 0.50 Reais if there were no revenue sharing. However, with μ at 0.5, the central government must set a national tax rate so as to collect 2 Reais, since it can only use half of the proceeds to repay debt. The state would have to pay 1 Real anyway. Hence, if μ exceeded 0.5, the (risk neutral) state would choose not to issue at all.[24]

We now show that the probability of a bailout is itself directly affected by μ. For this purpose, we investigate the effect on political support for a bailout. According to expression (3.4), a central state votes for a bailout if and only if

$$\frac{b_2^i}{y_2^i} > \frac{1}{1-\mu}\frac{\sum_{i=1}^n b_2^i}{\sum_{i=1}^n y_2^i}$$

Hence, among the central states, those heavily indebted favor a bailout. If $\mu = 0$ (no revenue sharing), all those to the right of the mean in terms of debt/GDP do so. As the contribution rate μ increases the number of such states decreases, since a bailout becomes more costly as it involves a side payment to states in the periphery via the revenue sharing device.

In turn, the peripheral state will favor a bailout if and only if

$$\mu\sigma^i = \frac{\mu\theta}{(1-\theta)\,n} > \frac{y_2^i}{\sum_{i=1}^n y_2^i}$$

From this expression it is straightforward that in the absence of a transfer mech-

[24] With the utility function specified in (3.1), it can be shown that a set of sufficient (but not necessary) conditions for $\frac{\partial b_2^i}{\partial \mu} < 0$ is: i) $b_2^i > 0$; ii) $\mu \leq \frac{n-1}{n}$ and iii)

$$Ey < \frac{1}{\gamma} + \frac{2}{n\,(1-\mu)} E \sum_{j \neq i} b_2^j$$

anism ($\mu = 0$), peripheral states would invariably oppose a bailout. Hence, if the proportion of central states is less than 50% a bailout would never go through (i.e. $\lambda = 0$).

Assume central states are also symmetric and n is large, such that a law of large numbers applies. Under this conditions expression (3.5) can be rewritten as

$$\lambda = \begin{array}{l} 0 \text{ if } \theta.F\left[\frac{1-\mu}{\theta}\overline{y}\right] + (1-\theta).F\left[\frac{\mu}{1-\theta}\overline{y}\right] \leq \frac{1}{2} \\ \pi \text{ if } \theta.F\left[\frac{1-\mu}{\theta}\overline{y}\right] + (1-\theta).F\left[\frac{\mu}{1-\theta}\overline{y}\right] > \frac{1}{2} \end{array}$$

Once the stock of debt and the revenue sharing conditions are set, the bailout opportunity will be exercised if and only if the mass of states with a sufficiently low output realization exceeds a critical level.

In summary, federal revenue sharing decreases borrowing and the number of central states supporting a bailout, but increases the number of peripheral states supporting it. The outcome will critically depend on the share μ of federal taxes that go to the revenue sharing pool, the proportion of peripheral states and the expected distribution of the tax base in period 2.

We can state the results as follows:

In the absence of revenue sharing, a bailout could only gain the approval of the majority of states if:

i) central (borrowing) states are a majority AND

ii) the debt/GDP distribution is skewed to the right (i.e., the median is to the right of the mean).

With a federal revenue sharing mechanism, a bailout will be supported by a *"coalition of extremes"* formed by two types of states:

i) non-borrowing states with (representation ratio) $\frac{\sigma^i}{y_2^i/\sum_{i=1}^n y_2^i} > \frac{1}{\mu}$ AND

ii) (central) states with a debt/GDP ratio above $\frac{1}{1-\mu}$ times the average debt/GDP.

5 Taking the Model to the Data

Brazilian politicians seem to have understood the incentives for over accumulation of state debts given the previous record of bailouts of subnational debts. A Constitutional Amendment approved in Congress in 1993 restricted new borrowing. The

amendment prohibited the issuance of new state bonds until 1999, with the major exception of bonds issued to pay judicial claims. Other limitations on new debts were introduced by the Central Bank in 1993 and 1994 (see Bevilaqua (2000)). Given the fact that the accumulation of debt was not driven by market forces, rather being governed by factors beyond the control of state governors - as the level of the interest rate and the ruling of courts - I focus on the decision to extend a bailout taking debt stocks as given.

For this purpose, the key expression is the bailout vote condition, which says that a state representative will vote for a generalized bailout if and only if

$$\frac{b_2^i}{y_2^i} > \frac{1}{(1-\mu)}\left[1-\mu\frac{\sigma^i}{y_2^i/\sum_{i=1}^n y_2^i}\right]\frac{\sum_{i=1}^n b_2^i}{\sum_{i=1}^n y_2^i}$$

In other words, once we have the overall state indebtness as a fraction of the aggregate tax base and the share of federal taxes that goes to the revenue sharing fund, μ, the optimal voting strategy for a representative maximizing the welfare of state i will be completely determined by the debt to tax base ratio of the state and its *expected* share in the revenue sharing fund relative to its share in the national tax base ($\frac{\sigma^i}{y_2^i/\sum_{i=1}^n y_2^i}$). I will refer to the later ratio as the *representation ratio.*

As an exercise, I take a picture of the Brazilian federation as of 1997. I only look at state debts that were in fact renegotiated. They represented over 90% of outstanding state debts at the time and were equivalent to 10.3% of national GDP. I also need an estimation for μ. In 1996, 18.8 billion Reais were pooled in the participation fund of states and municipalities. Federal revenues in the same year reached 91.7 billion Reais, once contributions to social security and FGTS, a state managed severance payment fund for private sector employees whose contributions are tied to workers' salaries are excluded. This means that 20.49% of the federal taxes were pooled into the revenue sharing fund. I take this fraction as a proxy for μ.[25]

Figures 3.1 and 3.2 give a scatter plot of proxies for the two state specific statistics

[25] The fact that not all federal revenues are shared creates an incentive for the federal government to tilt taxation towards non-shared taxes (which, in general, are more distortive). I assume that states expect the central government to resort to non-shared taxes in the future in the same proportion as in the current period. The 1988 Constitution established that 20% of the taxes not defined in it would be directed to the revenue sharing fund.

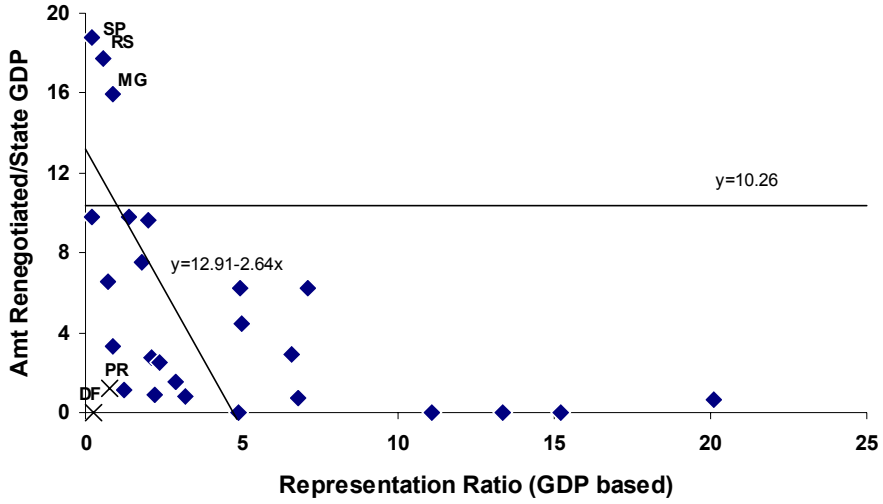

Figure 3.1: Brazil: the 1997 bailout

mentioned above. The corresponding values are shown in Table 1. The largest states of the federation were also the most indebted ones.[26] In the model, y is meant to capture taxable rather than total income. In Figure 3.1 state GDP is used as a *proxy* for taxable income. The horizontal axis represents the participation of the state in revenue sharing benefits relative to its participation in GDP. States with a ratio below 1 are under represented in the fund while states with a ratio above unity are over represented (i.e. are net beneficiaries of the revenue sharing mechanism). State GDP is likely to be a rather crude proxy for taxable income however. Figure 3.2 replots the graph using the states contribution to federal revenues in 1996 instead of its share in national GDP to obtain the *representation ratio*.

[26] In contrast, the poorer provinces have resorted relatively more to the accumulation of debt in the Argentinian federation (see Fig. 3.4). A generalized bailout in Argentina would clearly be associated with an amplified redistribution from the central to the peripheral provinces. It extracts resources from the center through two channels: (i) by shifting the debt burden and (ii) by creating an additional transfer to the periphery due to revenue sharing. In this setting, the side payment implied by the revenue sharing mechanism is likely to be redundant: it accrues to provinces that would have supported a bailout anyway. Contrary to Brazil, where the Senate has a prevalent role on the issue, provinces with more political clout (higher participation in Congress) could influence the outcome despite being in minority.

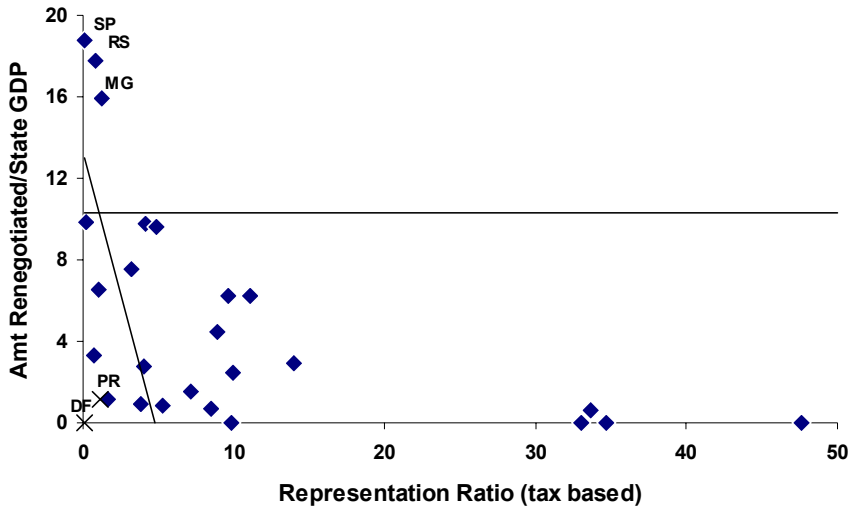

Figure 3.2: 1997

Taking the cross sectional picture in 1996, I implicitly make the assumption that state politicians did not expect a major regional reshuffle of the tax base relative to the prevailing situation at the time. This first approximation could be substituted by tax base growth estimates for the 27 states of the federation if they were available.[27] Table 1 also lists the actual percentage contributions to federal revenues for the five year period starting in 1997. The contribution shares to federal revenues increased for only five states: the Federal District (64.1%), Roraima (16%), Paraná (9.3%), Rio de Janeiro (5.7%) and Amapá (4.5%). It turns out that the changes in the period following the bailout were insufficient to change the broad picture presented in Figures 3.1 and 3.2.

The horizontal dotted lines in Figures 3.1, 3.2 and 3.4 represent the average renegotiated debt/state GDP in the respective federations.[28] In the absence of

[27] Remember that expression (3.5) tells us that the endogenous probability of a bailout will also be a function of these expected growth rates.

[28] Note that it is not important if the debt is immediately redeemed by the federal government. Any subsidy proportional to the renegotiated amount implies nothing more than a rescaling of the vertical axis. Such rescaling does not affect the political support for a bailout.

To be accurate, however, the expected evolution of the representation ratios (that are primarily

revenue sharing, states below the dotted line would lose from a generalized bailout. If, as assumed in the model, a bailout is driven by politicians with subnational constituencies, a general bailout would have seemed extremely unlikely in 1997, since it would only have been supported by three states.[29]

Revenue sharing brings a new dimension into the analysis. As shown by the analysis in Sections 3 and 4, the vote of a state not only depends on its relative indebtness statistic but also its expected over- or under-representation in the revenue sharing fund, relative to the tax base. Using the estimates of μ and overall state indebtness we obtain the diagonal indifference lines of Figures 3.1 and 3.2. Only states within the triangle formed by the intercepts of this line and the origin are predicted to oppose a generalized bailout. Instead of 24 out of 27 states opposing a bailout, as would have been the prediction in the absence of revenue sharing, I have 12 states opposing a bailout if we compute the tax base embedded in the representation ratio using state GDPs. If instead I proxy the tax base by the participation in federal revenues and plug in the parameters of Table 1 in equation (3.4) I find that only 7 states of the 27 states would object to a bailout proposal (see Figure 3.2). The bill would easily go through the Senate. Interestingly, the state-specific statistics would also have predicted the approval of the bailouts of 1989 and 1993. Without revenue sharing however only the latter would have been approved as the 1993 distribution of renegotiated debt/state GDP was skewed to the right.

Some authors have argued that the state of São Paulo may have been too large to fail. Models like Wildasin (1997) provide a theoretical underpinning for such argument. This prediction is not unambiguous however. For instance, the model of Sanguinetti and Tommasi (2001) for instance implies the contrary.[30] Moreover, small federation units are often politically overrepresented. To address this concern, I considered the alternative hypothesis that it was common knowledge that a share

driven by the state specific expected growth rates) should be considered, with horizons given by the expected repayment stream of the federal debt.

[29] Since the minority includes the largest states/provinces, an alternative interpretation of the figures could be that their position is the key determinant of a bailout. At least in Brazil this seems unlikely since the policy had to be voted in the Senate.

[30] Wildasin's model focuses on positive externalities produced by local public goods. Sanguinetti and Tommasi emphasize that smaller units internalize a smaller fraction of the cost, thus being more prone to overspending and bailouts.

of the debt of São Paulo - of which part was owed to its beleaguered state bank Banespa - would have to be assumed by the federal government anyway.

The table below shows the number of states (out of the 27) that would have been predicted by the theory to oppose the 1997 bailout if we consider that all Senators took it for granted that $x\%$ of São Paulo's debt would have to be assumed by the federal government. By taking the revenue sharing mechanism into consideration, the opposition to a bailout decreases from between 21-24 to 6-7 states. Hence, even if the state of São Paulo were perceived as too large to fail, we would still not have a plausible explanation for the approval of the general bailout in Senate.

Predicted Number of States Opposing a Bailout Proposal

x	without RS	with RS
0	24	7
25	24	7
50	21	6
75	21	6

Senators seem to understand that there is little to gain by casting a dissenting vote in measures favoring other states of the Federation when the outcome is clear.[31] Even so, as noted in section 2, two senators expressed their negative votes on the symbolic approval of the precedent-setting-debt-agreement of São Paulo state when it finally reached the voting floor of the Brazilian Senate in November 1997. They represented the state of Paraná and the Federal District. The theory presented predicts that the states they represented were the two most likely states to oppose a bailout at the time: they are identified by the crosses in Figures 3.1 and 3.2. These are the states furthest from the indifference line, i.e., those whose support for a bailout would be most expensive to buy through compensating deals. According to the theory, states with such a locus are the least likely to take part in a "coalition of extremes" since they do not benefit from a generalized bailout in either dimension: neither via debt relief nor via increased income through constitutional transfers.

[31] Following another vote related to the debt of the São Paulo state, a well known Senator of the state of Santa Catarina commented "*I did not oppose it so that people won't say I am against governor Mario Covas [of São Paulo].*"

The likelihood of two randomly selected Senators belonging to the two most bailout adverse states is no more than 0.46%. These states also happened to be among the few that increased their contribution to federal revenues in the period 1997-2001 (as can be seen in Table 1).

6 Conclusion

The driving forces in the model are constitutional variables that typically showing little variation across time, like the number of subnational units, the share of tax revenues funneled into the revenue sharing pool and the participation of each state in it. In this sense, it might be concluded that the main determinant of bailout propensity in a country is history. The record of previous bailouts, once established, would tend to reinforce the effects of the underlying constitutional parameters given by the past.

The main point of the paper is that there is more than simple debt transfer in a bailout when a revenue sharing mechanism is in place. It was shown that a federal revenue sharing mechanism might well scale back the amount borrowed by states in the center, since they anticipate costly transfers to the periphery. However, the political support for a bailout however can increase drastically in the presence of revenue sharing, since the mechanism provides side payments to the opponents of a bailout. The paper provided some evidence that this highly stylized model is consistent with the observations in the Brazilian Federation. In particular, it rationalizes the approval of the state debt bailouts by the Brazilian Senate with senators individually maximizing the proceeds accruing to their political constituencies. It could also explain the historical slackness of the Brazilian Senate borrowing authorizations without the necessity of vote trading. Revenue sharing could ease logrolling in chambers where states are equally represented. Specifically, the mechanism is not plagued by the typical enforcement problems involved in vote trading, since rules have (accidentally) been written in the Constitution.

By having a national constituency, the central government internalizes the externalities induced by the expectation of a bailout. In principle, it could try to induce states to more cooperative borrowing behavior. The first best way of proceeding

would be to eliminate any expectation of a bailout. Until such a commitment is perceived as credible, subnational borrowing controls imposed at the federal level will constitute a justifiable helping hand to markets in their disciplining role. However, borrowing controls pose some policy challenges for the Ministry of Finance (and the Senate in the Brazilian case). Specifically, an authorization policy should not be a deterministic continuous increasing function of the requested amount.[32] If such was the case, states could easily undo the control by inverting the function, using the desired amount to be borrowed as argument to decide on the amount to be requested. Furthermore, if the objective is to avoid a generalized bailout, controlling the level of indebtness of federation units alone might not necessarily be the only policy instrument. As suggested in Section 4, the distribution of state debt to the expected tax base ratios and the ratio of the participation in revenue sharing to the share in taxable income statistics could in principle be instrumental in curtailing the demand for a bailout and strengthening the credibility of a no bailout commitment.[33]

One obvious way of eliminating the effects of the side payments conditioned on bailout is to make them unconditional. This could be done by extending the coverage of revenue sharing so as to include local tax revenues. Such extension, however, is likely to aggravate the common pool problem as states will have little incentives to raise their own taxes.[34] Side payments conditioned on bailouts will be present as long as local and federal taxes are not shared at exactly the same rate (and do not apply to the same tax base).

This simple model is highly stylized and abstracted from a number of considerations to focus on issues believed to be important in some Latin American federations. I have focused on redistributive aspects and emphasized the demand side for a bailout. The principles are general, however, and the conditions derived are easily adaptable to evaluate the political support for a bailout in any country with revenue sharing. The decision structure could easily be adapted to country specific institutions. Local authorities might be weighted by the size of their electorate (if

[32] Like, for instance, the authorization of a fixed proportion of the requested amount.

[33] Specifically, one would like to have as many states as possible within the boundaries of the "no bailout triangles" of Figures 3.1 and 3.2.

[34] At first sight the bailout record of Sweden, with its tax equalization mechanism, suggests little encouragement for such venue. Pettersson-Lidbom and Dahlberg (2003) provide an empirical analysis of about 1,700 bailouts of Swedish municipalities between 1974 and 1992.

bailout is decided upon by politicians with national constituencies) or the number of seats in the parliament.

A number of extensions could be possible. One that might be worth considering is the case where the central government has its own incentives to supply a bailout. Such extension would introduce strategic behavior and moral hazard type considerations into the setting. Another line that might be pursued would be to introduce a principal-agent problem. Shifting debt to the federal level leads to an increase in overall taxation due to revenue sharing. If politicians obtain disproportional benefits from larger budgets, a bailout may be a way of achieving over taxation relative to the preferred tax rate of voters, making it less transparent which government tier is to be blamed for the difference.

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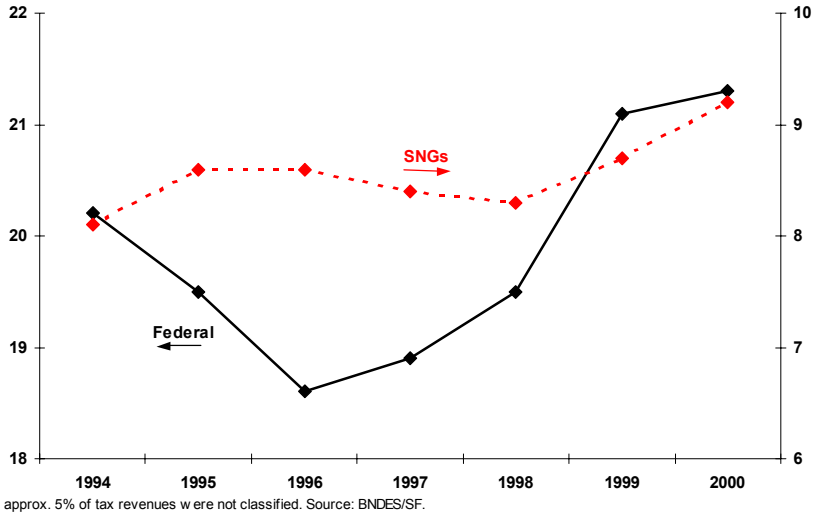

Figure 3.3: Brazil: tax revenues (as percentage of GDP)

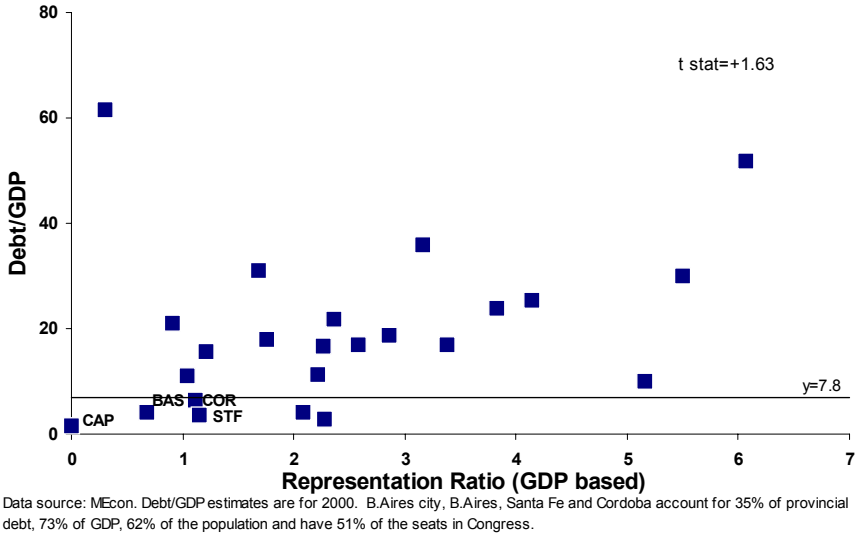

Figure 3.4: Argentina: provincial indebtness

Table 1		% Participation FPE & FPM 1996 (A)	% Constitutional Transfers in State Disposable Revenues	% of National GDP 1997 (B)	% Contribution to Federal Revenues		Ratio		Amount Renegotiated 1997 (% of State GDP)
					1996 (C)	1997-2001	(A)/(B)	(A)/(C)	
Acre	AC	2.00	86.1	0.15	0.06	0.05	13.37	34.70	0.00
Alagoas	AL	3.26	54.4	0.67	0.33	0.24	4.89	9.86	0.00
Amazonas	AM	2.04	22.0	1.65	1.25	1.09	1.23	1.63	1.17
Amapá	AP	1.91	86.3	0.17	0.06	0.06	11.07	33.03	0.00
Bahia	BA	9.03	29.9	4.25	2.25	2.12	2.12	4.01	2.77
Ceará	CE	6.48	40.9	2.02	1.22	0.99	3.20	5.29	0.84
Distrito Federal	DF	0.61	6.0	2.29	5.21	8.55	0.27	0.12	0.00
Espírito Santo	ES	1.65	10.6	1.86	2.27	1.80	0.88	0.72	3.28
Goiás	GO	3.30	18.4	1.84	1.04	0.97	1.79	3.17	7.57
Maranhão	MA	5.61	65.0	0.85	0.40	0.30	6.60	13.96	2.89
Minas Gerais	MG	8.68	8.4	10.01	6.86	5.50	0.87	1.26	15.95
Mato Grosso do Sul	MS	1.46	18.8	1.07	0.36	0.28	1.37	4.12	9.78
Mato Grosso	MT	2.12	22.0	1.06	0.43	0.38	2.01	4.88	9.65
Pará	PA	4.87	46.2	1.69	0.68	0.55	2.89	7.13	1.56
Paraíba	PB	4.02	53.4	0.80	0.45	0.37	5.00	8.90	4.43
Pernambuco	PE	6.03	33.0	2.70	1.57	1.36	2.23	3.84	0.92
Piauí	PI	3.43	62.3	0.48	0.31	0.22	7.11	11.08	6.23
Paraná	PR	4.82	10.1	6.06	4.14	4.53	0.80	1.16	1.19
Rio de Janeiro	RJ	2.38	3.1	11.22	14.55	15.39	0.21	0.16	9.81
Rio Grande do Norte	RN	3.29	51.1	0.48	0.39	0.32	6.81	8.49	0.73
Rondônia	RO	1.82	40.1	0.77	0.18	0.17	2.36	9.94	2.48
Roraima	RR	1.39	84.9	0.07	0.04	0.05	20.11	33.65	0.63
Rio Grande do Sul	RS	4.55	6.0	7.95	5.51	4.99	0.57	0.82	17.77
Santa Catarina	SC	2.56	6.6	3.66	2.38	1.98	0.70	1.07	6.54
Sergipe	SE	2.72	57.7	0.55	0.28	0.25	4.94	9.60	6.22
São Paulo	SP	7.03	0.5	35.48	47.69	47.43	0.20	0.15	18.75
Tocantins	TO	2.97	77.9	0.20	0.06	0.06	15.22	47.58	0.00

Sources: IBGE, Secretaria do Tesouro Nacional, Secretaria de Receita Federal and Bevilaqua (2000).
Federal revenues collected by Secretaria de Receita Federal in 1996 amounted to R$ 91.7 billion (excludes Social Security and FGTS).
R$ 18.8 billion were redistributed through FPE and FPM.

Chapter 4

Sovereign Debt Recontracting: The Role of Trade Credit and Reserves *

1 Introduction

Access to short-term trade credits has often been pointed out as key for understanding why countries repay their debts if not for reputational considerations alone. In his 1999 survey Rogoff noted that *The strongest weapon of disgruntled creditors, perhaps, is the ability to interfere with short-term trade credits that are the lifeblood of international trade* (Rogoff (1999, p. 31). Nevertheless, short-term trade credits have not been formally incorporated into the sovereign debt literature.[1] This paper tries to bridge this gap. Although we are not aware of a study that quantifies the effects of trade finance on sovereign lending, a few papers do suggest that the effects are of first order. One such study is Rose (2002), that has found empirical support for the hypothesis that the downside of a non repayment strategy comes through the trade channel: changes in international debt contracts are generally followed by sub-

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[1] The seminal paper of Bulow and Rogoff (1989a) incorporated retaliatory trade measures into the literature. The paper does refer to the importance of trade credits in its introduction.

stantial reductions in trade flows between the creditor and the borrowing country.[2] The study mentions the use of retaliatory trade measures and reductions in the trade credit availability as candidate explanations for the means by which the fall in trade flows might come about. As an increasing number of countries are becoming WTO members and there is no exemption clause to the non-discrimination principle related to debt issues in the GATT articles, the scope for retaliatory measures, seems to be rather narrow. Moreover, with multiple creditors each of them individually might be tempted to free ride and let other creditors incur the costs of punishment (Wright (2002)). No such legal impediment applies to trade credit however, which occurs on a voluntary basis and often comes from governmental trade agencies and private banks - most of which are also creditors in other types of lending operations with the borrowing country.

By introducing an explicit role for trade credit, we obtain two basic insights for the role of international reserves. First, we highlight a rationale for borrowed reserves that relies on the potential provision of liquidity services in the event of a cutoff from short-term trade credit during debt renegotiations. The model thus provides an explanation for why developing countries often hold substantial stocks of reserves in spite of the fact that their external liabilities carry a considerably higher interest rate. Rather than appealing to transaction costs (which are unlikely to be important in the case of central banks) to explain such holdings, the model recognizes that reserves are not necessarily dominated in rate of return if in some states of the world the borrower retains some portion of reserves while rescheduling or repudiating external debt.

Second, we find a theoretical underpinning for anecdotal evidence suggesting that the terms of actual rescheduling agreements may be sensitive to the ability of the creditors and the country to 'wait out' a bargaining process. From the borrower's side, time pressure comes from the fact that short-term trade credit may dry up during the period in which outstanding loans are in default. In our model, the country's liquidity demand during a renegotiation can only be met by pre-existing reserves. International reserves therefore directly affect the bargaining position of

[2] Another paper, by Rose and Spiegel (2002), finds that there is more lending between countries that trade more.

debtors during a debt renegotiation, by reducing the country's degree of impatience to reach an agreement. Similarly lenders may face time pressure deriving from accounting practices that impose a cost on the bank if loans remain in arrears for sufficiently long.

Two considerations imply that higher reserves shift bargaining power towards the borrower. First, although international reserves do not provide net wealth *ex ante*, since they are offset by external liabilities, they do provide net wealth in the event of a repudiation as a result of partial attachability. Hence, a higher stock of reserves increases the credibility of the borrower's threat to walk away from the negotiation table. Second, while reserves and trade credits are perfect substitutes when the latter is available, reserves may provide liquidity services in case of repayment problems until an agreement that restores the borrower's access to short-term credit markets is reached. A borrower with reserves is therefore less impatient to conclude a rescheduling negotiation. Further, borrowed reserves allow the borrower to shift some consumption from a high-consumption state, associated with debt repayment, to a low-consumption state, in which debt is rescheduled (van Wijnbergen (1990)). Thus, they constitute one additional channel through which risk may be shifted from (probably less risk averse) lenders to borrowers.

Our model could help explaining why in some instances countries with sizable foreign reserves obtain concessions from creditors.[3] In the beginning of 2001, after its reserves had tripled to $24bn in the previous year, the Russian government tried to pursue a hard line with its creditors, of which Germany was the principal, by declaring a *technical delay of repayments*.[4] The timing coincided with ongoing negotiations with the German government over some $6.4bn worth of 'transfer roubles' - an artificial currency used for trade in Soviet times. The sovereign analyst of the rating agency Standard and Poor's commented the Russian threat of default by noting: *They are not desperate for funds, that obviously strengthens their position.*[5] Following discontinuation of debt service, Germany responded by withholding new

[3] Earlier examples in which the comfortable liquidity position was cited to have strenghtened the borrowers bargaining position include Argentina in 1984 (Dornbusch (1984)) and Venezuela in 1986 (see "Unsung Debtors" in The Economist, September).

[4] The first creditor affected was the German export credit guarantee group Hermes, that did not receive repayments on Soviet-era borrowings. (Financial Times, Jan 6th, 2001)

[5] *In "Russia's Threat of Default", FT, Jan 5th, 2001.*

export credit guarantees to Russia. Although the overall success of the Russian strategy is an open issue, Germany settled one year later for $440m, at the same time agreeing to raise the insurance cover of business relations with Russia.

Relation to the literature. The model assumes that the country assets, i.e., its exportable output and international reserves, can be partially seized in the event of repudiation.[6] With rational expectations and perfect information however, asset seizures do not occur in equilibrium and deadweight losses are avoided (Eaton and Engers (1999)). Nevertheless, the possibility of seizures clearly defines the threat points, shaping the outcome of the bargaining process.[7] By assuming partial attachability of the exportable good the model resembles more Bulow and Rogoff (1989a), who consider that a fraction of export proceeds may be attached, rather than Eaton and Gersovitz (1981) or Bulow and Rogoff (1989b) where the rationale for repayment is based on reputational aspects alone and non-repayment is punished with permanent exclusion from international credit markets. In our model however, all that creditors effectively do in case of default is to withhold voluntary short-term trade credits, even though it is understood that they could attach a fraction of the borrower's assets.

Outline. The paper is organized as follows. Section 2 outlines the model. Section 3 analyzes the bargaining game that begins at the moment output is realized and debt service is due. Following the approach of Rubinstein (1982), a unique Nash equilibrium is found by exploiting the relative impatience of bargainers and the requirement that all threats be credible (i.e., the equilibrium is perfect). Section 4 scrutinizes the borrower's choice between repayment and rescheduling. The model implies that the borrower has an incentive to accumulate gross reserves even though such balances would be an inefficient source of liquidity if debts were always repaid. Section 5 studies the reserve accumulation process by endogeneizing long-term borrowing in advance of a potential rescheduling. We show that competitive

[6] Alternatively, one could assume that an attempt to attach assets in court is successful with probability $\nu > 0$. This would not alter the implications of the paper. Note that international reserves are not necessarily restricted to reserves held by the central bank.

[7] In practice, attachments have occasionally occurred during debt renegotiations. Delaume (1994) discusses attachability in the context of sovereign debt defaults and Wright (2002, p.35-37) provides an account of the recent legal battle between the Swiss Compagnie Noga d'Importacion et d'Exportacion and the Russian government.

lenders do provide long-term finance not only for investment projects, but also for accumulation of international reserves. We conclude by discussing some empirical implications of the model and directions for further research.

2 The Model

The model is a hybrid of a two-period model and an infinite horizon model. At time zero the borrower enters a competitive loan market in which a large number of risk-neutral lenders compete to provide funds. Banks are assumed to maximize expected profits discounting at rate r, that is taken to be less than the country leader's (henceforth country's) rate of time preference, δ. Competition drives expected profits to zero.

2.1 The Technology

There are three goods. Since trade is central to the story, we assume that the only consumption good is an importable good that is not produced locally and is the international numeraire. The other two goods are exportables that accrue to the country in period 1. The borrower has three sources of the importable good for consumption: i) international reserves, which are deposits in foreign banks paying a risk-free real return of $\rho \geq 0$; ii) a storable export good that is the output of the investment project and has price 1 in terms of the importable; iii) a perishable export good that accrues to the country as a constant endowment stream of y per period (hy over any interval of length h), starting in period 1. The perishable export good can be traded internationally at price p. Since exportable goods are only obtained in period 1, the country has to borrow to be able to consume, invest in a risky project or accumulate reserves in period 0.

The production technology of the storable exportable good requires one unit of the imported good as input at $t = 0$, giving a stochastic output $Q(s)$ at $t = 1$, where s is a discrete random variable with finite support whose probability distribution is common knowledge. To keep things simple, we will assume that the country has no further need for project finance upon completion of the investment project.

Note that since one exportable good is perishable, it must be traded immediately,

with the proceeds either consumed or added to reserves. Also, we assume that the country cannot convert the output from the investment project into reserves during a debt renegotiation. This condition is satisfied endogenously as long as creditors can penalize reserve holdings more strongly than output, or as long as any attempt to sell the output is interpreted as repudiation, triggering attachment of a share of reserves and output.

2.2 The Borrower

The country's preference at time 0 is given by

$$U_0 = u(c_0) + \beta E v(W_1) \tag{4.1}$$

where $u(.)$ and $v(.)$ are twice differentiable, concave functions and W_1 represents an index of future consumption. The expectation in (4.1) is taken over the probability distribution of output from the investment project. Concavity of the utility function implies that the country will wish to insure against variability of W_1 deriving from the stochastic production technology.

Although the two period structure in (4.1) is all we need to study the insurance role of reserves, we want actual debt service on the original loan to be determined by a time consuming bargaining process. We therefore treat W_1 not as a consumption in a single terminal period, but as a measure of consumption over the indefinite future. In order to get closed form solutions, we assume that the borrower is risk neutral from time 1 onwards. At $t \geq 1$, then, the borrower maximizes the present value of consumption, W_t, given by

$$W_t = \sum_{i=0}^{\infty} \left[\beta(h)\right]^i c_{t+hi} \quad , \quad t \geq 1 \tag{4.2}$$

where $\beta(h) = \frac{1}{1+\delta h}$ is the country's discount factor and h will coincide with the interval between alternate proposals during a debt renegotiation (the dependence of β on h will be suppressed when this can be done without confusion). The country therefore maximizes utility over an infinite horizon, although at time 0 all that is

relevant is the expected discounted value of future consumption.[8]

2.3 Trade Finance and Sanctions

Assumption. *In the absence of external short-term trade finance,* $p(R) \epsilon [p(0), 1]$, $p'(R) \geq 0$, $p''(R) \leq 0$ *and* $p(0) > 0$ with $\lim_{R\to\infty} p(R) = 1$. *If external short-term finance is available,* $p = 1$.

This assumption is intended to capture the potential liquidity services of international reserves. We take a reduced form approach, letting a more careful analysis of the micro-economic foundations for future research. The assumption implies that, when the borrower is cutoff from external short-term trade finance, its terms of trade are an increasing, concave function of the stock of reserves R.[9]

The dependency of terms of trade on liquidity gives the lenders the ability to harass a recalcitrant borrower by interfering with its access to short-term trade credit during a debt rescheduling process. Lenders have an incentive to limit availability of short-term credits to the country as much as possible, since by doing so they increase the borrower's impatience to reach an agreement. In what follows, we assume that lenders are able to cut off short-term finance completely until the relationship with current creditors is terminated, either through a negotiated agreement or through unilateral repudiation, but not further.[10] This would be the case if trade credit were provided by the same lenders that provide the long term project finance or if debt instruments contained cross-default clauses.[11] (We assume that also long-term

[8] The preferences given by (4.1) and (4.2) are not stationary, but this does not introduce a time consistency problem. To see this, notice that the marginal rate of substitution in consumption between any two future periods is the same regardless of the period from which it is viewed.

[9] As the storable export good is only traded after the end of negotiations, terms of trade equals the price of the perishable export good.

[10] One could extend the analysis to allow the possibility of cutoff of trade finance in the event of repudiation. Bulow and Rogoff (1989b) showed that in the absence of cash-in-advance insurance contracts, this kind of cutoff could sustain lending even if lenders were not able to extract debt service unilaterally. In Bulow and Rogoff (1989a) the lender may harass the borrower's trade forever if the borrower repudiates, but there is no trade during the negotiation. Incorporating a permanent cutoff from trade credit upon repudiation in our model increases the deadweight loss of repudiation and makes it less likely that the country can credibly threaten to do so.

[11] In reality, this is not always the case. Kaletsky (1985, p.37) gives examples in which LDC borrowers tried to discriminate among creditors, maintaining debt service for short-term lenders, while rescheduling longer term debts. We do not treat the implications of this observation here.

credit is unavailable during a renegotiation.)

The lack of short-term trade credit increases the actual cost of exporting, being equivalent to a tax on exports whose proceeds are wasted. With no reserves, the country is restricted to international barter at terms of trade $p(0) > 0$. Reserves improve the terms of trade and in the limit substitute completely for the liquidity provided by access to short-term credit markets. Thus, the cost of operating as a financial autarky, $c(R_t)$, can be expressed in terms of the loss in real income per unit of time due to the terms of trade deterioration brought about by the cutoff from short-term trade finance, i.e.:

$$c(R_t) = (1 - p(R_t))y \tag{4.3}$$

Note that by writing c as a function of R_t, we are assuming that lenders do not freeze the country's reserve assets as long as a renegotiation process goes on.[12] Since the borrower suffers an utility loss of $c(R_t)$ in each period of the negotiation, we can focus on the implications of the cutoff from credit during the negotiation process.

If the country repudiates its foreign obligations, we assume that lenders can forcibly attach a fraction of the borrower's exportable output (as in Bulow and Rogoff (1989a)) and/or a portion of international reserves. Let $\gamma < 1$ and α be the fractions of international reserves and output, respectively, that the borrower loses as a result of the lenders' attempts to confiscate debt service. In fact, central bank assets held in the U.S. are given protection by the Foreign Sovereign Immunities Act and there have been few successful freezes of reserves in association with the buildup of arrears and debt reschedulings (see Delaume (1994) for some instances), suggesting that the appropriate assumption is that gross reserves may not be fully confiscated by lenders.[13]

We also assume that there is no deadweight loss associated with the confiscation of reserves, but that the lender can only collect a fraction $\mu < 1$ of the output lost by the borrower. The deadweight loss $(1 - \mu)\alpha Q$ is an essential feature of

[12] Alternatively, one could allow lenders to attach a fraction γ of reserves at the outset of the negotiation.

[13] Note that freezing reserves of a country in default, but engaged in a 'good faith' rescheduling negotiation, is a different action than confiscating reserves of a borrower who has repudiated. The distinction is important for the discussion of the liquidity role of reserves in Section 4.

the model, since it gives the country and its creditors an incentive to bargain to avoid the deadweight losses associated with the confiscation of output. With $\mu = 1$, repudiation by either party is Pareto efficient, leaving them with nothing to bargain over. In summary, the shares of the pie accruing to the country and the bank, respectively, in the event of a repudiation, are given by

$$\lambda(t) = \frac{(1-\gamma)\,R_t + (1-\alpha)\,Q}{R_t + Q} \qquad 1 - \lambda^*(t) = \frac{\gamma R_t + \mu\alpha Q}{R_t + Q} \tag{4.4}$$

3 The Bargaining Game

Once we have the basic outline of the model, we start by looking at the outcome by backward induction, i.e., we take gross reserves, R_1, and debt service on long-term debt, D, as given. We then analyze the game that takes place when borrower and lender(s) observe output and debt service is due. We will assume that while debt may be owed to a large number of banks, the banks' interests in the event of a repudiation or rescheduling are represented by a single *lead bank* that acts on behalf of all lenders. The amount D, that represents interest and principal on all outstanding debts, is due at the instant that output is realized.

At time 1, the country's total resources consist of gross assets $R_1 + Q \geq 0$, where Q is the output of the investment project (remember that the perishable export good starts accruing only in period 1). On paper, these assets are offset by the stock of debt service obligations $D > 0$. Since the country has the option to repudiate its debt, however, the actual liability only amounts to the minimum of D and what it can be bargained into repaying.[14] We now focus on the bargaining solution.

3.1 The Negotiation Framework

To model the bilateral bargaining game we follow the alternating offers framework, developed by Rubinstein (1982), as outlined in Fig. 4.1. The bank and the country take turns at making proposals over how to divide the country's resources at time t, denoted by $\pi_t = R_t + Q$. We denote the share of the pie to be received by the

[14] D will grow due to arrears during the negotiation. This is irrelevant to the solution because it does not affect penalties the lender can impose (reserve growth, in contrast, does matter).

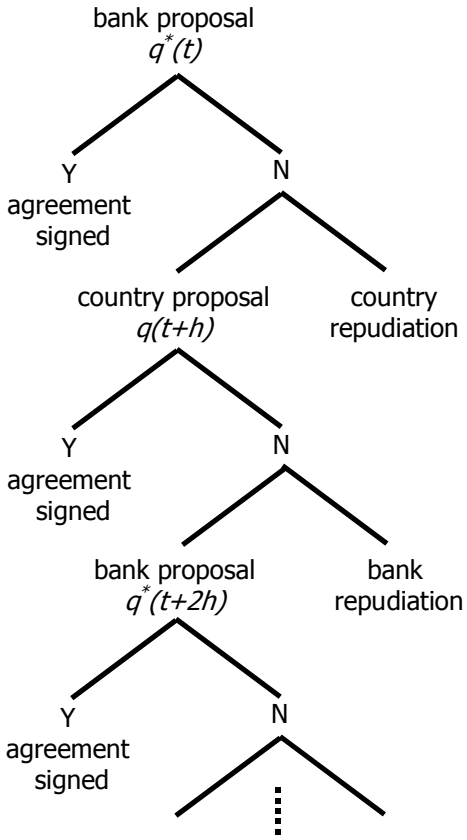

Figure 4.1: The bargaining game

country by $q^*(t)$ when the bank makes the proposal and by $q(t)$ when the proposal is made by the country. Throughout the paper, starred variables will refer to bankers. Supposing that the bank has the first offer, the bargaining game will be characterized by a potential sequence of alternating offers $q^*(t)$, $q(t+h)$, $q^*(t+2h)$, $q(t+3h)$, etc.

After each proposal, the responding player either accepts or turns down the offer. In case of agreement, π_t is split according to the proposed terms. The agreement restores the country's creditworthiness and its access to external short-term trade credit, so that the country can trade the perishable exportable good at value $p = 1$, irrespective of reserves. The demand for reserves at that point will be zero and the pressure of discounting makes the country consume its share of the pie plus the current value of its exportable output immediately.

If players disagree, the responder may terminate the negotiation unilaterally by walking away from negotiations or it may wait to make a counter-offer.[15] In case of unilateral termination by either player, the bank will extract whatever debt service it can obtain by attaching the maximum fraction of reserves and/or confiscating a fraction of the country's (exportable) output.[16] To keep things simple, we assumed that once lenders have imposed this penalties, their claim on the country is regarded as settled. In other words, the original lenders cannot preclude new lenders from lending to the country after termination of a negotiation. If, on the other hand, a proposal by one of the players is rejected and a counter-proposal is made, the obligation remains on the table and the borrower remains in formal default.

There are three possible ways in which a negotiation can end: by agreement to the bank's proposal, by agreement to the country's proposal or by unilateral repudiation of one of the players. If $C_t \leq \pi_t$ denotes the country's consumption of reserves and output at time t given that negotiation ended at that time, the country's post-negotiation utility will be given by

$$W_t = C_t + \sum_{i=0}^{\infty} \frac{hy}{(1+\delta h)^i} = C_t + \frac{y}{\beta\delta} \tag{4.5}$$

where

$$C_t = \begin{array}{ll} q(t)\pi_t & \text{if agreeing to country's proposal} \\ q^*(t)\pi_t & \text{if agreeing to bank's proposal} \\ (1-\gamma)\,R_t + (1-\alpha)\,Q & \text{if unilateral repudiation} \end{array}$$

and the last term represents the present value of trade from the perspective of the country when the borrower has access to trade credit.[17]

[15] Sutton (1986) analyzes a game in which the responder has access to an outside option with propability p. The game here assumes that $p = 1$ and the outside option is unilateral termination of the negotiation.

[16] If repudiation penalties do not transfer resources to the bank, the bank will never find it optimal to repudiate. In contrast to Eaton and Gersovitz (1981) and Bulow and Rogoff (1989b), the lender does collect part of the penalty and therefore may prefer repudiation to bargaining.

[17] If $\delta > r$, the country could consider selling its output stream to the lenders, who attribute a higher value to it. We consider such contract to be suboptimal because of the adverse incentives it would generate on the production of a good (see Lucas(1979)) and/or enforceability problems in the delivery of goods.

3.2 The Bargaining Solution

To solve the model, we exploit the recursive nature of the game. Consider first the case in which the bank places the offer at time t. The best strategy for the bank will be to offer the minimum acceptable share to the borrower. If the country is to accept the offer, however, the utility deriving from its implementation must be at least equivalent to what the country would get by turning it down and either making the minimum acceptable counter-offer to the bank at $t+h$ or repudiating. Hence,

$$q^*(t)\pi_t + \frac{y}{\beta\delta} = \max\left[\lambda(t)\pi_t + \frac{y}{\beta\delta}; \beta\left(q(t+h)\pi_{t+h} + \frac{y}{\beta\delta}\right) + p(R_t)hy\right] \tag{4.6}$$

The second term in the brackets measures the country's utility if it waits to make the minimum acceptable offer in the next round. Note that we are assuming that the borrower consumes the proceeds from the sale of the perishable good immediately. As we show in Section 3.3, this results from optimal reserve policy during a renegotiation. Using the fact that $\frac{y}{\beta\delta} = \frac{y}{\delta} + hy$, and substituting with expressions (4.3) and (4.5) in (4.6), gives us the following expression for the bank's minimum acceptable offer to the country:

$$q^*(t) = \max\left[\lambda(t); \beta\frac{\pi_{t+h}}{\pi_t}q(t+h) - \frac{hc(R_t)}{\pi_t}\right] \tag{4.7}$$

Note that the ability of the bank to cutoff credit during the negotiation affects the minimum offer, even though banks cannot impose any penalty beyond the period of repudiation. The country looses the amount $c(R_t)$ each period in which it remains in default, by virtue of having to finance its trade using its reserves rather than trade credit. In the particular case in which the stock of reserves is constant, this term is equivalent to the fixed bargaining cost introduced by Rubinstein (1982) in his original article.

Equation (4.7) provides one relationship between the offers $q^*(t)$ and $q(t+h)$. A second relationship can be obtained by considering the country's counter-offer at time $t+h$. As with the bank, the optimal minimum acceptable offer leaves the bank indifferent between accepting and refusing. If the bank were to wait to make the

minimum acceptable counter-offer, it would receive the discounted value of its share of the pie, $\beta^* \frac{\pi_{t+2h}}{\pi_{t+h}} (1 - q^*(t+2h))$. The payoff obtained from unilateral termination of the negotiation is $(1 - \lambda^*(t+h))\, \pi_{t+h}$.[18] This gives us

$$1 - q(t+h) = \max \left[1 - \lambda^*(t+h); \beta^* \frac{\pi_{t+2h}}{\pi_{t+h}} (1 - q^*(t+2h)) \right] \tag{4.8}$$

Taken together, equations (4.7) and (4.8) yield the following recursion for the country's share $q(t)$:

$$q^*(t) = \max \left[\begin{array}{c} \lambda(t); \\ \min \left[\beta \frac{\pi_{t+h}}{\pi_t} \left(1 - \beta^* \frac{\pi_{t+2h}}{\pi_{t+h}} (1 - q^*(t+2h)) \right); \beta \frac{\pi_{t+h}}{\pi_t} \lambda^*(t+h) \right] - \frac{hc(R_t)}{\pi_t} \end{array} \right] \tag{4.9}$$

As long as $1 + \rho h < \sqrt{(1 + rh)(1 + \delta h)}$, the unique convergent solution to the second-order difference equation in the minimum subgame perfect equilibrium bank offer $q^*(t)$ is given by

$$q_N^*(t) = 1 - \sum_{i=0}^{\infty} (\beta\beta^*)^i \left(\frac{\pi_{t+2ih}}{\pi_t} - \beta \frac{\pi_{t+(2i+1)h}}{\pi_t} + \frac{hc(R_{t+2ih})}{\pi_t} \right) \tag{4.10}$$

(see Appendix A). The overall solution to expression (4.9) therefore takes the form

$$q^*(t) = \max \left[\lambda(t); \min \left[q_N^*(t); \beta \frac{\pi_{t+h}}{\pi_t} \lambda^*(t+h) - \frac{hc(R_t)}{\pi_t} \right] \right] \tag{4.11}$$

Although we have been referring to q as the minimum share the country receives in a perfect equilibrium, it is also the maximum perfect equilibrium share (Appendix B).[19] The equilibrium strategy for the bank is to propose $q^*(t)$ given by (4.11) when

[18] Recall that we assumed that it is not costly for the bank to interfere with the country's access to trade credits. This is the natural assumption if the banks are the providers of trade credit. As noted by Bulow and Rogoff (1989a), the action may affect the utility of the country's trading partners and thereby bring them into negotiation. We do not model this possibility here.

[19] Rubinstein (1982) studied the cases of discounting and (constant) bargaining costs separately. In the constant bargaining costs case, the solution is discountinuous in the bargaining costs and possibly non-unique, with the player with the lower cost receiving either the entire 'pie' (if he moves first) or anything greater than or equal to the pie less his bargaining cost (the solution is not unique if the high cost player moves first). We get uniqueness and continuity in the bargaining cost due to the simultaneous presence of discounting in our setup.

it is its turn to make an offer and refuse any offer below $1-q(t)$, given by equation (4.8), after substituting from (4.11) for $q^*(t+2h)$. Conversely, for the country, the optimum strategy is to offer the amount given by equation (4.8) and refuse any offer below the quantity $q^*(t)$ as defined by equation (4.11). The solution is immediate, i.e., the first offer will be implemented, so that deadweight losses due to delay or repudiation are avoided.

So far, we have arbitrarily assumed that the bank had the advantage of making the first proposal. One way to eliminate this arbitrary advantage is to reduce the time between offers to an arbitrarily small period of time.[20] If h is negligible, the non-proposing part can refuse the offer at negligible cost and place a new proposal on the table (i.e. continuous negotiation). The bargaining solution then reduces to

$$q^* = \max\left[\lambda; \min\left[q_N^*; \lambda^*\right]\right] \tag{4.12}$$

where $\lambda = \lambda(1)$, $\lambda^* = \lambda^*(1)$, and $q_N^* = \lim_{h\to 0} q^*(1)$.

One can see the logic of equation (4.12) in Fig. 4.2, where for a given value of π_1, we measure the country's share on the horizontal axis and the bank's on the vertical axis. Since the bank's share is $1-q^*$, potential bargaining solutions lie on the efficient sharing locus $\overline{ab}$. As confiscation of output involves a deadweight loss, the repudiation payoffs $[\lambda, 1-\lambda^*]$ lie strictly inside the $\overline{ab}$ locus, with λ^* exceeding λ by $(1-\mu)\,\alpha\frac{Q}{R_1+Q}$.

The bargaining outcome depends on the position of q_N relative to the negotiation interval $[\lambda, \lambda^*]$, the endpoints of which are determined by the value of the outside option represented by repudiation to the two players. If q_N falls within this interval, the bargaining is resolved as if there were no outside option. In this region, players know that repudiation threats will ultimately not be carried out. Such non-credible threats are excluded by the requirement of subgame perfection.

If q_N falls outside of the negotiation interval, the equilibrium offer lies at the nearest endpoint, with the relevant party's repudiation threat determining the split of the pie. If $q_N \leq \lambda$, for example, the country has no incentive to continue bargain-

[20] The *first mover advantage* shows up in the two last terms in equation (4.11): the first of these is reflected in the fact that the bank receives more than half of the pie even if $c(R_t) = 0$ and $\delta = r$; the second has the country receiving less than λ^*.

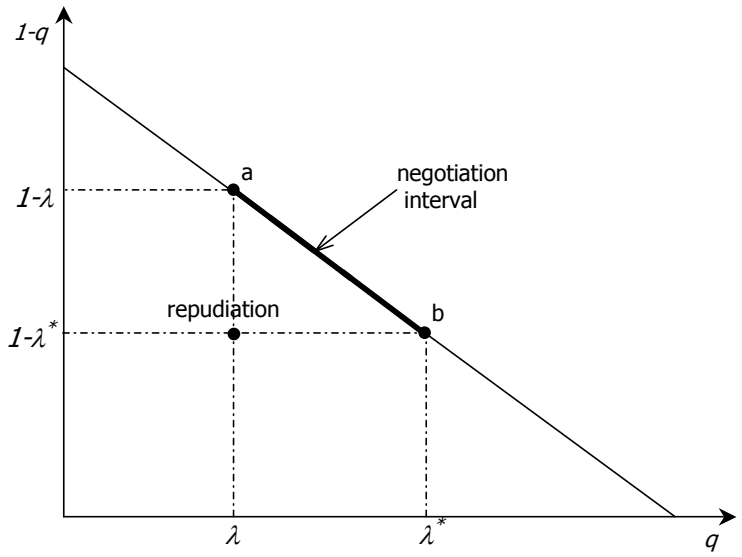

Figure 4.2: The contract curve

ing and can therefore credibly threaten to walk away. In this case, the bank 'buys off' the country and consumes what would otherwise be a deadweight loss.

3.3 Optimal Reserve Policy During Renegotiation

At time $t = 0$, the borrower might want to accumulate reserves to smooth consumption between states in which debt is repaid in full and states in which debt is renegotiated. During a renegotiation, reserves also improve the borrower's terms of trade. Since the borrower is risk neutral from $t = 1$ onwards, only the latter rationale applies during a renegotiation. The optimal reserve policy during a renegotiation might involve consuming out of the stock of reserves or using some portion of export proceeds to add to reserves.

The basic feature of the optimal reserve policy can be understood by considering the autonomous reserve policy the country would run following a repudiation, if repudiation were accompanied by a permanent cutoff of trade credits. In this case it is straightforward that, since the country is risk neutral, the optimal reserve policy involves attaining the target level of reserves, $\widetilde{R}$, immediately, where $\widetilde{R}$ is the level of reserves for which the marginal increase in the discounted value of liquidity services

equals the marginal return to immediate consumption (1).[21] This reserve policy is reminiscent of the target-adjustment models in the reserve demand literature (e.g., Frenkel (1983)). Hence, the optimal consumption policy is:

$$C_{t+kh} = \begin{array}{ll} R_{t+kh} - \widetilde{R} & \text{if } R_{t+kh} \geq \widetilde{R} \\ 0 & \text{if } R_{t+kh} < \widetilde{R} \end{array} \tag{4.13}$$

Expression (4.13) implies that once the target level of reserves has been reached, the optimal consumption plan involves consuming whatever income that may accrue in each subsequent period. The rationale underlying this policy extends to the case of optimal reserve management during a debt renegotiation. Consider that the country is able to allocate reserves and export proceeds optimally between reserves and consumption in between offers. Ignoring the repudiation option, the optimal policy would again be characterized by an interior reserve target, $\widehat{R}$, with the property that in each period, the marginal return to consuming an additional unit of reserves would equal the marginal deterioration in the value of the bargaining game due to the fall in reserves. The country would follow a policy similar to (4.13), so as to approach $\widehat{R}$ as rapidly as possible. The bargaining cost would adjust endogenously over time, reaching a constant level as soon as $R_t = \widehat{R}$.[22]

For simplicity, we focus on the case where the level of reserves acquired in period 0 is such that the country may attain the target level immediately at $t = 1$.[23] Reserves are then kept at that level and proceeds obtained from selling the perishable export good are immediately consumed.

As the stock of reserves is held constant during negotiations, the perfect equilibrium offer $q_N^*(t)$ is given by

$$q_N^*(t) = \frac{r - \frac{c(R_t)}{\pi_t}}{r + \delta} \tag{4.14}$$

The share is constant since both, the size of the pie π_t and the bargaining cost

[21] Appendix C shows that $\widetilde{R}$ is implicitly defined by $-c'(\widetilde{R}) = \delta - r$. Since $c''(R_t) < 0$, the optimal policy is to approach $\widetilde{R}$ monotonically.

[22] The outside option complicates matters. Since the marginal return on reserves conditional on $q = \lambda$ or $q = \lambda^*$ is less than one, the optimal reserve policy may be to consume all reserves in the first period of bargaining.

[23] I.e., we do not consider the case of gradual convergence to the target by conversion of the perishable export proceeds into reserves.

are fixed. The benchmark bargaining solution of a half-and-half split would emerge if trade credit were irrelevant ($c(R_t) = 0$) and the two players had identical discount rates ($r = \delta$). In this case, there is nothing to differentiate the bargaining strength of the two players, and the Rubinstein game yields the familiar symmetric Nash bargaining solution for a static bargaining problem with status quo point $[0, 0]$. However, since the country is more impatient than the bank ($\delta > r$), its share will be less than $\frac{1}{2}$, decreasing further as the cost of cutoff from trade credit grows.

The optimal level of reserve holdings is given by the condition $\frac{dV_N}{dR} = 1$. In order to get a closed form solution, we must specify the functional form of the bargaining cost. For example, with $c(R_t) = \frac{m}{R_t}$ we get $R = \sqrt{\frac{m}{\delta}}$: the level of reserves held during a negotiation increases with the responsiveness of the cost function to reserves and is inversely proportional to the square root of the borrower's impatience.

3.4 Extension: Fixed Costs to Lenders

The framework allows us to analyze the outcome in the presence of banking regulations that may act to increase the bank's impatience and thereby reduce their bargaining power. Suppose that the lender has to pay a fixed cost K if the negotiation if the bargaining is still unresolved at time $T + 1 > 1$. The deadline at $T + 1$ can be thought of as coming from regulations stating that a loan in arrears for T periods has to be declared as non-performing. Such action calls for provisions which can lower bank equity values. With the help of one additional technical assumption, one can derive the following bargaining solution for the case of constant reserves (see Appendix D):[24]

$$q^*(t) = \max\left[\lambda(t); \min\left[\frac{r - \frac{c(R_1)}{\pi_1}}{r + \delta} + \frac{K}{2\pi_1} e^{-\frac{r+\delta}{2}(T-t)}; \lambda^*(t)\right]\right] \tag{4.15}$$

It is clear from the expression above that the cost faced by the bank shifts bargaining power towards the country, raising its share $q^*(t)$. As before, the share of the

[24] The one-time cost K renders the problem nonstationary up to time T. After T, however, the stationary solution of equation (4.10) holds. Note that the solution at $t \leq T$ hinges on who has the last proposal before time T. To avoid the problems associated with taking the limit as $h \to 0$, we follow the approach of Binmore (1980) to remove the first mover advantage, assuming that the proposer is decided by the flip of a coin in each period.

country in the negotiation region is capped by its share deriving from the situation in which the bank chooses to abandon negotiations. Moreover, the country's share is non-decreasing in the proximity of the deadline T, i.e., the bank would increase its offer to the country if the deadline were anticipated.

4 The Repayment Decision

In this section we examine the effect of the country's assets on its choice to repay debts in full or reschedule and, in case the latter option is chosen, on the terms of the rescheduling agreement.

Since the country may always settle the claims by repaying outstanding debts at face value, its payoff in period 1 will be given by

$$W_1 = \max\left[V^p, V^r\right] + \frac{y}{\beta\delta}$$

where V^p and V^r are the values of repaying in full and rescheduling, respectively, net of future trade proceeds which will accrue either way.

4.1 The Value of Rescheduling

The value of rescheduling can be expressed as

$$V^r = \max\left[V; \min\left[V_N; V^*\right]\right] \ ,$$

where $V = \lambda\pi_1$, $V_N = q_N\pi_1$, and $V^* = \lambda^*\pi_1$. To streamline terminology, we will define the *bank region*, *country region* and *negotiation region*, as the set of reserve levels for which bank's threat to repudiate is credible (i.e. $V^r = V^*$), the country's threat is credible ($V^r = V$), and neither is credible ($V^r = V_N$), respectively. While the exact configuration of V^r will depend on all the parameters, one can see from (4.12) that V^r is a differentiable function of R_1 except at a finite number of switch points where the equilibrium moves from one region to another. Since $\lambda\pi_1$, $q_N\pi_1$, and $\lambda^*\pi_1$ are all nondecreasing in R_1, a rise in the level of reserves cannot decrease the value of rescheduling.

Proposition 1: V^r is a nondecreasing function of R_1. It is monotonically increasing in R_1 if reserves are not fully attachable ($0 < \gamma < 1$) and the interest rate on reserves is below the risk-free rate ($\rho < r$).

Proof. Follows from (4.12), (4.4) and (4.10). From (4.10) we get

$$\begin{aligned} V^r(R_1, Q) &= R_1 + Q - h\sum_{i=0}^{\infty}\left(\frac{1}{(1+rh)(1+\delta h)}\right)^i \\ &\quad \left((1+\rho h)^{2i}\left(\frac{\delta-\rho}{1+\delta h}\right)R_1 + \left(\frac{\delta}{1+\delta h}\right)Q + c((1+\rho h)^{2i}R_1)\right) \end{aligned}$$

where we used $\beta(h) = \frac{1}{1+\delta h}$ and $\beta^*(h) = \frac{1}{1+rh}$. Since $\delta > r \geq \rho$,

$$\begin{aligned} V^r(R_1, Q) &= \left(\frac{(r-\rho)(1+h\rho)}{r+\delta-2\rho+h(r\delta-\rho^2)}\right)R_1 + \frac{r}{r+\delta+r\delta h}Q \\ &\quad -h\sum_{i=0}^{\infty}\left(\frac{1}{(1+rh)(1+\delta h)}\right)^i c((1+\rho h)^{2i}R_1) \end{aligned} \tag{4.16}$$

The first term on the RHS is strictly increasing in R_1 if $r > \rho$. Since $c'(R_1) \leq 0$, the last term is non-decreasing in R_1. QED. ■

Figs. 4.3 and 4.4 trace the value of rescheduling assuming that the stock of reserves is constant. The V and V^* schedules differ by the amount of the deadweight loss, $(1-\mu)\alpha Q$, having a common slope of $1-\gamma$, that is equal to the fraction of non-attachable reserves. The shape of the V_N schedule hinges on whether creditors are able to interfere with trade finance during the negotiation. Fig. 4.3 is drawn assuming that creditors cannot affect terms of trade (that is the case if $R \to \infty$). In this case, the slope of V^N is determined by the relative impatience rates (i.e. $\frac{r}{r+\delta}$).[25] If reserves do deliver liquidity services (Fig. 4.4), V_N is monotonically increasing in R. In this case, the schedule lies strictly below its value in Fig. 4.3, converging asymptotically to it as $R \to \infty$.[26]

Take the case of zero bargaining costs in Fig. 4.3. To ensure that all three

[25] Note that if the country could not touch its reserves during a renegotiation and they earned the risk-free rate ($\rho = r$), they would effectively be fully attachable (V_N would be flat). This is so because the remuneration of reserves would make the bank infinitely patient with respect to that portion of the pie.

[26] Note that none of our results depends on strict concavity, although we choose to draw V_N as a strictly concave function in the diagram.

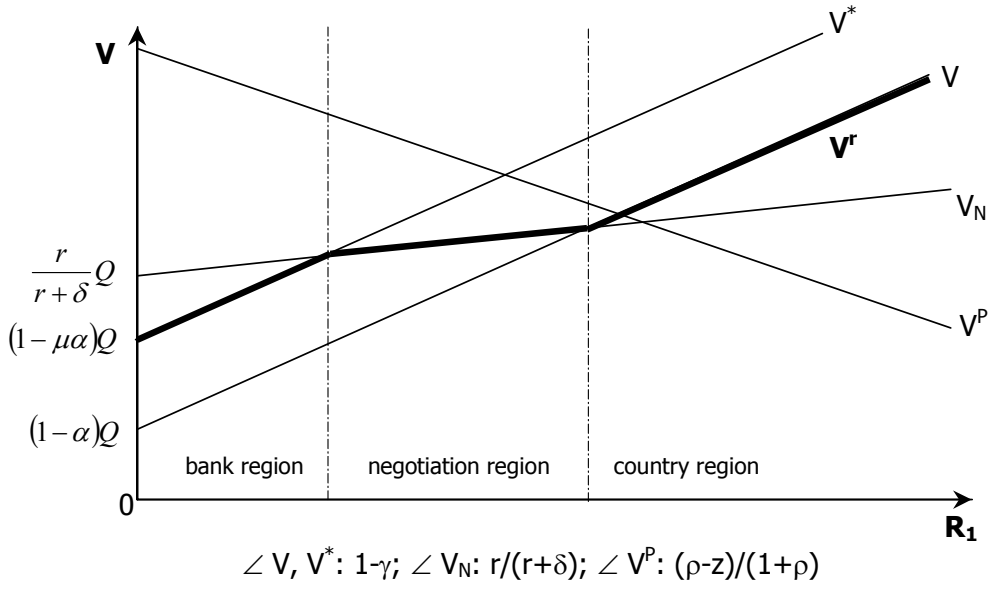

Figure 4.3: Reserves as net wealth

regions are non-empty we imposed the restriction that $1 - \mu\alpha < \frac{r}{r+\delta} < 1 - \gamma$, so that $\lambda < \lambda^* < q_N$ at $R_1 = 0$. At zero reserves the country would prefer negotiation to repudiation, whereas the bank prefers repudiation (one could easily investigate other cases). This means that the bank can credibly threaten to repudiate, so that $V^r(R_1 = 0) = V^*(R_1 = 0)$. The heavy line represents the value of rescheduling as a function of reserves.

Fig. 4.4 depicts the case in which reserves are fully confiscated in the event of a repudiation - implying that V and V^* are flat - and creditors can impose a terms of trade loss on the country by interfering with trade finance during negotiation. We assumed that liquidity services are substantial enough to ensure that $V^N(R_1 = 0) < V(R_1 = 0)$.

It is apparent from the diagrams that there are two ways in which borrowed reserves can provide a strictly positive rate of return conditional on a rescheduling. In Fig. 4.3, borrowed reserves play a pure *net wealth role*: when the agreement is determined at the margin by either player's threat to repudiate, a portion $1 - \gamma$ of reserves represent a direct addition to the country's wealth. In the negotiation

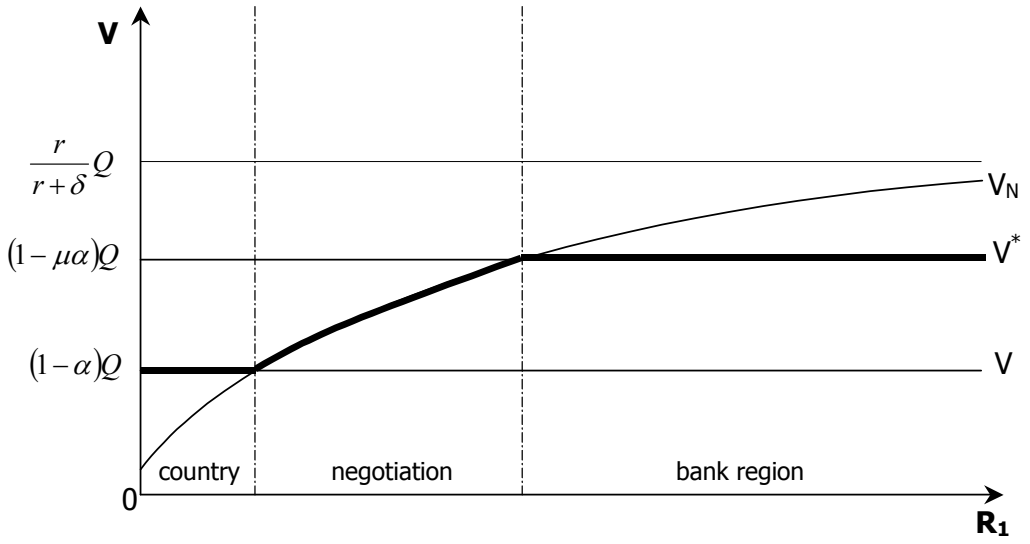

Figure 4.4: Reserves as liquidity

region this portion is $\frac{r}{r+\delta}$. Since agreement restores the country's access to trade credits, reserves no longer deliver liquidity services and are consumed immediately. In Fig. 4.4, reserves also play a *liquidity role*: when neither player can credibly threaten to repudiate, the agreement is determined at the margin by the relative impatience of the players. If lenders are able to interfere with trade finance during the negotiation, the country with higher reserves will seem less impatient due to the prospective liquidity services provided by its reserves.

Two remarks are in order here. First, we have assumed that lenders do not freeze or confiscate the assets of a country in arrears if the country is engaged in a 'good faith' negotiation. Hence, the entire amount of reserves delivers liquidity services (i.e., the negotiation cost is $c(R_1)$ instead of $c((1-\gamma)R_1)$). Second, one can see from the diagrams that the ex post marginal gross return of reserves conditional on rescheduling can only exceed 1 in case of a trade credit cutoff with the agreement falling in the negotiation region. There is a strong sense, therefore, in which the liquidity role is more central than the net wealth role in explaining the demand for reserves. In the model presented here, liquidity services are a *necessary* condition for reserves to be held past the first negotiation period if the country is following

an optimal reserve policy. If trade credit were always readily available, demand for reserves would be zero.

4.2 The Value of Repayment vs. Rescheduling

If z is the promised interest rate on debt incurred in period 0, where z satisfies the arbitrage condition for risk-neutral lenders that have the option of investing risk-free at r, the repayment option renders the value

$$V^p = Q + R_1 - \left(1 + \frac{R_1}{1+\rho} - R_0\right)(1+z) = Q + R_1\left(\frac{\rho - z}{1+\rho}\right) - (1-R_0)(1+z) \tag{4.17}$$

Recall that the country borrowed for the accumulation of reserves and one unit for the investment project.

Proposition 2: For a given R_o, V^p is a strictly decreasing function of R_1 if $\rho < z$, and independent of R_1 if $\rho = z$. Given R_1, it is strictly increasing in R_o.

Proof. Follows directly from (4.17). ■

Equation (4.17) states that the value of repaying falls by $\left(\frac{z-\rho}{1+\rho}\right)$ for each dollar of reserves that has been accumulated. The slope of the repayment value is directly proportional to the premium paid on the issuance of debt relative to the fixed remuneration rate of reserves up to $t = 1$ (that is the risk premium if $\rho = r$). Reserves therefore carry an opportunity cost in the states of the world in which the borrower repays. Hence, unless the country reschedules its debt in some states of the world, reserves will be dominated.

The proposition points to an important distinction between gross and net international reserves. First, given R_1, a higher level of R_o implies a decrease in borrowing and an increase in net reserves $R_1 - D$, raising the probability of repayment. Given the level of net reserves, a rise in gross reserves can be accomplished through borrowing (i.e., a simultaneous rise in R_1 and D). This lowers the probability of repayment.

Since, as shown in proposition 1, the value of rescheduling is non-decreasing in the level of reserves and the value of repayment is strictly decreasing in reserves (proposition 2), the effect of reserves on the rescheduling decision is straightforward:

Proposition 3: For given values of Q, R_o and $z \geq \rho$, either the country reschedules for all values of R_1, or there is a unique level of reserves , $R^*(Q, R_o, z)$, above which the country reschedules and below which the country repays. $R^*(Q, R_o, z)$ is continuous and piecewise differentiable in its arguments. Moreover, $\frac{\partial R^*(.)}{\partial Q} > 0$, $\frac{\partial R^*(.)}{\partial R_o} \geq 0$ and, if $1 + \frac{R_1}{1+\rho} > R_0$, $\frac{\partial R^*(.)}{\partial z} < 0$.

Proof. Follows from Propositions 1 and 2, (4.16) and (4.17). ■

We summarize the comparative statics of the rescheduling decision in the two corollaries below:

Corollary 1: For given values of R_o, R_1 and $z \geq \rho$, the country repays when output is above a cutoff level Q^*, and reschedules when it is below.

Fig. 4.5 plots R^* - the cutoff level of reserves at which the country is indifferent between repayment and rescheduling - as a function of z for given parameters Q and R_o, in the general case in which $\gamma < 1$ and $c(R_1) > 0$. Kinks in the schedule may occur at the points where the bargaining solution switches between regions. For R_1 sufficiently large, the country will choose to reschedule, and the outcome of rescheduling will fall into the country or bank region, so that the R^* converges to the repudiation asymptote at $(1+\rho)\gamma - 1$. The repayment value rises by more than the rescheduling value as Q increases, as the bank is not a residual claimant of the storable export good in case of repayment. This leads to an increase in the cutoff level of reserves with Q.[27]

The schedules partition the (z, R) plane into areas in which the pattern of rescheduling and repayment is clearly defined. If a country chooses to repay (reschedule) in a given output schedule, it will always choose to repay in any higher (lower) schedule.

Corollary 2: For given z and the probability distribution of s: i) a rise in R_1, given R_o, cannot increase the probability of repayment, and may decrease it. ii) a rise in R_0, given R_1, cannot reduce the probability of repayment, and may increase it.

[27] R^* may not be unique if $r > z$. We ignore this case since $r \leq z$ is an equilibrium condition with rational lenders.

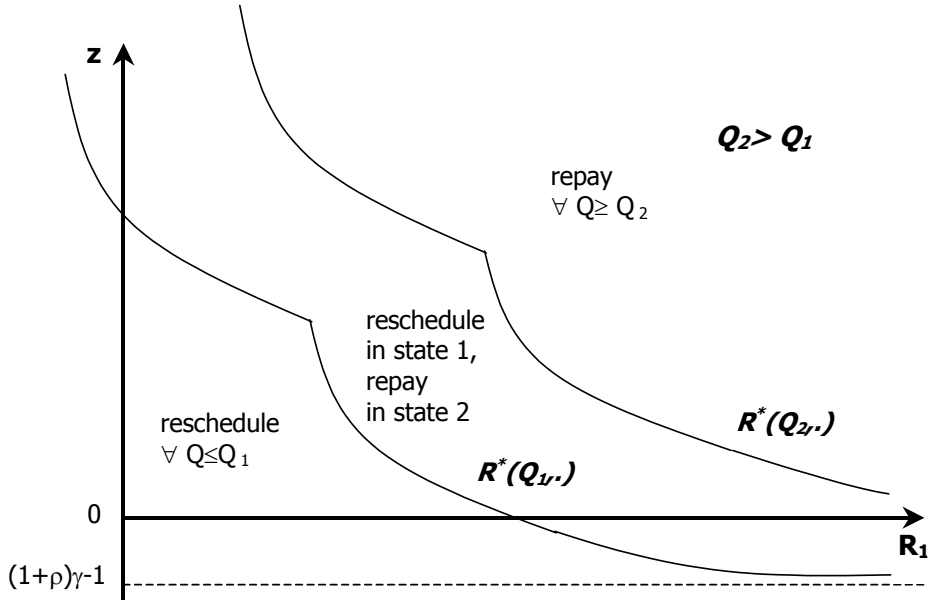

Figure 4.5: The rescheduling decision

5 The Supply and Demand of Borrowed Reserves

In the previous section we concluded that gross reserves may increase the value of rescheduling, and at the same time reduce the value of repayment if $\rho < z$. In this section we show that rational banks will lend reserves to the country - in spite of the fact that they increase the bargaining power of the country - as long as penalties on output are large enough. As we assume that banks are perfectly competitive ex ante, this amounts to showing that reserve lending in the first period satisfies the zero-profit condition.

We shall assume that there are two possible states in the economy, s_1 and s_2, that are associated with the output realizations Q_1 and Q_2 respectively, where $Q_2 > Q_1$. The arbitrage condition requires that $E(z(s_i)) = r$, where the expectation is taken given all information available at $t = 0$, which includes the specification of the bargaining problem that players will face in period $t = 1$. Below the $R^*(Q_1, .)$ schedule in Fig. 4.6, repayment occurs in both states so that lending is risk-free (i.e. $z(s_1) = z(s_2) = z$). Competition among banks drives the promised rate z down to

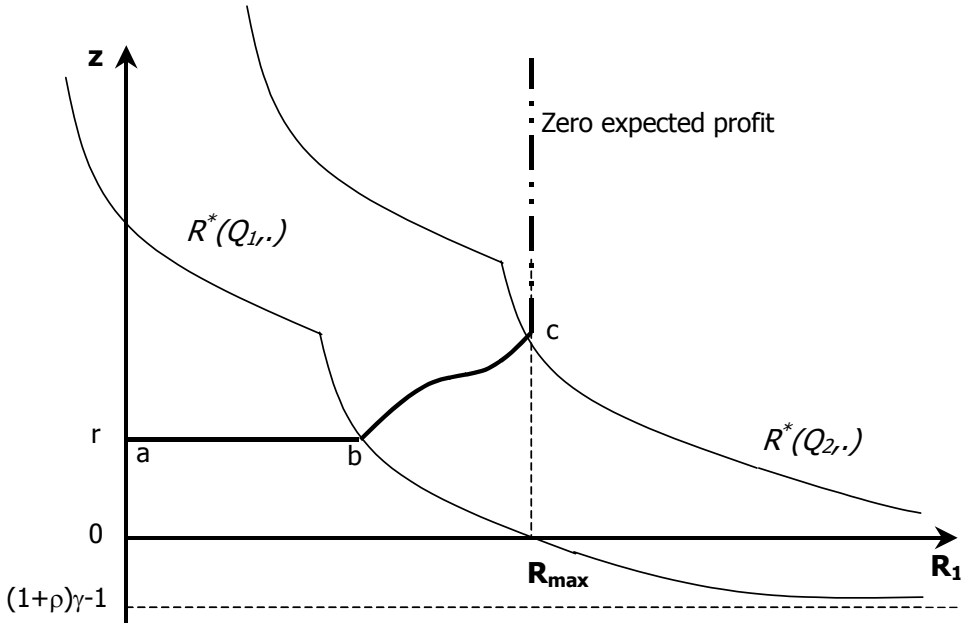

Figure 4.6: The supply of borrowed reserves

r. Notice that the existence of the horizontal segment $\overline{ab}$ in the zero-profit locus on Fig. 4.6 requires that the condition $R^*(Q_1, r) > -R_o$ is met. The range of borrowed reserves in which lending is risk-free increases with Q_1, α and $c(.)$.

Between the $R^*(Q_1, r)$ and the $R^*(Q_2, r)$ schedules, the country repays only in the high-output state. Notice that the return in the low output state falls with R_1, so that the promised return (which is paid only in the high output state) must rise with R_1 in this interval. This gives the segment $\overline{bc}$ in the zero-profit locus, that must be above r. There is no discontinuity at b because the rescheduling process is efficient and involves no deadweight loss.[28]

At point c the country reschedules in the low output state and is indifferent between rescheduling and repaying in the high output state. Hence, any further rise in the promised interest rate z is irrelevant, as both players anticipate that it will never be honored. Since the return conditioned on rescheduling can never exceed

[28] If the rescheduling process involves a deadweight loss, there would be a discontinuity at b and the possibility of two equilibrium promised interest rates over some interval of reserves.

r, the zero profit locus becomes vertical at c. We denote the maximum amount of borrowed reserves by $R_{\max}$, so that the country's overall long-term credit ceiling is $1 + R_{\max}$. The supply schedule is given by $\overline{abc}$. [29]

Credit ceilings are a well known characteristic of the sovereign debt literature (e.g., Eaton and Gersovitz (1981)). Defining $q_i(s)$ as the share of reserves or output $(i = R, Q)$ received by the borrower in a rescheduling agreement in state s and assuming that reserves earn the risk-free rate from $t = 0$ to 1, $R_{\max}$ satisfies

$$R_{\max} = \frac{E\left[\left(1 - q_Q(s)\right) Q(s)\right] - (1 + r)\left(1 - R_0\right)}{E\left[q_R(s)\right]}$$

If $R_{\max} \leq -1$, the country is excluded from long-term credit markets, and its investment can only be self-financed, i.e. via accumulation of current account surpluses. If $R_{\max}$ is positive but less than R_0, the investment project can be financed, but only if the country uses part of its reserve endowment.

The credit ceiling $1 + R_{\max}$ is a non-decreasing function of the penalties the lender can impose in case of repudiation, with comparative statics depending on the bargaining region that is operative in each output state at the credit limit.

Proposition 4: i) $\frac{\partial R_{\max}}{\partial (EQ)} \geq 0$**;ii)** $\frac{\partial R_{\max}}{\partial \alpha} \geq 0$**, with strict inequality if the bargaining equilibrium is in the country or bank region in either state at** $R_{\max}$**;iii)** $\frac{\partial R_{\max}}{\partial \mu} \leq 0$**, with strict inequality if the bargaining equilibrium is in the country region in either state at** $R_{\max}$**;iv)** $\frac{\partial R_{\max}}{\partial c} \geq 0$ **and** $\frac{\partial R_{\max}}{\partial \delta} \leq 0$**, with strict inequalities if the bargaining equilibrium is in the negotiation region in either state at** $R_{\max}$**;v)**$\frac{\partial R_{\max}}{\partial \gamma} = 0$ **if** $R_{\max} = 0$**. Otherwise** $sign\left(\frac{\partial R_{\max}}{\partial \gamma}\right) = sign\left(R_{\max}\right)$**;vi)**$\frac{\partial R_{\max}}{\partial R_0} \geq 1$ **and** $\frac{\partial R_{\max}}{\partial r} \leq 0$**.**

The results are intuitive. Part v) implies that borrowers do not have an incentive to increase the attachability of reserves (i.e., raise γ) so as to make long-term investments possible. This contrasts with the output penalty and the terms of trade loss. A rise in α, for example, increases the borrower's credit ceiling if either the country or the bank can credibly threaten to walk away in at least one of the states; similarly, a rise in c (for all R) increases the borrower's impatience and raises $R_{\max}$

[29] We are implicitly assuming that the reserve generating debt instruments are issued sequentially and contain a seniority clause, so that rational competitive lenders will never be willing to hold such instruments beyond the credit ceiling.

as long as the outcome lies in the negotiation region in one of the states. In either case, an appropriate alteration in the penalty structure is capable of increasing the credit ceiling. An increase in the attachability of reserves, on the other hand, will increase the credit ceiling if and only if it already is positive. It does not help the borrower to turn the borrowing limit positive however. The reason is simple: if the bank is not willing to lend enough so as to allow the borrower to retain positive reserves while financing its investment project, an increase in γ has no effect on the bank's expected rate of return.[30]

Since lenders are competitive *ex ante*, the country obtains the entire surplus from the relationship with lenders. It can choose the equilibrium level of reserves taking the bank's zero expected profit locus as given. Hence, equilibrium occurs at the point on the zero expected profit locus that maximizes the country's utility. When reserves are remunerated at the risk-free rate until $t = 1$, the country augments its consumption by $S = E(Q) - (1 + r)$, regardless of the level of reserves it holds. In this case, reserves serve a pure insurance role, redirecting consumption from high output states to low output states without changing its expected value.[31] The two state case when reserves are remunerated at the risk-free rate r is summarized in the proposition below:

Proposition 5: If the country is risk-neutral ($u'' = 0$), it is indifferent to the amount of borrowed reserves held, including zero. If the country is risk-averse ($u'' < 0$), the country borrows up to its credit ceiling and holds the maximum amount of borrowed reserves. Borrowed reserves provide partial insurance.

Fig. 4.7 shows the consumption allocation across the two states of nature that can be achieved by various contracts. Taken at face value, a debt contract has the borrower bearing all the risk, with consumption on a point like E. As Hellwig (1986) and others have pointed out, this makes the use of standard international debt instruments somewhat puzzling, given that lenders are probably less risk-averse

[30] The role of precommitments to high penalties as a way of facilitating long-term borrowing has been emphasized in the sovereign debt literature. See for example Cohen and Sachs (1986).

[31] In the case where reserves earn less than the risk-free rate, it is Pareto inefficient for the country to hold reserves if its debt is positive. The country still gets the entire surplus of the relationship at $t = 0$, but the surplus is a declining function of borrowed reserves.

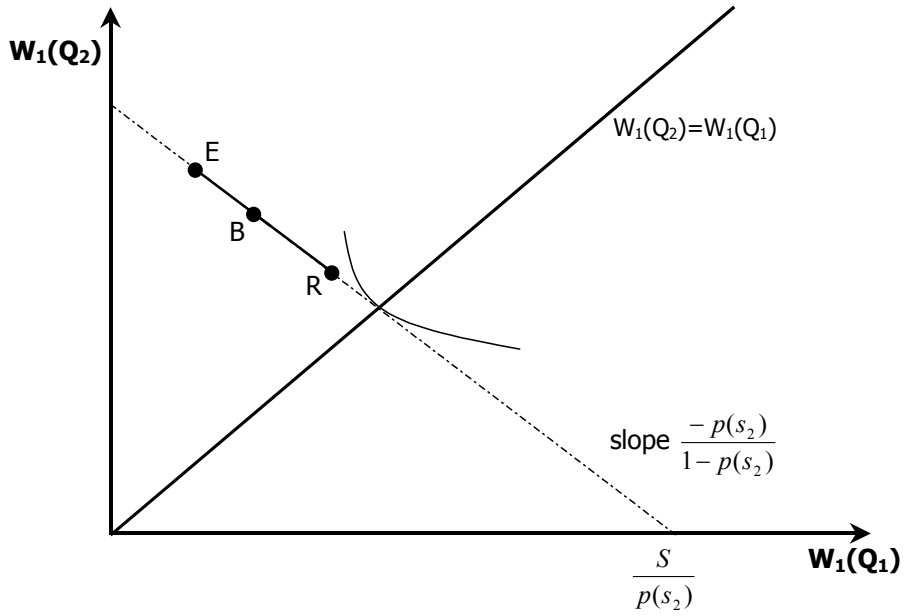

Figure 4.7: The insurance role of borrowed reserves

than borrowers. It would seem efficient to have payments contingent on output, thus shifting some of the risk to the lender.[32]

Point E however represents only *enforceable* debt contracts, and in equilibrium, the promised rate on debt contains a premium above the risk-free rate to compensate the lender for losses in case of a rescheduling (e.g., Grossman and van Huyck (1988)). The actual, ex post return paid by the borrower is below the risk-free return in the states in which debt is rescheduled. Sovereign lending, in the absence of borrowed reserves, moves the equilibrium to B, i.e., the possibility of rescheduling provides some of the missing insurance.

Borrowed reserves expand the range of achievable consumption allocations further. As borrowed reserves move from 0 to $R_{\max}$, the consumption allocation moves from B to R. A risk averse country will clearly choose the maximal amount of insurance given that lenders are competitive. This involves borrowing up to the credit ceiling and holding the excess over investment needs as reserves. It is easy to see that

[32] Atkeson (1991) argues that the optimal contract does not provide full insurance because of moral hazard.

the insurance that is made available through the resort to borrowed reserves is only partial: full insurance would require the transfer from the borrower to the lender to rise one-for-one with output. Since at its credit limit the country reschedules in the low output state and is indifferent between rescheduling and repayment in the high output state, the difference in payments in the two states is just the difference between the rescheduling payments. As long as $\alpha < 1$, these payments differ by less than output.

6 Conclusions and Future Research

In the model of this paper, a debt renegotiation does not imply a halt to international trade. Nevertheless, export seizing 'gun-boats' are not deployed. All that creditors effectively do is to stop rolling over short-term trade finance during the negotiation process. This has the effect of increasing the impatience of the borrower to seek an agreement in order to maximize the proceeds that accrue from its exports. In this sense, creditors are less active than in Bulow and Rogoff (1989a) and will probably incur less costs, attenuating the free-rider problem in case there are multiple creditors.

The borrower accumulates reserves to guarantee its liquidity (and possibly smooth consumption) in anticipation of the bargaining game. The relative degree of impatience of players - that ultimately defines the outcome - is the endogenous result of actions taken by them. For this reason, the distinction between gross and net international reserves is key to the outcome of the bargaining process. Borrowers with higher gross reserves find themselves in a position to reach a better deal during a debt renegotiation.

A worthwhile extension of the model would be to incorporate a third player into the bargaining game. The recent involvement of multilateral organizations, as the IFC and the IADB, in trade financing and their policy of lending or not into arrears is likely to affect the degree of impatience of creditors and borrowers and consequently shift bargaining power.

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Appendix A - Derivation of the Bargaining Solution

If parameters are such that repudiation is not chosen in equilibrium, equation (4.9) reduces to the second-order difference equation

$$q^*(t) = \beta\frac{\pi_{t+h}}{\pi_t} - \beta\beta^*\frac{\pi_{t+2h}}{\pi_t} - \frac{hc(R_t)}{\pi_t} + \beta\beta^*\frac{\pi_{t+2h}}{\pi_t}q^*(t+2h) \tag{4.18}$$

Define the variable

$$\Gamma_{t+kh} = (\beta\beta^*)^k \frac{\pi_{t+2kh}}{\pi_t} \tag{4.19}$$

where we assume that parameters are such that $\Gamma_{t+kh} < 1 \quad \forall\ k \in \mathbb{Z}_+$.

After iterating expression (4.18) and using (4.19), we can rewrite (4.18) as

$$q^*(t) = \sum_{i=0}^{T-1} \Gamma_{t+ih} \left(\beta \frac{\pi_{t+(2i+1)h}}{\pi_{t+2ih}} - \frac{hc(R_{t+2ih})}{\pi_{t+2ih}} - 1 \right) + \Gamma_t - \Gamma_{t+Th} \left(1 - q^*(t+2Th)\right) \tag{4.20}$$

Since $q^*(t)$ is bounded between 0 and 1, and $\lim_{k\to\infty} \Gamma_{t+kh} = 0$, the last term in this equation vanishes as $T \to \infty$. It follows that the general solution to (4.20) is given by

$$q^*(t) = 1 - \sum_{i=0}^{\infty} \Gamma_{t+ih} \left(1 - \beta \frac{\pi_{t+(2i+1)h}}{\pi_{t+2ih}} + \frac{hc(R_{t+2ih})}{\pi_{t+2ih}} \right)$$

Appendix B - Unicity

Let the proposer in period t be determined by the flip of a coin and $hc_i(t)$ represent the cost of delay of h in reaching an agreement for player i. Also, let $\pi_i(t)$ represent i's expected continuation value in a perfect game before the proposer is determined and $v_i(t)$ and $v_i'(t)$ represent the continuation value conditioned on being the proposer at time t or not respectively. Further, $M_i(t) = \sup_\Omega \pi_i(t)$ and $m_i(t) = \inf_\Omega \pi_i(t)$ where Ω represents the set of subgame perfect equilibria and $\overline{\beta} = \max[\beta; \beta^*]$.

Lemma: If there exists $D(t) < \infty$ such that $M_i(t) - m_i(t) \leq D(t)$, then $M_i(t-h) - m_i(t-h) \leq \overline{\beta} D(t)$.

Proof: Suppose the country proposes the split (x, y) at $t-h$. The bank will surely reject if

$$y < \beta^* m^*(t) - c^*(t-h)$$

and accept if

$$y > \beta^* M^*(t) - c^*(t-h) \tag{4.21}$$

In case the bank rejects, the country will have to wait a period and will receive at least $m(t)$ in period t. The country will offer at most the value on the RHS of

expression (4.21), since at this value the bank would already accept the offer for sure. Since the country has the offer, it will do no worse than receiving the better of this two payoffs:

$$v(t-h) \geq \max\left[\beta m(t) - c(t-h); x + y - \beta^* M^*(t) + c^*(t-h)\right] \tag{4.22}$$

$v(t-h)$ is also limited from above by the highest equilibrium payoff offered by the bank after a rejection by the country, $M(t)$, and the value given by least offer that is accepted by the bank. Hence, we also have

$$v(t-h) \leq \max\left[\beta M(t) - c(t-h); x + y - \beta^* m^*(t) + c^*(t-h)\right] \tag{4.23}$$

Similarly, if the bank makes the offer at $t-h$, the country rejects if

$$x < \beta m(t) - c(t-h)$$

and accepts if

$$x > \beta M(t) - c(t-h)$$

$$\beta m(t) - c(t-h) < v'(t-h) < \beta M(t) - c(t-h) \tag{4.24}$$

Substituting $M_i(t) \leq D(t) + m_i(t)$ in expressions (4.22), (4.23) and (4.24) we get

$$\begin{aligned} & \max\left[\beta m(t) - c(t-h); x + y - \beta^* m^*(t) - \beta^* D(t) + c^*(t-h)\right] \\ \leq \;& v(t-h) \leq \max\left[\beta m(t) + \beta D(t) - c(t-h); x + y - \beta^* m^*(t) + c^*(t-h)\right] \end{aligned}$$

and

$$\beta m(t) - c(t-h) < v'(t-h) < \beta m(t) - c(t-h) + \beta D(t)$$

Since $\pi_i(t) = E\left[v_i(t)\right]$, it follows that the bounds on $\pi(t-h)$ will be

$$\begin{aligned} & \max\left[\beta m(t) - c(t-h); \frac{1}{2}\left[x + y - \beta^* m^*(t) - \beta^* D(t) + c^*(t-h) + \beta m(t) - c(t-h)\right]\right] \\ \leq \;& \pi(t-h) \leq \max\left[\begin{array}{c} \beta m(t) + \beta D(t) - c(t-h); \\ \frac{1}{2}\left[x + y - \beta^* m^*(t) + c^*(t-h) + \beta m(t) + \beta D(t) - c(t-h)\right] \end{array}\right] \end{aligned} \tag{4.25}$$

A similar expression holds for $\pi^*(t-h)$.

Since $M(t-h)$ and $m(t-h)$ are defined as bounds to the equilibrium payoff, the difference $M(t-h)-m(t-h)$ must be bounded by the outer quantities in equation (4.25). Hence, the inequalities above imply

$$M(t-h)-m(t-h) \leq \beta D(t)+\frac{1}{2}\left(\max\left[0;\omega-\beta D(t)\right]-\max\left[0;\omega-\beta^* D(t)\right]\right) \quad (4.26)$$

, where $\omega = x+y-(\beta m(t)-c(t-h))-(\beta^* m^*(t)-c^*(t-h))$. It is easy to see that for all values ω this implies

$$M(t-h)-m(t-h) \leq \max\left[\beta D(t);\frac{\beta^*+\beta}{2}D(t)\right] \leq \overline{\beta} D(t) \quad (4.27)$$

Similarly, one can also show that

$$M^*(t-h)-m^*(t-h) \leq \max\left[\beta^* D(t);\frac{\beta^*+\beta}{2}D(t)\right] \leq \overline{\beta} D(t) \quad (4.28)$$

QED.

Let $D(t) = R_t + Q$. From (4.27) and (4.28), as $t \to \infty$, $M_i(\tau) - m_i(\tau) = 0 \ \forall \ \tau$, i.e., each player has a unique equilibrium expected payoff for any finite time period.

Appendix C - Optimal Reserve Policy

Under financial autarky, the optimal reserve policy is given by the solution to

$$\max_{R_{t+(i+1)h}} \sum_{i=0}^{\infty} \frac{C_{t+ih}}{(1+\delta h)^i}$$

s.t.

$$\begin{aligned} C_{t+ih}+\frac{R_{t+(i+1)h}}{(1+\rho h)} &= R_{t+ih}+p(R_{t+ih})hy \\ C_{t+ih} &\geq 0 \quad \text{and} \quad R_{t+ih} \geq 0 \end{aligned}$$

The Euler equation that characterizes the optimal policy is

$$\left(1+\theta_i\left(1+\delta h\right)\right)\left(1+p'(R_{t+h})hy\right)+\lambda_i = \left(1+\theta_{i-1}\right)\left(\frac{1+\delta h}{1+rh}\right)$$

where λ_i and θ_i are the shadow prices on the last two constraints, respectively. An interior solution is obtained when $\lambda_i = \theta_i = \theta_{i-1} = 0$. Letting $h \to 0$, we obtain the condition for the interior optimum:

$$\frac{p'(R_{t+h})y}{\delta - r} = 1$$

Appendix D - The Solution with a Fixed Cost to Lenders

Assume that in each period players put their proposal in an envelope and the relevant offer is decided by the flip of a coin. Moreover, let V_b and V_c denote the country's payoff if the bank or the country gets to make the offer in a period t, respectively. We have

$$V(t) = \frac{E\left[V_c(t) + V_b(t)\right]}{2}$$

The optimal strategy for each player will be to make the minimum acceptable offer, i.e., to offer the amount that leaves the responder indifferent between accepting and turning the offer down. Hence, we get

$$V(t) = \frac{\left[1 - (\beta^* V^*(t+h) - hc^*(t))\right] + \left[\beta V(t+h) - hc(t)\right]}{2} \tag{4.29}$$

where $c(t)$ and $c^*(t)$ represent the cost of delay in reaching an agreement for the country and the bank respectively. But perfect information implies $V^*(t) = 1 - V(t)$ for all t, so that we can rewrite (4.29) as

$$V(t) = \frac{1 - \beta^* + h\left(c^*(t) - c(t)\right) + \left(\beta^* + \beta\right)V(t+h)}{2} \tag{4.30}$$

Starting at $T + h$, bargaining costs are constant at $c(t) = c$ and $c^*(t) = 0$. The subgames starting at T and $T + h$ (before the coin toss) are identical, rendering the solution

$$V(T + kh) = \frac{1 - \beta^* - hc}{2 - \beta^* - \beta} \qquad \forall\, k \geq 1 \tag{4.31}$$

Now consider that the bank incurs a one time cost of k if the offer at time T is

refused. We can obtain $V(T)$ by substituting equation (4.31) in (4.30) at time T:

$$V(T) = \min\left[\frac{1-\beta^*-hc}{2-\beta^*-\beta} + \frac{k}{2}; 1\right]$$

where we ensured that the country share does not exceed 1.

Consider that the time between offers is given by $h = \frac{T}{n}$ with $n \,\epsilon\, \mathbb{N}$. Iterating (4.30) and defining ϕ as the arithmetic average of β and β^* leads us to

$$V(t) = \frac{1-\beta^*-hc}{2-\beta^*-\beta} + \frac{1}{2}\sum_{i=0}^{n-1} \phi^i hc^*(t+ih) + \phi^n V(t+nh)$$

If the interval h goes to zero (i.e. $n \to \infty$), the last term vanishes and we obtain

$$V(t) = \begin{cases} \min\left[\frac{r-c}{r+\delta} + \frac{k}{2}e^{-\frac{r+\delta}{2}(T-t)}; 1\right] & \text{if } t \leq T \\ \frac{r-c}{r+\delta} & \text{if } t > T \end{cases}$$

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