Essays on Political Economy of Fiscal Policy

by

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to my beloved wife, Yuko

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Declaration

I declare that any material contained in this thesis has not been submitted for a degree to any other university. I further declare that the material contained in this thesis is my own work, with the exception that the contents of Chapter 3 are joint work with Amrita Dhillon and Tomas Sjöström.

Also a paper titled *Delay in Fiscal Reform* drawn from Chapter 2 of this thesis appears as PRI Discussion Paper Series 08A-06, at the Policy Research Institute, Japanese Ministry of Finance.

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Summary

Chapter 2 analyzes the political economy of delayed agreements over fiscal reforms, in a setting where two interest groups can bargain over the allocation of the cost of the stabilization, using an alternating offers model. This contrasts with Alesina and Drazen (1991), where the group that concedes earlier bears a fixed disproportionate share of the burden. This allows a systematic comparison of expected delay in the bargaining game, i.e., "the coalition government" and in the concession game, i.e., "the divided government". When interest groups are sufficiently patient, or when shares in the concession game are highly unequal, agreement is reached more quickly on average under bargaining. Both games have the common feature that delay signals the "toughness" of interest groups.

Chapter 3 compares default incentives in competitive sovereign debt markets when leaders can be either democratically elected or dictators. When leaders can be replaced, the incentives for repayment are mainly the ego rents from office. In a dictatorship, the cost of defaulting is the permanent loss of reputation and the loss of future access to credit. There is a trade off between repayment and risk sharing under the state-contingent optimal contracts. We show that when ego rents are high and value of reputation to dictators is low, democracies have an incentive to repay more in good states and repay less in bad states. Thus the democratic leader defaults more often, improving risk-sharing.

Chapter 4 examines the political economy of sovereign debt crises, using newly established data from 81 countries between 1975 and 2010. The empirical results validate that political factors matter for debt sustainability. I find that in a democracy, the parliamentary system is less likely to reschedule their external debt than a presidency, while rescheduling propensity of a country is increased by political instability. Also results show that public creditors (*The Paris Club*) tend to give a "democratic advantage" as a foreign assistance to democratic countries, in contrast with private creditors (*The London Club*).

Chapter 1

Introduction

"A democracy cannot exist as a permanent form of government. It can only exist until the voters discover that they can vote themselves largesse from the public treasury. From that moment on, the majority always votes for the candidates promising the most benefits from the public treasury with the result that a democracy always collapses over a loose fiscal policy, always followed by a dictatorship, then a monarchy."

– Alexander Fraser Tytler, a British lawyer, 1747-1813

"There is no such thing as a good tax."

– Winston Churchill, a British politician, 1874-1965

Fiscal policy has been playing an essential role to stabilize aggregate demand, determine the pattern of resource allocation and the income distribution, and promote the socio-economic development. The main instruments of fiscal management are government spending and taxation. Changes in the level and composition of government spending and taxation can have a significant impact on the economy. While these policy instruments have been used since ancient Greek and Roman times, the economic model developed by Keynes (1936) has been adopted in various forms since the World War II era. In terms of stabilization function, governments try to maintain a countercyclical fiscal stance by keeping a constant level of expenditures and constant tax rates, which helps consumers smooth their own consumption. The standard economics textbook explains that these consumption smoothing attempts result in fiscal deficits, based on Barro (1979).

One of the most striking macroeconomic developments during the last few decades is the rise and persistence of large fiscal deficits in a number of countries, and the increase in the number of sovereign debt default (Reinhart and Rogoff (2011)). Despite recent major fiscal reforms all over the world, many countries have suffered from recurrent large fiscal imbalances that often reflect lack of fiscal discipline, and faced fiscal crises, most notably the Eurozone crisis beginning in the late 2009. As a result of delays in fiscal reforms (e.g., attempts to reduce tax evasion), the Greek government faced a debt crisis in 2010. In order to secure bailout funds from foreign lenders, they had to accept the fiscal consolidation plan proposed by the International Monetary Fund (IMF) and the European Union (EU), which forced the Greek government to decrease civil wages by more than 30%, cut pension benefits, and reduce the number of civil servants by 15,000. While those measures ended up reducing annual expenditure on wages by over one-third, unemployment rates skyrocketed to more than 27%, and interest rates went up over 30%.

The fact that governments tend to accumulate debt above levels that could be plausibly explained by consumption smoothing theories has been well documented (Alesina and Perotti (1995)). Among others, the possible explanation of accumulating fiscal debts could be the influence of political considerations on fiscal policy making. Fiscal policy ultimately aims to spend money, which is collected from citizens through taxation. Since taxation is a relatively visible burden to citizens, the decision is more likely to be affected by political considerations as well as economic considerations, compared to monetary policy. Even beyond political incentives, tax issues have often been highlighted for fundamental political principles – For instance, we could easily see a slogan of "Taxation without representation" on all vehicle license plates in Washington D.C.[1]

The literature on the political economy of fiscal policy is very large, and dates back to the nineteenth century with the Italian school of public finance (Buchanan (1960)). Most of the earlier literatures from the 1970s and 1980s were done by James Buchanan and his associates, such as Buchanan and Wagner (1977) and Brennan and Buchanan (1980). Their explanation of why governments run fiscal deficits is mainly based upon the notions of "fiscal illusion" and voter's irrationality. They emphasize the opportunistic manipulation of government spending by incumbant policy makers, who would try to improve their chances to get re-elected. Under these circumstances, voters are assumed to appreciate government expenditure, in articilar its expansionary macroeconomic consequences, but consistently underestimate its costs in a form of future burden.

In the 1990s, however, these literatures have been criticized because of the assumption that voters make consistent mistakes (Alesina and Perotti (1995)). Therefore, there is a tendency to see different lines of theoretical argument about the motivations behind accumulation of debts, with the assumption that the time horizon and discount factor of politicians coincide with those of the economy, and voters behave rationally with perfect information.

Alesina and Tabellini (1990), for example, models deficits as a strategic variable to

[1]Washington D.C. vehicle authorities encourage all D.C. residents to support D.C.'s quest for full representation in the U.S. Congress by displaying this slogan on their vehicle license plates. All new registrants receive "Taxation without Representation" tags automatically unless requested otherwise.

"tie the hands of successors" with different fiscal preferences. Under a democracy where government debt is used strategically by policymakers with different preferences, in order to influence the choices of their successors, debt accumulation is likely to be higher than that of optimal composition by a social planner. In other words, it could be caused by the voters' disagreement, rather than their myopic actions. The larger the equilibrium level of debt in the model is, the larger is the degree of polarization between alternating governments, and the less likely it is that the incumbent government will be re-elected.

Alternatively, distributional conflicts within social groups have also been used to explain why fiscal deficits are accumulated even if they are recognized as being necessarily adjusted. A seminal paper, Alesina and Drazen (1991) models the decision on fiscal adjustments as a 'war of attrition' between groups that decides which will bear the costs of the adjustment. The adjustment occurs when one group makes a decision to accept to pay these costs, with the judgment that its additional tax payments related to further delay would exceed its benefits from waiting further for the other to concede. As discussed in chapter two, these models of delayed adjustment suggest that the probability of an adjustment to take place in a timely manner would decrease with the level of fragmentation and polarization, as the parties have a larger incentive to wait under higher polarization.

Considering the above, democratic governments do not necessarily provide ideal circumstances to ensure optimal policy outcomes. Rather, the empirical literature on democracy and economic development of the last few decades fails to arrive at a clear answer on the relationship (Brunetti (1997)).[2] Further, Bardhan (1993) suggests that the theoretical relationship between democracy and growth itself is ambiguous, while Sah (1991) has argued that authoritarian regimes exhibit a larger variance in economic performance than democ-

[2]Of the seventeen papers reviewed in Brunetti (1997) that empirically examine the democracy-growth relationship, nine find no effects, four find positive effects, and the other four find negative effects.

racies. Depending on the composition of the voters, democracies may be more susceptible to pressures for immediate consumption that could hamper long-run investment. On the other hand, authoritarian leaders, who have the sufficient capacity to cope with such pressures, may instead be self-aggrandizing. In fact, the legitimacy of authoritarian regimes could be sustained by providing economic stability, or rapid growth in some cases.

Furthermore, Reinhart and Rogoff (2011) suggest that the pressing needs of governments to reduce debt rollover risks and curb rising interest expenditures are leading to a revival of "financial repression", which had its peak during the heaviliy regulated Bretton Woods system. The mechanism of "financial repression" described in Reinhart and Rogoff (2011) is that more directed lending to governments by captive domestic audiences, explicit or implicit caps on interest rates under a mild inflation, and tighter regulation on cross-border capital movements would result in debt reduction. Needless to say, traditional approaches on fiscal consolidation is to cut expenditures or increase taxes. Therefore, this evolution may imply that in the wake of the Eurozone crisis and "fiscal cliff" in the U.S., the feasibility to implement classical fiscal adjustments in a timely manner has been questioned under recent democracies.

A natural question then is *if democracies may not help avoid fiscal crises, including sovereign default, which system is better off?* Given democratic countries are not likely to revert to autocracy, it is necessary to address how the difference in democratic systems affects the decisions on fiscal reforms and sovereign debt default. Hence, this essay theoretically and empirically investigates how fiscal policy is formulated in the context of political economy, focusing on not only the difference between democracy and dictatorship, but also the difference among democratic systems, such as parliamentary or presidential regimes, and divided or coalition governments.

The remaining of this essay consists as follows.

Chapter two analyzes the political economy of delayed agreements over fiscal reforms, in a setting where two interest groups can bargain over the allocation of the cost of the stabilization. This contrasts with the classic contribution of Alesina and Drazen (1991), which assumes that a group which concedes earlier bears a fixed disproportionate share of the burden. The approach of this chapter is to study an alternating offers model of bargaining in the economic environment of Alesina and Drazen, i.e., where bargaining takes place in continuous time, and there is two-sided uncertainty. This allows a systematic comparison of expected delay in the bargaining game (i.e. "the coalition government") and in the concession game (i.e. "the divided government"). When interest groups are sufficiently patient, or when shares in the concession game are highly unequal, agreement is reached more quickly on average under bargaining. But, both games have the common feature that delay signals the "toughness" of interest groups.

Chapter three compares default incentives in competitive sovereign debt markets when leaders can be either democratically elected or dictators. This provides a novel solution to the paradox pointed out by Bulow and Rogoff (1989), that if savings are allowed, then countries will prefer to default on their debt at some point. A noticeable innovation is to introduce incomplete information on the ability type of leaders. The result show that this gives leaders incentives not to default on foreign debt even when it is to the advantage of the representative agent to do so. When leaders can be replaced, as in democracies, the incentives for repayment are mainly the ego rents from office. In a dictatorship, on the other hand, the cost of not repaying loans is the permanent loss of reputation and the loss of future access to credit. Under the optimal contract, there is a trade off between repayment and risk sharing. I show, that when ego rents are high and value of reputation to dictators is low, then democracies have incentive to repay more in good states, and then repay less in bad states under the optimal contract. Thus under these circumstances, the democratic leader defaults more often than dictatorships, improving risk-sharing.

Chapter four examines the political economy of sovereign debt crises, using a newly constructed database that maps the timing of sovereign debt rescheduling decisions in 81 countries for 1975-2010. While comparatively little empirical work has been undertaken, in comparison with existing empirical literature, this chapter studies the role of political institutions more comprehensively – I analyze both democratic and non-democratic regimes, and investigate a large number of political instituional characteristics, while controlling macro-economic variables that account for debt dynamics. A notable innovation is to study *the Paris Club* (sovereign creditors) and *the London Club* (private creditors) debt reschedules separately. To my best knowledge, the literature has ignored the difference along with the data limitation.

The empirical results validate and support the view that political factors matter for debt sustainability. I find empirical supports, under some conditions, for the hypothesis that parliamentary democracies have a lower propensity to reschedule their external liabilities than presidency scheme. This result is consistent with the theoretical literatures that the parliamentary regime has a strong check-and-balance system on executives. It then finds that the probability of default is lower in countries under government concentration. This finding may be seen as being in line with a theoretical implication by Alesina and Drazen (1991) that fiscal adjustments tend to be delayed under a divided government. I also find that the probability of rescheduling seems to be increased by political instability, such as electoral competitiveness. If the competitiveness increases, the chance to be reelected in the next election is lower, which may lead to disincentives to save. Interestingly, in contrast, the occurrence of default seems to be lower when the executive is expected to remain in office for the next term. Finally, the result shows that the Paris Club members tend to give more support to those borrowers who are democratic than to those who are not, while this has not been observed in the London Club. This may correspond to "democratic advantage" given by international community. Importantly, these results are robust to extensive controls and to numerous changes of specifications and estimation method. Beyond providing a contribution to the existing literatures, these findings have important implications for both academics and policy-makers who analyze sovereign defaults.

Chapter 2

Delay in Fiscal Reform

2.1 Introduction

The sustainability problem of government deficits is currently in the spotlight all over the world. It is vital for developing countries seeking to avoid bankruptcy to develop adequate debt management policies, especially in the wake of the 1997 Asian financial crisis and the 2010 Eurozone crisis. This need for fiscal sustainability is also shared by industrialized countries, even the United States. Spending for social programs continues to rise, reflecting the rapidly aging population. In order to keep the fiscal condition sustainable, in general, cutting spending, increasing taxes, or both would be required. On the other hand, countries sometimes pursue economic policies that are widely recognized as unsustainable and costly to all groups. Why such a fiscal reform is delayed? How can we promote the reform?

The current theoretical explanations for the delay are summarized as follows. First, free-rider problem allows every group to have incentives to avoid sharing the burden as

[0] As declared, this chapter has been published as a working paper as PRI Discussion Paper Series 08A-06, at the Policy Research Institute, Japanese Ministry of Finance.

in Alesina and Drazen (1991) and Velasco (2000). Even when it was widely recognized that fiscal adjustment were necessary, a social consensus on the sharing of the burden of stabilization programme was difficult to achieve. Secondly, lobbying activities of interest groups may affect the date of stabilization as in Tornell (1998). Expenditure cuts might involve the so called "pork-barrel" problem, and thus also bring on political difficulties. Thirdly, every group is likely to expect that things would get better before such measures being implemented. More practically, politicians tend to avoid tax increase, because this policy change can burden citizens directly. Therefore, given the expectation, the reform is likely to be politically shirked by national rebellion.

Among them, one of the most influential explanations has been taken by Alesina and Drazen (1991). They applied "war-of-attrition" to explain why the reforms are delayed, where they elaborated on earlier ideas by Riley (1980) and Bliss and Nalebuff (1984).[1]

In their model, even if overall benefits are obviously expected to exceed the overall cost of the reform, the reform can be delayed as long as the burden of stabilization is unequally distributed. Stabilization occurs only when one group concedes and bears a disproportionate share of the burden, which is exogenously fixed. The groups have to concede at some point because there is the cost of waiting, which is private information. Thus, as long as participants in the process believe that someone else may have a higher cost of waiting, concede earlier and then accept a larger share of the burden, every group has an incentive to attempt to shift the burden of stabilization onto other groups by waiting for the action of others, as in the free-riding behaviour in provision of public goods. As a result, stabilization does not occur immediately. If every group takes the cooperative strategy, they could obtain the benefit, but this solution can not be obtained on equilibrium path.

[1]Riley (1980) built the biological war-of-attrition model, and Bliss and Nalebuff (1984) focused on the public good model.

This is called “a war of attrition” among interest groups. They solve for the expected time of stabilization in a model of “rational” delay and analyze it relating to several political and economic variables.

This influential paper Alesina and Drazen (1991) has been extended in several directions. In Drazen and Grilli (1993)’s non-monetary model without an explicit inflation rate, monetization is introduced as a distortionary tax before stabilization. Casella and Eichengreen (1996) analyzes the conditions under which a foreign aid can accelerate stabilization. The aid are used to reduce the fiscal burden of the group that concedes first. Spolaore (2004) examines the relative performance of three different government systems in terms of the efficiency of stabilization. Martinelli and Escorza (2007) modified the assumption in Alesina and Drazen (1991) that each group chooses the same expected concession time due to *ex-ante* symmetry which leads to a symmetric Nash equilibrium. Further discussions will be described in the following section.

While these models successfully figure out the mechanism of delayed reforms, most of literatures with the concession framework assume that each group may take a non cooperative behaviour. This concession process can be regarded as a dead locked situation in the divided government with endless debates where interests group have no ways to compromise. But it can be also considered that in the process of reaching an agreement on stabilization, each group in a coalition government may negotiate or bargain on the share of the cost of stabilization.[2] Hence it is natural to assume that the groups would negotiate over the combination of policies and that all groups could agree with an allocation of the cost as a consequence of the bargaining.[3]

[2]See Persson and Tabellini (2000) chapter 7.2 which describes the legislative bargaining.

[3]In order to see this point practically, consider the case where the interest groups could be the representatives of firms and workers; a group for firms is likely to insist to raise the value added tax or build

Stabilization policies then can be made through the bargaining in the legislative process. Bargaining over the share can be a device to adopt the information dynamics into the concession process. In other words, with the legislative bargaining process for incompletely informed groups or parties, the expected delay of reform can be different from in the war-of-attrition setting. Needless to say, both process should be compared in order to make a reform with less delay. Hence the aim of this chapter is to describe the model of delayed stabilization in both bargaining and concession framework under the same economic environment in order to compare the expected delay of both processes. This comparison may lead to some policy implications.

Very few papers deal with bargaining of delayed reform. Hsieh (2000) and Sibert and Perraudin (2000) extend Alesina and Drazen (1991)'s war of attrition model by endogenizing the distribution of the stabilization costs through a bargaining process. But due to their strong assumption, they have limitation to compare with the result of Alesina and Drazen (1991). Both of them suppose one-sided uncertainty. Their models also assume one-sided offering.[4] As Alesina and Drazen (1991) considered conflicts among two or more interest groups in infinite time, alternating offer would be rather reasonable assumption. Furthermore, both of them could not indicate the length of delay, as they assume a finite horizon model with discrete time, two or three stages.

Unlike them, in this chapter we will build the two-sided incomplete information and alternating offer model under an infinite horizon with continuous time, regarding Cramton

the proportional tax, while the group for workers tends to propose an increase in the capital tax or more strengthened progressive tax. The final solution would be a mixed policy of these taxes. They might also fight upon the burden of welfare benefits. For concrete example, as in Alesina and Drazen (1991), the components of successful Poincaré stabilization in 1926 were considered as a revised version of his initial proposal of 1924, which had been denied by the other party.

[4]Hsieh (2000) applies conflicts among capitalists and labours over wages.

(1992) for describing and characterizing sequential equilibrium. Then we could obtain the expected delay in the bargaining process which will be directly compared with the concession process.

Again while this chapter is related to Alesina and Drazen (1991) in the analysis of the delay of macro stabilizations, the contribution of this essay is to set up and solve the bargaining game in the legislative process in addition to the war-of-attrition game in Alesina and Drazen (1991); in this chapter, the interest groups can communicate and exchange private information through generalized bargaining system.[5]

Main findings are the following. The introduction of information aggregation process makes the difference in the expected delay between concession and bargaining setup. Thus this chapter analyzes how the both of concession and bargaining process affect the expected delay of stabilization. With two-sided uncertainty and alternating offering, interest groups use a delay as a strategic variable. The simulation with the uniform distribution shows that when interest groups are more patient than a threshold, the bargaining process may hasten the stabilization. Meanwhile, when groups are more impatient, the bargaining may rather take more time to reach an agreement on the reform due to the negotiation procedure. Furthermore, in more polarized economy, the bargaining process may lead to the shorter delay more effectively. As a consequence, comparison of two process may imply which process would be more efficient in terms of the expected delay of fiscal reform.

This allows a systematic comparison of expected delay in the bargaining game and in the concession game of Alesina and Drazen. When interest groups are sufficiently patient, or when shares in the concession game are very unequal, agreement is reached more quickly

[5]A large part of the political economy literature are silent on how the relevant agents acquire and aggregate information.

on average under bargaining. But, both games have the common feature that delay signals the "toughness" of the interest group.

The rest of the chapter is organized as follows. Related literatures are reviewed in Section 2. The set up of the model is described in Section 3. The equilibrium in the bargaining process are presented in Section 4. The War of Attrition game is discussed in Section 5. Section 6 analyze the welfare in the economy. Section 7 compares two results and obtains policy implication. Section 8 concludes.

2.2 Related Literature

First of all, we will briefly look at Alesina and Drazen (1991). They applied "war-of-attrition" to explain why the reforms are delayed. They solve for the expected time of stabilization in a model of "rational" delay and analyze it relating to several political and economic variables. As long as participants in the process believe that someone else may have a higher cost of waiting, stabilization does not occur immediately. If all groups are identical like a single agent, then one stabilizes immediately as one knows that he will be the stabilizer with probability one. An increase in the cost of waiting will move the expected date of a stabilization forward. If the gain from waiting is larger, each group holds out longer. The difference in the shares of the burden of stabilization could be interpreted as representing the degree of political cohesion in the society. If the difference is larger, the economy is more polarized or less cohesive. As the relative burden of stabilization is unequally distributed, it might be harder to reach agreements on how to allocate tax increases among coalition partners. If the burden of stabilization is shared relatively equally, stabilization occurs more immediately.

In Drazen and Grilli (1993)'s non-monetary model without an explicit inflation rate, monetization is introduced as a distortionary tax before stabilization. They show that highly distortionary finance can be welfare improving. Higher inflation will shorten the delay by raising the cost of living in the economy before a stabilization. There is a trade-off with higher inflation of lowering welfare until a stabilization and inducing an earlier time of agreement on use of nondisortinary financing. This paper also shows by simulation methods that the U-shape relationship between the expected utility and inflation rate, and between the expected concession time and the inflation rate.

During a war of attrition, a change in the environment may lead to a change in the date of concession. For example, Casella and Eichengreen (1996) analyzes the conditions under which foreign aid can accelerate stabilization, where the aid reduces the fiscal burden of the group that concedes first. Incoming aid will reduce future fiscal burden and therefore this should hasten stabilization. But at the same time, there is an incentive for players to postpone concession until arriving closer to the moment of transfer. Due to distributional conflicts to shift the cost onto its rival, the aid announced relatively early in the inflation process can accelerate stabilization. On the other hand, the aid announced or delivered after a considerable delay can have the opposite effect. Thus the effects of aid are contingent and timing of release of information is crucial.

Spolaore (2004) analyzes the relative performance of three different government systems in terms of inefficient delays of stabilization to occur; *cabinet system*, in which one decision maker has full control over adjustment policies; *consensus system*, in which adjustment policies must be agreed upon by all agents; and *checks-and-balances system*, in which one agent decides what policy adjustment should be used, but the remaining agents may veto its use. The result is that checks-and-balance system dominates pure consensus systems, but may or may not outperform cabinet systems. The outcome depends on the degree of political fragmentation and the size of distributions of shocks.

In symmetric Nash equilibrium as in Alesina and Drazen (1991), each group chooses the same expected concession time. Martinelli and Escorza (2007) modified this strong assumption of ex ante symmetry. As the gains from stabilization of each group are drawn from the different distribution, an interest group, which is more exposed to inflation costs, will be likely to give in immediately, leading to earlier stabilization. They show by simulation that, if the expected cost of inflation increases for the more exposed group, then the probability of immediate reform increases. The effect of a reduction in the cost of inflation, benefiting mostly the less exposed group, may be a shorter delay. Intuition is that the more exposed group will prefer to give up at time zero by realizing the cost.

The paper also shows by simulation that, if the distributive outcome of reform become more unequal, the probability of immediate agreement increases as the more exposed group which realize the high cost, prefers to give up at time zero. But at the same time, the expected delay of stabilization increases, since an increase in the distributional outcome raises the willingness to fight against the opponent.

Furthermore, a policymaker may have an incentive to abandon fiscal responsibility and revert to inflation method, as this way is costless rather than other taxation with legislative process. If the public is uncertain about the degree of commitment of the policymaker to fiscal responsibility, success is less likely.

2.3 The Model

In this chapter, we analyze a stripped-down version of Alesina and Drazen (1991) in order to analyze the difference between bargaining results and concession results. Time is continuous and infinite $t \in (0, \infty)$. At $t = 0$, the government deficit is zero and the economy is hit by a shock reducing tax revenue by amount τ. From then until the date of stabilization T, the government deficit τ has to be financed at each period by distortionary taxation.[6]

There are two political groups or parties $i = L, R$.[7] Before stabilization, each party pays one half of the distortionary taxation and, in addition, suffers from some welfare loss $\theta_i \tau$, where θ_i is private information to each party i. The parameters θ measures the deadweight loss of tax burden $\frac{\tau}{2}$ suffered by group $i = L, R$. Thus the total loss due to taxation suffered by group i at any time before stabilization is described as $(\frac{1}{2} + \theta_i)\tau$.

The type of group i, θ_i , is independently drawn at $t = 0$ from a common continuous distribution $F(\theta)$ with $\theta \in [\underline{\theta}, \bar{\theta}]$.[8] This θ_i is private information, which is known only to the group itself, while the other only knows the distribution $F(\theta)$ and its positive density function $f(\theta)$.

The distortions disappear with stabilization at $t = T$. In other words, all groups benefit from stabilization because of the existence of distortionary taxes before stabilization. But the two groups can negotiate, or bargain, over the sharing of the burden of stabilization. Let κ_i be the share borne by group i ; $\kappa_L + \kappa_R = 1$. This means that after stabilization at T, group i must make a tax payment to the government of $\kappa_i \tau$ in perpetuity.

We are now ready to write down the utility flows to group i, given a stabilization occurs at T, with shares κ_L and κ_R. For group i, utility at instant t is equal consumption, which

[6] In Alesina and Drazen (1991), deficit is covered by distortionary taxation and governmental bond. But this assumption is not very essential. For example, Martinelli and Escorza (2007) put an assumption of no bond issue, and Drazen and Grilli (1993) considered the monetary version of this model where the deficit is financed by inflation tax without issued bond.

[7] This may be generalized easily to more than two groups in a case where we set the assumption of exogenous fixed shares of cost of stabilization. On the other hand, in the bargaining model, multiple players case might become very complicated.

[8] In concession setup, we need to set the lower bound of $\underline{\theta} > 0$ to avoid no concession cases.

in turn is equal to exogenous income (normalized to zero), minus tax payments and the deadweight loss before T,

$$u_i(t) = \begin{cases} (-1/2 - \theta_i)\tau & \text{if} \quad t \leq T \\ -\kappa_i \tau & \text{if} \quad t > T. \end{cases} \tag{2.1}$$

We also assume that groups are infinitely lived and discount the future according to a common rate r, which is known to both groups. Hence total discounted payoff with stabilization at $t = T$ can be written as

$$\begin{aligned} V(T, \kappa_i; \theta_i) &= \int_0^\infty u_i(t) e^{-rt}\, dt \\ &= -\int_0^T \left(\frac{\tau}{2} + \theta_i \tau\right) e^{-rt}\, dt - \int_T^\infty \kappa_i \tau e^{-rt}\, dt \\ &= \frac{\tau}{r}\left[e^{-rT}\left(\theta_i + \frac{1}{2} - \kappa_i\right) + \left(-\frac{1}{2} - \theta_i\right)\right]. \end{aligned} \tag{2.2}$$

In what follows, note that the only part of V that depends on T and κ_i is $e^{-rT}\left(\theta_i + \frac{1}{2} - \kappa_i\right)$, so we can think of each group as maximizing just

$$U^i(T, \kappa_i; \theta_i) = e^{-rT}\left(\theta_i + \frac{1}{2} - \kappa_i\right). \tag{2.3}$$

In the bargaining game, to be described below, the players bargain over κ_L and κ_R by making alternating offers. However, it is convenient and without loss of generality to transform the problem by assuming that they bargain over the object $\alpha = \frac{1}{2} - \kappa_R$, which must lie between $-\frac{1}{2}$ and $\frac{1}{2}$. A positive α means $\kappa_R < \frac{1}{2}$, ie group R has to pay relatively smaller share of the burden, and conversely a negative α means that group L has to pay relatively smaller share of the burden.[9] Then, expected payoffs over agreement on (α, T) can be written as

$$U^L = e^{-rT}(\theta_L - \alpha) \quad \text{and} \quad U^R = e^{-rT}(\theta_R + \alpha). \tag{2.4}$$

[9] Needless to say, if the cost is equally distributed at $\kappa_R = \kappa_L = 1/2$, $\alpha = 0$.

In the concession framework, which will be solved in Section 5, the share of cost of stabilization is *exogenously* determined. A group which concedes earlier than the other has to bear a higher share $\kappa > \frac{1}{2}$, while the rest of this, $1 - \kappa$, is borne by the other group. Each party maximizes its expected lifetime payoff by choosing a time to concede if the other party has not yet conceded. They, therefore, have an incentive to wait till the other takes the initiative of the reform. Note that, in the concession game, we assume $\theta_i + \frac{1}{2} - \kappa_i > 0$ to avoid no concession, meaning that stabilization occurs in finite time with probability one. If this does not hold, groups will always postpone their decisions to concede or offer.

2.4 Equilibrium Delay in the Bargaining Game

In this section, we analyze the war-of-attrition with the bargaining process by allowing each group to bargain over the share of cost of stabilization, while this parameter in Alesina and Drazen (1991) is exogenous. We adopt Cramton (1992)'s model for this purpose.

2.4.1 Description of the Game

At $t = 0$, each group gets to know their own private information θ_i of how much exposed to distortionary taxes. Then they start to negotiate over α. In this section, as θ_i can be used to express a value revealed by offering in the bargaining process, true valuations are often denoted by L and R respectively, in order to explicitly distinguish the true value with the revealed value.

If at time t neither group L nor R has yet made an offer of α, either group L or R can make an offer at t. If, for example, group L has made an offer at t, group R either (a) accepts, in which the game ends, with payoffs given by equation (2.2), or (b) after a minimum period t_0, makes a counter offer. The minimum period is set at $t^0 = -(1/r)\log\delta$ as in Admati and Perry (1987). δ is the discount factor from one period delay.[10] As they make an offer alternately, they can choose the delay between offers as a signal.

As time passes, the gain from stabilization is discounted by r. Thus both groups prefer agreement on today to the same agreement tomorrow. We now show that delay is more costly for a high θ than for a low θ. More precisely, a high θ type is willing to give a bigger concession in term of α to get a given reduction in the stabilization time. In other words, the utility function satisfies the *single crossing property*, with which utility of interest each group is strictly monotone in α and the slope of indifference curve is strictly monotone in θ. Then the indifference curves of θ and θ' cross only once. Figure 2.1 shows this property for the interest group L and Figure 2.2 for the group R respectively.

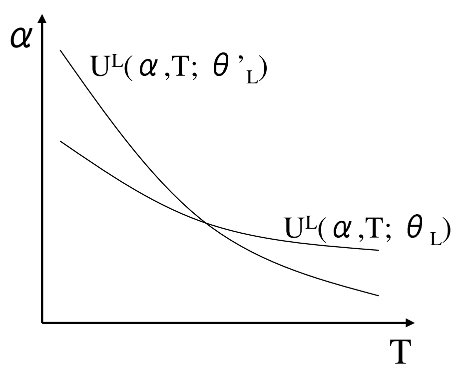

Figure 2.1: $\theta_L' > \theta_L$

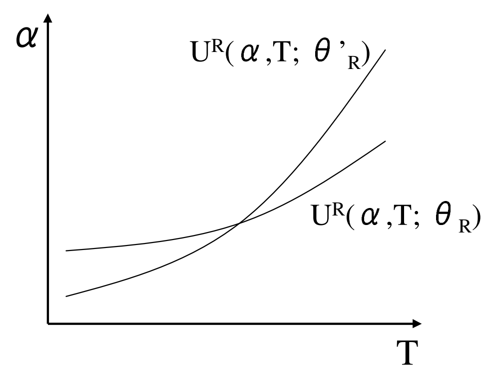

Figure 2.2: $\theta_R' > \theta_R$

Lemma 1 *The payoffs of each group satisfy the single crossing property.*

Proof. For R, the expected payoff over the bargaining process is $U^R(\alpha, T; \theta_R) = e^{-rT}(\theta_R +$

[10] Later on, we analyze the limiting case such that the minimum time between offers goes to zero ($\delta \to 1$), in order to compare with the concession set up.

α). Hence $\partial U^R/\partial\alpha = e^{-rT} > 0$ and $\partial U^R/\partial T = -re^{-rT}(\theta_R + \alpha) < 0$. Thus the slope of the indifference curve is $-(\partial U^R/\partial T)/(\partial U^R/\partial\alpha) = r(\theta_R + \alpha)$, which is strictly increasing in θ_R. For L, we identically obtain $-(\partial U^L/\partial T)/(\partial U^L/\partial\alpha) = -r(\theta_L - \alpha)$, which is strictly decreasing in θ_L. The proof for the single crossing property of the original function in Alesina and Drazen (1991) is given in Lemma 3. ■

2.4.2 Equilibrium Strategies

We will build a sequential equilibrium where both groups use a delay as a strategic variable and interact by offering and accepting. Before analyzing the equilibrium path, we define the equilibrium offer, the acceptance or delay decision as a function of beliefs.

Equilibrium Offer under No Uncertainty After both type are revealed by offering, equilibrium offer after this becomes the Rubinstein (1982) full information offer and the most patient type accept the offer.

In full information about both type, the alternating offer game with a fixed time between offers has a unique subgame perfect equilibrium where the groups stabilize immediately at the share $\alpha(L, R)$ if L makes the initial offer and $\alpha(R, L)$ if R makes the initial offer.[11]

At Rubinstein offers, each group is indifferent between accepting at the other's offer immediately or stabilizing at his own offer after a one period delay such as

$$R + \alpha(L, R) = \delta(R + \alpha(R, L)) \text{ and } L - \alpha(R, L) = \delta(L - \alpha(L, R)).$$

Hence equilibrium shares are gives as

$$\alpha(L, R) = \frac{\delta L - R}{1 + \delta} \text{ and } \alpha(R, L) = \frac{L - \delta R}{1 + \delta}. \tag{2.5}$$

[11] See Rubinstein (1982).

Thus offering group receives a truncated payoff of $\delta(R+L)/(1+\delta)$ and the other receives $\delta^2(R+L)/(1+\delta)$. After revealing value θ_R and θ_L, along the equilibrium path, L makes offer $\alpha(\theta_L,\theta_R)$, and R accepts this offer, since rejecting and making counter offer $\alpha(\theta_R,\theta_L)$ tomorrow yields the same payoff as accepting $\alpha(\theta_L,\theta_R)$ today.

Acceptance/Delay Decision under One-sided Uncertainty Suppose that L reveals θ_L, but R's value is still private information. In this case, a less patient R accepts the offer, while a more patient R rejects the offer.

Define $\tilde{\theta_R}(\theta_L,\alpha)$ as the type of R that is indifferent between accepting or rejecting the offer α with revealing θ_L. Hence $\tilde{\theta_R}(\theta_L,\alpha)$ is indifferent between $\alpha(\theta_L,\tilde{\theta_R})$ today and $\alpha(\tilde{\theta_R},\theta_L)$ tomorrow.

$$\tilde{\theta_R}+\alpha(\theta_L,\tilde{\theta_R})=\delta(\tilde{\theta_R}+\alpha(\tilde{\theta_R},\theta_L))=\delta(\tilde{\theta_R}+\frac{\theta_L-\delta\tilde{\theta_R}}{1+\delta})=\frac{\delta}{1+\delta}(\tilde{\theta_R}+\theta_L)$$

Solving $\tilde{\theta_R}$ and the analogous $\tilde{\theta_L}$, we obtain

$$\tilde{\theta_R}=-(1+\delta)\alpha(\theta_L)+\delta\theta_L \text{ and } \tilde{\theta_L}=(1+\delta)\alpha(\theta_R)+\delta\theta_R. \tag{2.6}$$

A group $R\geq\tilde{\theta_R}(\theta_L,\alpha)$ accepts the offer $\alpha(\theta_L,\tilde{\theta_R})$, while a group $R<\tilde{\theta_R}(\theta_L,\alpha)$ prefers to delay before making the revealing offer $\alpha(\theta_R,\theta_L)$. L infers that $R=\theta_R(\Delta\,|\,\theta_L,\tilde{\theta_R})$ if R delays Δ before making the offer $\alpha(\theta_R,\theta_L)$ and that $R\geq\tilde{\theta_R}$ would have accepted L's offer. The optimal length of delay $\Gamma(R\,|\,\theta_L,\tilde{\theta_R})$ before offering $\alpha(R,\theta_L)$ is given by the incentive constraint

$$e^{-r\Gamma}\left[R+\alpha(\theta_R(\Gamma),\theta_L)\right]=\max_{\Delta} e^{-r\Delta}[R+\alpha(\theta_R(\Delta),\theta_L)].$$

First order condition with regards to Δ can be derived as

$$\frac{\partial U^R}{\partial\Delta}=-re^{-r\Delta}[R+\alpha(\theta_R,\theta_L)]+e^{-r\Delta}\frac{\partial\alpha}{\partial\theta_R}\frac{\partial\theta_R}{\partial\Delta}=0$$

$$\Leftrightarrow -r\left(R+\frac{L-\delta R}{1+\delta}\right)+\frac{-\delta}{1+\delta}\frac{\partial\theta_R}{\partial\Delta}=0.$$

Then this yields the separable first order differential equation

$$\frac{\partial\theta_R}{\partial\Delta}=-\frac{r}{\delta}(\theta_R+\theta_L).$$

The optimal delay is then obtained by integration of $\partial\Delta$ as

$$\begin{aligned}\Gamma(R\,|\,\theta_L,\tilde{\theta_R}) &= \int_{\tilde{\theta_R}}^{R}-\frac{\delta}{r}\frac{d\theta_R}{\theta_R+\theta_L}=-\frac{\delta}{r}\int_{\tilde{\theta_R}}^{R}(\theta_R+\theta_L)^{-1}d\theta_R \\ &= -\frac{\delta}{r}\Big[\log(\theta_R+\theta_L)\Big]_{\tilde{\theta_R}}^{R}=-\frac{\delta}{r}\log\frac{R+\theta_L}{\tilde{\theta_R}+\theta_L}. \end{aligned} \quad (2.7)$$

The inverse $\theta_R(\Delta\,|\,\theta_L,\tilde{\theta_R})$ is given as

$$\begin{aligned} -\frac{r\Delta}{\delta} &= \log\frac{R+\theta_L}{\tilde{\theta_R}+\theta_L} \\ \Leftrightarrow\ \theta_R(\Delta\,|\,\theta_L,\tilde{\theta_R}) &= (\tilde{\theta_R}+\theta_L)e^{-\frac{r\Delta}{\delta}}-\theta_L. \end{aligned} \quad (2.8)$$

By the single-crossing property, since Γ and θ_R are strictly decreasing, this is necessary and sufficient for the optimization problem. The analogous functions for group L are derived as

$$\Gamma(L\,|\,\theta_R,\tilde{\theta_L}) = -\frac{\delta}{r}\log\frac{\theta_R+L}{\theta_R+\tilde{\theta_L}} \quad (2.9)$$

$$\theta_L(\Delta\,|\,\theta_R,\tilde{\theta_L}) = (\theta_R+\tilde{\theta_L})e^{-\frac{r\Delta}{\delta}}-\theta_R. \quad (2.10)$$

2.4.3 Equilibrium Path

Initially, both groups delay negotiations by refusing to make an initial offer. As time goes on, both groups become anxious about the gains from stabilization, since if the gains are larger, the other group would have made an offer. Define $\theta_R(\Delta)$ as a value of R that makes an initial offer after Δ, and $\Gamma(R)=\theta_R^{-1}(R)$ as the delay until R makes an initial offer if L does not make one until then. $\theta_L(\Delta)$ and $\Gamma(L)=\theta_L^{-1}(L)$ are analogous. Less patient group which can obtain higher gains from stabilization is likely to stabilize earlier. Hence $\theta_R(\Delta)$, $\theta_L(\Delta)$, $\Gamma(L)$ and $\Gamma(R)$ are decreasing functions.

After a delay of Δ without an offer, R believes that the value of L is no less than $\theta_L(\Delta)$, that is, L is in $[0, \theta_L(\Delta)]$, as a less patient group $L > \theta_L(\Delta)$ would have made an offer before Δ. L's belief on R's valuation conditional on the history is the truncated prior:

$$F_L(R \mid \Delta) = \frac{F(R)}{F(\theta_R(\Delta))} \ \text{ for } \ 0 \leq R \leq \theta_R(\Delta).$$

Similarly, after a delay of Δ, L believes that the value of R is in $[0, \theta_R(\Delta)]$.

Then there are three possible cases in the equilibrium path, depending on the valuations L and R:

1. L is less patient than R. L makes the initial offer $\alpha(\theta_L, \tilde{\theta_R})$ after a delay of $\Gamma(L)$, where $\tilde{\theta_R}$ is the most patient R to accept the offer. If $R \geq \tilde{\theta_R}$, R accepts the offer without delay. Otherwise, R rejects the offer and reveals his type R by delaying $\Gamma(R)$ plus the minimum delay t^0 before making the counter offer $\alpha(R, L)$. L accepts the offer without delay.

2. R is less patient than L. R makes the initial offer $\alpha(\theta_R, \tilde{\theta_L})$ after a delay of $\Gamma(R)$, where $\tilde{\theta_L}$ is the most patient L to accept the offer. If $L \geq \tilde{\theta_L}$, L accepts the offer without delay. Otherwise, L rejects the offer and reveals his type L by delaying $\Gamma(L)$ plus the minimum delay t^0 before making the counter offer $\alpha(L, R)$. R accepts the offer without delay.

3. R is equal to L. If the groups happen to make initial offers at the same timing, a coin is flopped to determine which group will be the initial one. Then one's offer is accepted without delay.

Negotiations end in finite time after at most two offers, but the equilibrium path still depends on the group's option to make alternating offers. The strategies depend only on the current beliefs and the recent offer. The posterior beliefs following an offer depend only on the prior belief and the amount of delay before the offer.

2.4.4 Equilibrium Delay

We will state the strategies and beliefs in the three phases of the game; *Phase 0*, in which no offers have been made; *Phase 1*, in which one offer has been made; and *Phase 2*, in which two or more offers have been made. Suppose L makes an initial offer and then R responds with acceptance or a counteroffer. The other possible path, in which R makes the first offer, are symmetric. Then we solve equilibrium in backward way such as dynamic programming.

For simplicity, we assume that the group never make offers which are more attractive than their revealed value.

Phase 2 Suppose that the previous offers reveal valuations θ_R and θ_L, and that R just made an offer $\alpha(\theta_R)$. Let's $\theta_L^0 = \min\{\theta_L, \tilde{\theta_L}(\theta_R, \alpha)\}$.

If L counter offers after delay of Δ in response to R's offer $\alpha(\theta_R, \theta_L)$, then R infers that L's valuation is $\theta_L(\Delta \,|\, \theta_R, \theta_L^0)$. L's response to R's offer $\alpha(\theta_R, \theta_L)$ could be:
(i) if $L \geq \theta_L^0$, accept α without delay, given $L - \alpha(\theta_R, \theta_L) \geq \delta[L - \alpha(\theta_L^0, \theta_R)]$, otherwise, counter $\alpha(\theta_L^0, \theta_R)$ without delay. Then R accepts the offer with probability one.
(ii) if $L < \theta_L^0$, counter $\alpha(L, \theta_R)$ after delay $\Gamma(L \,|\, \theta_R, \theta_L^0)$. Then R accepts the offer with probability one.

Proposition 1 *In the subgame after both group have revealed their private information θ_R and θ_L, the belief and strategies form an equilibrium. In the equilibrium path, stabilization*

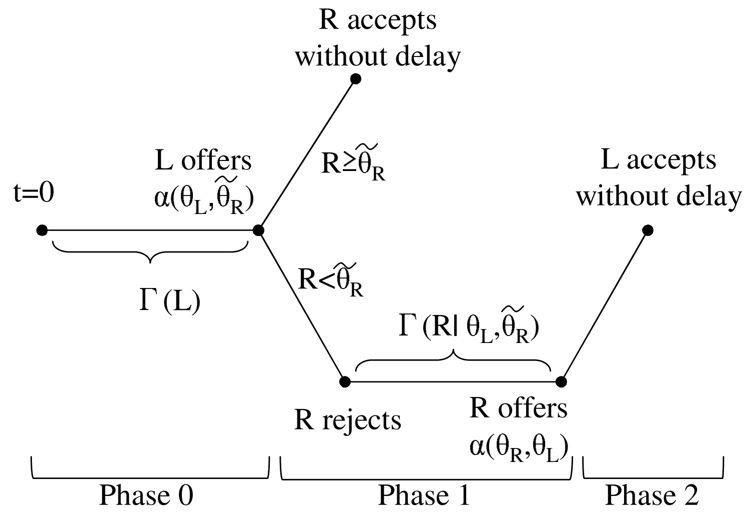

Figure 2.3: Timing of the Game

occurs without delay at a share of cost $\alpha(\theta_L, \theta_R)$ *if L make an offer or* $\alpha(\theta_R, \theta_L)$ *if R make an offer.*

Proof. See Appendix. ■

As Cramton (1992) argued, this equilibrium path satisfies the "spirit" of the Cho-Kreps intuitive criterion, since beliefs are revised following the signal of strength.[12] Thus beliefs may change by the actions that groups take. In other words, delay provides a group with

[12]Cho-Kreps intuitive criterion provide a refinement of sequential equilibrium, while not every sequential equilibrium satisfies this criterion. In a signaling game with a sequential equilibrium, an action that will not reach in equilibrium is said to violate the Cho-Kreps Intuitive Criterion if: there exists some out-of-equilibrium action so that one type can gain by deviating to this action, when the receiver interprets her type correctly, while every other type cannot gain by deviating to this action even if the receiver interprets her truly.

Hence, the separating equilibrium satisfying Cho-Kreps intuitive criterion is more 'robust' than other sequential equilibrium or Perfect Bayesian equilibrium. See more details in Cho and Kreps (1987).

a mean to convince the other of the truth.

On the other hand, if groups have a threat with beliefs, the Rubinstein solution can not be sustained, while beliefs in Rubinstein model are fixed due to the common knowledge of valuation. Wheres fixing beliefs violates the Cho-Kreps criterion. Then, in order to guarantee the Rubinstein outcome in this subgame, we assume beliefs stay fixed at the revealed value, unless an offer is delayed or an offer that should have been accepted is mistakenly rejected. This discussion is for off equilibrium path, where mistakes can be taken.

Phase 1 Suppose that L revealed θ_L with an offer $\alpha(\theta_L)$, and that R just made an offer α. Let's $\theta_R^0 = \min\{\theta_R, \tilde{\theta_R}(\theta_L, \alpha)\}$.

If R counter offers after delay of Δ in response to L's offer, then L infers that R's valuation is $\theta_R(\Delta \,|\, \theta_L, \theta_R^0)$ with probability one. R's response to L's offer α is:
(i) if $R \geq \theta_R^0$, accept α without delay, given $R + \alpha(\theta_L) \geq \delta[R + \alpha(\theta_R^0, \theta_L)]$, otherwise, counter $\alpha(\theta_R^0, \theta_L)$ without delay. Then R accepts the offer with probability one.
(ii) if $R < \theta_R^0$, counter $\alpha(R, \theta_L)$ after delay $\Gamma(R \,|\, \theta_L, \theta_R^0)$. Then follow phase 2.

Proposition 2 *In the subgame after L has revealed θ_L with an offer $\alpha(\theta_L)$, the beliefs and strategies form an equilibrium. In the equilibrium path, R accepts $\alpha(\theta_L)$ without delay if $R \geq \tilde{\theta_R}(\theta_L, \alpha)$, and otherwise counter the offer $\alpha(R, \theta_L)$ after a delay $\Gamma(R)$. This offer is accepted without delay by L.*

Proof. See Appendix. ■

Phase 0 Suppose that no offers have been made. In this initial subgame, if R does not make any offer before a delay Δ, L infers that R's valuation is $[0, \theta_R(\Delta)]$. If R makes the initial offer α after Δ, L infers that R's valuation is $\theta_R(\Delta)$ with probability one. Then follows phase 1. If R does not make an offer, L makes an initial offer $\alpha(L, \tilde{\theta_R}(L))$ after $\Gamma(L)$. Then follow Phase 1.

The groups determine when they make an offer as a function of their valuations. As the timing of offer is a monotone function of one's valuation, a separate equilibrium may exist. The followings are focused on L, but the analysis for R is analogous. First, we determine L's optimal offer at time Δ, provided that R infers that the valuation of L is θ_L with probability one.

Proposition 3 *If L makes an initial offer after a delay of Δ and L believes that $R \in [0, \theta_R(\Delta)]$, then in the equilibrium path, L makes an initial offer of $\alpha(\theta_L, \tilde{\theta_R})$ where $\tilde{\theta_R}$ uniquely satisfies*

$$F(\theta_R) - F(\tilde{\theta_R}) - (1-\delta^2)(\tilde{\theta_R} + \theta_L) = \delta^3 \int_0^{\tilde{\theta_R}} \left(\frac{R + \theta_L}{\tilde{\theta_R} + \theta_L} \right)^{1+\delta} dF(R). \tag{2.11}$$

Proof. See Appendix. ■

Then we determine the initial time of delay $\Gamma(L)$ and valuation $\theta_L(\Delta)$. Due to the incentive constraint, a less patient group would imitate a more patient group by delaying longer $\Delta > \Gamma(L)$, in order to convince the other that her valuation is more patient, that is, $L < \theta_L(\Delta)$. Hence, to make $\theta_L(\Delta)$ be a part of an equilibrium, the guarantee that such a deviation is not incentive compatible should be imposed. The best response to a delay Δ should be a offer after $\Gamma(L)$.

Proposition 4 *If the time between offers is sufficiently small, then the strategies and beliefs form an equilibrium. The initial delay for L is*

$$\Gamma(L) = \int_0^L \frac{q(\theta_L) + k(\theta_L) - \delta c(\theta_L)}{r(\tilde{\theta_R} + \theta_L) c(\theta_L)} d\theta_L$$

where $c(\theta_L) = F(\theta_L) - F(\tilde{\theta_R}) - (1-\delta)(\tilde{\theta_R} + \theta_L) f(\tilde{\theta_R})$, $q(\theta_L) = \delta^2(\delta-1)\int \left(\frac{R+\theta_L}{\tilde{\theta_R}+\theta_L}\right)^{\delta} dF(R)$ *and* $k(\theta_L) = \frac{\delta}{1+\delta} f(\theta_L)\,(2\tilde{\theta_R} - 2\delta\theta_L)$. $\tilde{\theta_R}(\theta_L)$ *uniquely satisfies (2.8).*

Proof. See Appendix. ■

In order to derive explicit solutions to compare with war-of-attrition case, consider the case where the valuation of both groups are on uniform distribution.

Proposition 5 *Suppose that the valuation of both groups are uniformly distributed. Then* L *delays* $\Gamma(L)$ *before making an initial offer.* $\theta_L(\Delta)$ *makes an initial offer* $\alpha(\theta_L(\Delta))$ *after* Δ*. Then* $R \geq \tilde{\theta_R}(\Delta)$ *immediately accepts the offer, where*

$$\Gamma(L) = \frac{\delta(4\gamma - 2\delta - \gamma\delta - 2)}{2r(1+\delta)\gamma(\gamma\delta - 2\gamma + 1)} \log L \quad \textit{and} \quad \gamma = \frac{2+\delta}{4+2\delta-2\delta^2}.$$

Proof. See Appendix. ■

By using the result of Proposition 5, the equilibrium strategies in this case can be derived as

$$\theta_L(\Delta) = e^{\frac{2r(1+\delta)\gamma(\gamma\delta-2\gamma+1)}{\delta(4\gamma-2\delta-\gamma\delta-2)}\Delta} \quad \text{and} \quad \tilde{\theta_R}(\Delta) = (2\gamma-1)\theta_L(\Delta).$$

Thus, the minimum expected delay in the bargaining is $\Gamma(L)$, when L makes an initial offer and it is accepted immediately. On the other hand, on equilibrium path, there may be a sequential equilibrium, where whether the initial offer is accepted or rejected depends on the valuation of the other. If the initial offer is rejected, R makes a counter offer after $\Gamma(R \mid \theta_L, \tilde{\theta_R})$ and it is accepted by L. In this case, the expected delay of stabilization is $\Gamma(L) + \Gamma(R)$. Hence the expected delay of stabilization can be described as

$$ED_B = \begin{cases} \Gamma(L) & \text{if} \quad L \geq R \geq \tilde{\theta_R} \\ \Gamma(L) + \Gamma(R \mid \theta_L, \tilde{\theta_R}). & \text{if} \quad 0 < R < \tilde{\theta_R} \end{cases}$$

In the bargaining framework, a group becomes more impatient if their expected gain from stabilization is larger. Then the group with larger expectations of gains makes initial offer, hence makes concession earlier on. Initial offer is only accepted if the gain are sufficiently large. Thus the larger are gains, stabilization may occur sooner. Also the larger is discount rate, the time of delay is more shortened.

2.5 Equilibrium Delay in the War-of-Attrition Game

In order to compare the results in both concession and bargaining setups, in this section, we discuss the equilibrium delay in the war-of-attrition case, where the share of cost of stabilization is exogenously determined as in Alesina and Drazen (1991) and most of extensions. In the concession framework, the problem of each party is to maximize its expected lifetime payoff by choosing a time to concede if the other party has not yet conceded.

Due to concession, one of the two groups (the *loser*) has to agree to bear a higher fraction of the new non-distortionary taxes, while the rest of this is borne by the other group (the *winner*). The share imposed on a group which concedes earlier is $\kappa_i^L = \kappa > 1/2$, which is exogenous parameter. Note that in Alesina and Drazen (1991), κ is treated as the measures of the divergence between the distributional implications of the reform plan, or 'degree of polarization' of society.

If a group concedes earlier, then one receives the flow payoff $u_i^L = -\kappa\tau$ and the other receives $u_i^W = -(1-\kappa)\tau$. Thus the expected payoff as of time $t = 0$ as a function of one's chosen concession time T_i is the sum of $V^i(\theta_i, T, \kappa_i^L)$ multiplied by the probability of the other not having conceded by T_i and $V^i(\theta_i, T, \kappa_i^W)$ multiplied by the probability of the other group conceding at t for all $t \leq T_i$. Define $H(T)$ as the distribution of the opponent's optimal concession time and $h(T)$ as the associated density function. Then the expected payoff as a function of T_i can be written as

$$\begin{aligned} EV^i(T_i) &= [1 - H(T_i)] \left[\int_0^{T_i} \underline{u}_i(t) e^{-rt} dt + \int_{T_i}^{\infty} u_i^L(t) e^{-rt} dt \right] \\ &\quad + \int_{t=0}^{t=T_i} \left[\int_0^t \underline{u}_i(x) e^{-rx} dx + \int_t^{\infty} u_i^W(x) e^{-rx} dx \right] h(t) dt. \end{aligned}$$

Lemma 2 *The concession time is monotonically decreasing in θ_i such as $T_i'(\theta_i) < 0$.*

Proof. See Appendix. ■

This shows that the higher is the cost to distortion, the earlier group concedes. In order to find the optimal concession time $T(\theta)$ for a group of type θ, we will consider a symmetric Nash equilibrium.[13] In this equilibrium, if each group's concession behaviour is described by the same function $T(\theta)$, it is optimal for a group to behave according to $T(\theta)$. Given concession time as a function of θ, the expected delay of stabilization in the concession ED_C is then the expected $\min\{T(\theta_L), T(\theta_R)\}$ with the expectation taken over $F(\theta)$.

Proposition 6 *The expected concession time in a symmetric Nash equilibrium is chosen to maximize the expected payoff as*

$$\left[-\frac{f(\theta)}{F(\theta)} \frac{1}{T'(\theta)} \right] \frac{2\kappa - 1}{r} = \theta + \frac{1}{2} - \kappa$$

and the boundary condition $T(\bar{\theta}) = 0$ holds.

Proof. See Appendix. ■

The right hand side is the cost of waiting another instant to concede, that is, the difference between the loss due to distortion and the increase in tax burden by the stabilization to the group who concedes. The left hand side is the expected gain from waiting another

[13] This derivation mainly follows Alesina and Drazen (1991).

instant to concede, which is the product of the conditional probability that another concedes multiplied by the gain if the other concedes. A concession occurs when the cost of waiting is equal to the expected gain from waiting.

If the group is characterized by the maximum possible cost of distortion, it will concede immediately and there will be no war-of-attrition. As long as all groups in the process initially believe that someone else may have a higher θ, stabilization does not occur immediately.

Then, we will consider the case where $F(\theta)$ is uniform over $[\underline{\theta}, \bar{\theta}]$.[14] In this case, as $F(\theta) = (\theta - \underline{\theta})/(\bar{\theta} - \underline{\theta})$, then $-f(\theta)/F(\theta) = 1/(\underline{\theta} - \theta)$. Under this assumption, $T'(\theta)$ is therefore given by

$$\begin{aligned} T'(\theta) &= -\frac{f(\theta)}{F(\theta)} \frac{2\kappa - 1}{r} \frac{1}{\theta + 1/2 - \kappa} \\ &= \frac{(2\kappa - 1)/r}{(\underline{\theta} - \theta)(\theta + 1/2 - \kappa)}. \end{aligned}$$

Using the method of partial fractions and integrating, the optimal time of concession of a

[14] As in Section 2.2, we assume $F(\theta) \in [0.1]$. On the other hand, we also assume $\theta_i + 1/2 - \kappa_i > 0$ to assure the concession to occur. Hence in the concession setup, the lower bound $\underline{\theta}$ exists to satisfy this assumption. Below this threshold, no concession occurs, that is, the expected delay goes to infinity. Note that $\underline{\theta}$ may vary, depending on κ_i.

group of type θ can be obtained by

$$
\begin{aligned}
T(\theta) &= \int_{\underline{\theta}}^{\theta} \frac{-(2\kappa-1)/r}{(\theta-\underline{\theta})(\theta+1/2-\kappa)} d\theta \\
&= \int_{\underline{\theta}}^{\theta} \frac{-(2\kappa-1)/r}{(\underline{\theta}+1/2-\kappa)(\theta-\underline{\theta})} d\theta + \int_{\underline{\theta}}^{\theta} \frac{-(2\kappa-1)/r}{-(\underline{\theta}+1/2-\kappa)(\theta+1/2-\kappa)} d\theta \\
&= \frac{(1-2\kappa)/r}{\underline{\theta}+1/2-\kappa} \left(\log(\theta-\underline{\theta}) - \log(\theta+\ 1/2\ -\kappa)\right) + C^0 \\
&= \frac{(1-2\kappa)/r}{\underline{\theta}+\ 1/2\ -\kappa} \left(\log \frac{\theta-\underline{\theta}}{\bar{\theta}-\underline{\theta}} + \log \frac{\bar{\theta}+\ 1/2\ -\kappa}{\theta+\ 1/2\ -\kappa}\right) \\
&\quad \text{where} \quad C^0 = \frac{(1-2\kappa)/r}{\underline{\theta}+\ 1/2\ -\kappa} \left(-\log(\bar{\theta}-\underline{\theta}) + \log(\bar{\theta}+\ 1/2\ -\kappa)\right)
\end{aligned}
$$

We assume that C^0 is set to assure $T(\bar{\theta}) = 0$. Again, given concession time as a function of θ, the expected delay of stabilization in the concession ED_C is then $\min\{T(\theta_L), T(\theta_R)\}$ with the expectation taken over $F(\theta)$.

The uncertainty about the cost to waiting of other group is important to delay stabilizations. As long as groups in the process believe that someone else may have a higher θ and then give up first, stabilization does not occur immediately. If all groups are identical, we could interpret this as a single agent. In this case, he knows with probability 1 that he will be the stabilizer. Thus he stabilize immediately. Meanwhile the higher θ leads to shorter concession time. An increase in the cost, for unchanged distribution θ, will move the expected date of a stabilization forward.

Higher κ leads to later stabilization. The gain from waiting in that one's opponent will concede is larger. Hence each group holds out longer. It might be hard to reach agreements on how to allocate tax increases among interest groups.

2.6 Welfare Analysis

In this section, we will analyze the welfare in this economy. In the bargaining framework, the stabilization occurs when a group accepts the offer by the other, while in the concession framework, the stabilization occurs when a group concedes. With the interactions that two parties take, how does the total welfare change in the process?

Proposition 7 *The welfare increases as the timing of stabilization becomes earlier.*

Proof. In this economy, there are two political groups which maximizes each utility function (2.1). Hence total welfare W can be described as

$$\begin{aligned} W = V^L + V^R &= \frac{\tau}{r}\left[e^{-rT}\left(\theta_L + \theta_R + 1 - (\kappa_L + \kappa_R)\right) + (-1 - \theta_L - \theta_R)\right] \\ &= \frac{\tau}{r}[e^{-rT}(\theta_L + \theta_R) + (-1 - \theta_L - \theta_R)]. \end{aligned}$$

We can see how W is affected when the timing of stabilization changes by differentiating the above such as

$$\frac{\partial W}{\partial T} = -\tau e^{-rT}(\theta_L + \theta_R) \leq 0.$$

■

This result can be interpreted intuitively as follows. There is a distortion in the economy before stabilization. Therefore, given that the total cost of the reform does not change irrespective of its distribution, the earlier the reform which terminates the distortion takes place, the larger total welfare becomes.

As in the previous sections, the only solutions that we could obtain are the expected time of delay due to two-sided uncertainty about the cost to waiting of the other group. In the concession process, the expected delay for a group ED_C^i is the optimal timing for the group to concede given the other group has not conceded yet. Then the actual delay T_C is $\min\{ED_C^L, ED_C^R\}$. In the bargaining process, the expected delay for a group ED_B^i is the optimal timing for the group to offer the share given the other group is more patient and then has not offered yet. Then the actual delay T_B is $\min\{ED_B^L, ED_B^R\}$.

When a group makes a decision, stabilization occurs. Therefore for a group i, ED^i can be considered as T. Hence it can be concluded that every group should recognize the process in which the expected delay is shorter would be more desirable in terms of welfare improving.

2.7 Comparative Simulation

In this section, by using numerical method, we will analyze the equilibrium delay in both the bargaining and war-of-attrition setup, which has been obtained in the previous sections under the assumption of uniform distribution of the type.

Hereafter, we consider the limiting case of bargaining model that the minimum time between offers goes to zero as ($\delta \to 1$), in order to compare properly with the concession setup, where the payoff is discounted only by r. Hence, as in section 2.4, given L makes an initial offer, the expected delay in the bargaining can be obtained as

$$\begin{aligned} ED_B &= \begin{cases} \Gamma(L) & \text{if} \quad L \geq R \geq \tilde{\theta_R} \\ \Gamma(L) + \Gamma(R \mid \theta_L, \tilde{\theta_R}) & \text{if} \quad 0 < R < \tilde{\theta_R} \end{cases} \\ &= \begin{cases} -\frac{7}{3r} \log L & \text{if} \quad L \geq R \geq \frac{1}{2}\theta_L \\ -\frac{7}{3r} \log L - \frac{1}{r} \log \frac{2(\theta_R + \theta_L)}{3\theta_L}. & \text{if} \quad \frac{1}{2}\theta_L > R > 0 \end{cases} \end{aligned}$$

Note that the cost share does not affect the time of delay as the bargaining process endogenously determine the share. On the equilibrium path, groups take strategies to form a sequential equilibrium, where separating equilibrium may occur depending on the valuation of the other.

2.7.1 Expected Delay in Each Process

Before direct comparison, analysing the delay in each process would be useful to examine how groups interact in general.

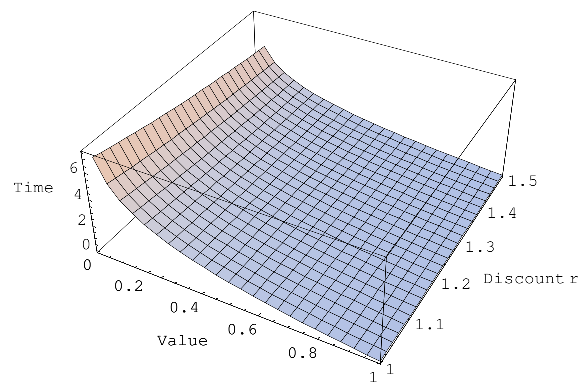

Figure 2.4: Expected delay in the Bargaining Case

Figure 2.4 shows the expected delay in the bargaining case. To simplify, in Figure 2.4, we examine the the minimum delay $\Gamma(L)$.[15] A group becomes more impatient if their expected gain from stabilization is larger. The group with larger expectations of gains makes initial offer, hence makes concession earlier on. Thus the larger are gains, stabilization occurs sooner. Also the larger is discount rate, the time of delay is more shorten.

Figure 2.5 shows the time of delay in the war-of-attrition case. In a concession game, the share of cost of stabilization τ is exogenously fixed. Thus the gain from stabilization,

[15] One can easily show that even if we plot $\Gamma(L) + \Gamma(R)$, the big picture will not change.

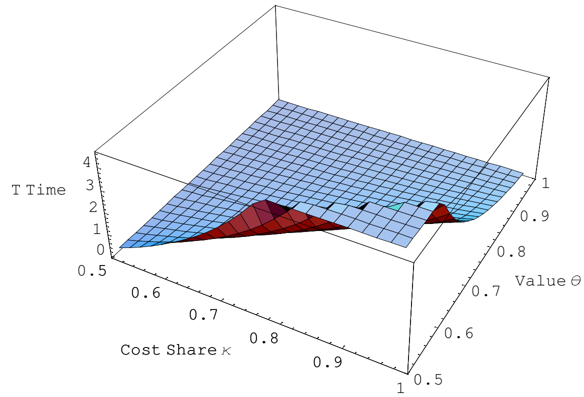

Figure 2.5: Expected Delay in the War-of-Attrition Case

which is independently drawn from distribution F, and the share κ can affect the time of delay. A group more exposed to distortionary taxation before stabilization, that is, which may have larger gains from stabilization, will be likely to give in immediately, leading to immediate stabilization. If the cost share for stabilization becomes more polarized, the expected gains or losses from waiting increases. Therefore, concession time will be prolonged as groups become more patient. Stabilizations are delayed as long as groups believe someone else may have a higher cost for distortion. On the contrary, if a group recognizes his cost as the highest, no delay may occur.

2.7.2 Comparison of Expected Delay

Figure 2.6 and 2.7 compare the two setups in terms of the expected time of delay. To simplify, we assume that discount rate r is normalized to one. In concession case, we need to put further assumption of $\theta_i + 1/2 - \kappa > 0$, in order to make sure that groups concede at some point, otherwise, no one concedes due to less profit from stabilization. Thus we consider the case of $\theta_i \in [0.3, 1]$, that is, $\underline{\theta} = 0.3$ for the concession. In the bargaining process, however, as the cost share is endogenously determined, the time of delay is still independent of the value of κ. Thus, even in the range of $0 < \theta < 0.3$, the bargaining process does have an equilibrium path, while the war of attrition model may have no concession in the range.

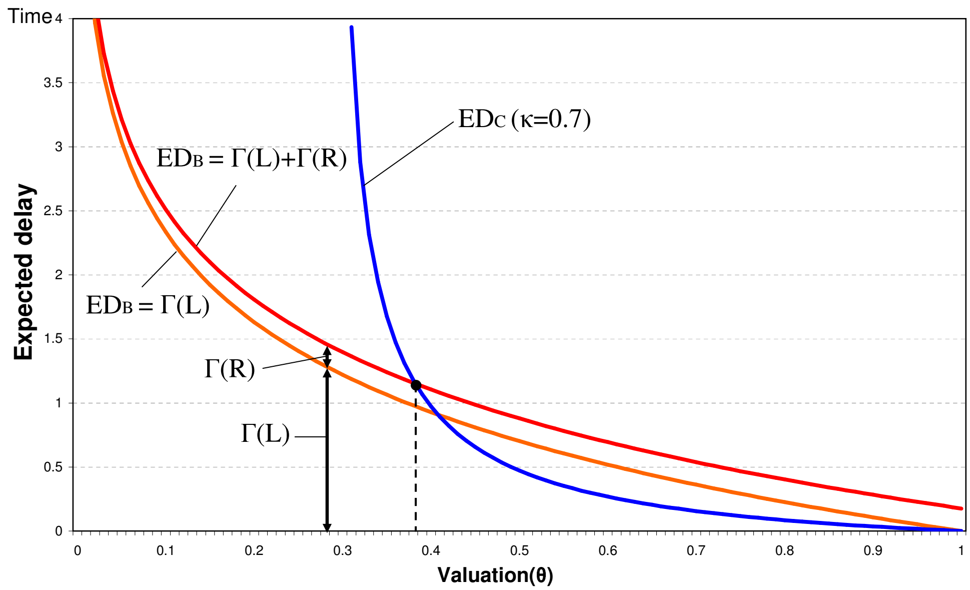

Figure 2.6: Comparison at $\kappa = 0.7$

Figure 2.6 implies that the bargaining process may take more time to reach an agreement. At the range of higher valuation, in which a group is more impatient, the delay in the bargaining case is longer than in the concession case. Even if a group is likely to concede sooner, due to uncertainty at the initial period, groups have to wait in order to make an offer which can be indifferent between acceptance and reject.

On the other hand, at the range of lower valuation, in which a group is more patient, however, the bargaining process may hasten the stabilization rather than in the concession. This may be interpreted as an intuitive way that due to the bargaining process of exchanging and signaling the information, groups could make an offer to reach agreement sooner.

Thus when interest groups are unlikely to concede, the bargaining process may hasten the stabilization. Meanwhile, when groups are willing to settle early, the bargaining may rather take more time to reach agreement on the stabilization due to negotiation procedure. One can conclude that the introduction of bargaining process has a smoothing effect on reaching an agreement of fiscal reform.

In Figure 2.7, we examine the sensitivity analysis of a change in κ. As stated above, the expected delay in the bargaining is independent of κ.

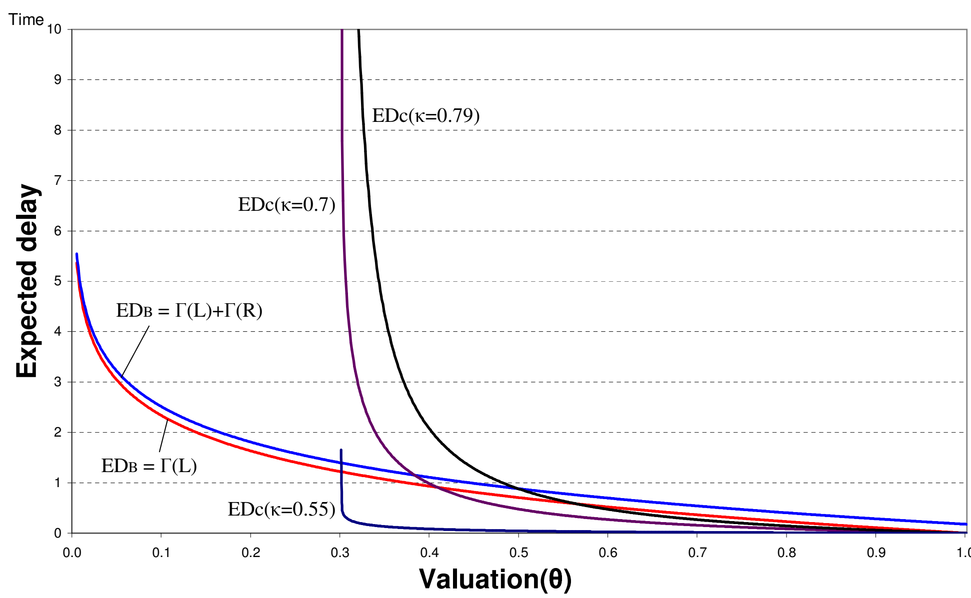

Figure 2.7: Sensitivity Analysis of κ

If the share of cost for stabilization is more equally distributed in concession model such as $\kappa = 0.55$, the difference between the gain from waiting and losses from concession becomes smaller. Then groups concede earlier, so that the bargaining process may delay the reform in most cases.

On the other hand, when the share of cost for stabilization is more polarized such as $\kappa = 0.79$, the gain from waiting become larger. Then groups tend to wait the other concede longer. In this case, the bargaining process may be more useful on reaching agreement earlier on rather than equally distributed case. Thus, in more polarized economy, the bargaining process may work for shorter delay more effectively.

2.7.3 Policy Implications

A situation with conflicts between two major groups is seen as a divided or twisted government, for instance, a party which supports the president doesn't keep the majority of the congress, and neither of these two interest parties under presidency has enough power to move the policy forward. From historical perspectives, distributive conflicts could lead to such a nationwide issue – right parties tend to insist the proportional income tax and indirect tax, while the left prefers capital tax and more progressive tax.

Such twisted governments have been often observed under democracies in recent years. Obama Administration has experienced a divided government since 2010. The Senate, the upper house, has been run by Democrats, which supports President Obama, while the House of Representatives, the lower house, has been dominated by Republicans, which is the opposition to the administration. As a result of conflicts over medicare reforms which Democrats put their priority, the 2014 budget discussion had been suspended, and without any compromise, a government shutdown had happened for almost one month in October 2013. According to Standard & Poors, the economic loss of the shutdown was estimated to be 24 billions US dollars. With critiques by public, President Obama had to agree to compile a temporal budget for the next three months to avoid sovereign default.

In the late 90's, Japan also faced a twisted government, where Liberal Democratic Party (LDP) had a majority of the lower house and formed the cabinet including prime minister, while Democratic Party of Japan (DPJ) dominated theupper house after the election in 1998. Then unfortunately Asian financial crises occured, and both parties had agreed to promptly deal with the situation. Nevertheless urgent policy packages submitted by the LDP cabinet had been intensively discussed in the Congress. At the final stage, the DPJ had proposed the revised package, and LDP accepted the revision after back-and-forth internal debates. The process to reach the agreement took several months, and the delay is considered to increase the economic shock.

The U.S.'s case could be categorized as a concession game, while Japan's case can be seen as a sort of barganing game described in this chapter. Both cases imposed enormous costs to the economy. In the concession process, both groups would not compromise until reaching their upper limit of cost of waiting. Such a lack of compromise may lead to a deadlock situation of complete fiscal inaction. In the bargaining process, both groups would discuss the share of the cost by offering each other, but as simulations in this chapter suggest, if groups are willing to concede earlier due to higher cost of waiting, the bargaining game may rather take more time to reach an agreement. i.e., building a coalition doesn't necessariliy mean to hasten legislative process.

What should they have done differently? It is not so easy to assess how fast they would have reached an agrement if they have taken different approaches. Once a party initiates the political process in either way, it is hard to reverse. Then when interest parties create its political strategy to deal with the situation, they should take into account information on the other as much as possible and analyze which process is likely to lead to faster political agreement, as minimizing delay is better off to all stakeholders, improving welfare. Such efforts could lead to obtaining better public recognition such as a responsible party.

2.8 Concluding Remarks

We analyze the political economy of fiscal policy, especially in delayed agreement on fiscal reforms. Stabilization is often delayed even though every group benefits from it. One of the reason is that interest groups conflicts over the distribution of the cost for stabilization. Information aggregation process among interest groups makes the difference between war-of-attrition model and bargaining model, where delay is used as a strategic variable.

In war-of-attrition framework, a group more exposed to distortionary taxation before stabilization, that is, which may have larger gains from stabilization, will be likely to give in immediately, leading to immediate stabilization. If the cost share for stabilization becomes more polarized, the expected gains or losses from waiting increases. Therefore, concession time will be prolonged as groups become more patient. Stabilizations are delayed as long as groups believe someone else may have a higher cost for distortion. On the contrary, if a group recognizes his cost as the highest, no delay may occur.

In bargaining framework, a group becomes more impatient if their expected gain from stabilization is larger. Then the group with larger expectations of gains makes initial offer, hence makes concession earlier on. Initial offer is only accepted if the gain are sufficiently large. Thus the larger are gains, stabilization occurs sooner. Also the larger is discount rate, the time of delay is more shortened.

The comparison of two models implies that the introduction of information aggregation process makes the difference in the expected delay between concession and bargaining setup. When interest groups are unlikely to concede, the bargaining process may hasten the stabilization. Meanwhile, when groups are willing to settle earlier, the bargaining may rather take more time to reach agreement on the reform due to uncertainty. Furthermore, in more polarized economy, the bargaining process may work for shorter delay more effectively.

Some policy implications can be obtained by this outcome. Intuitively, the bargaining procedure seems to hasten the legislative process in any case, but this chapter shows that under certain condition where groups are willing to concede early due to higher cost of waiting, the bargaining may take more time to reach an agreement. In that case, it would be more efficient to keep a dead locked situation without calling on the other to start bargaining process.

2.9 Appendix

Lemma 3 *The payoff function in Alesina and Drazen (1991) satisfies the single crossing property.*

Proof. In Alesina and Drazen (1991), payoff function is defined as

$$\begin{aligned} U(\theta;T,\alpha) &= \int_0^T u_i^D(x)e^{-rx}\,dx + e^{-rT}V^j(T) \\ &= \int_0^T \left[-\frac{\tau(x)}{2} - \theta_i\tau(x)\right] e^{-rx}\,dx + e^{-rT}\frac{-\alpha_j\tau(T)}{r} \\ &= \int_0^T \left[-\left(\frac{1}{2}+\theta_i\right)\gamma r\bar{b}e^{(1-\gamma)rx}\right] e^{-rx}\,dx + e^{-rT}\frac{-\alpha_j}{r}r\bar{b}e^{(1-\gamma)rx} \\ &= \int_0^T -\left(\frac{1}{2}+\theta_i\right)\gamma r\bar{b}e^{-\gamma rx}\,dx - \alpha_j\bar{b}e^{-\gamma rx}. \end{aligned}$$

Hence, we obtain

$$\begin{aligned}\frac{dU}{dT} &= -\left(\frac{1}{2}+\theta_i\right)\gamma r\bar{b}e^{-\gamma rx}+\gamma r\alpha_j\bar{b}e^{-\gamma rx}\\ &= \left(\alpha_j-\frac{1}{2}-\theta_i\right)\gamma r\bar{b}e^{-\gamma rx} \ < \ 0\\ \frac{dU}{d\alpha} &= -\bar{b}e^{-\gamma rx} \ < \ 0.\end{aligned}$$

Therefore, the slope of indifference curve $[T, \alpha]$ becomes

$$\begin{aligned}-\frac{dU}{dT}\Big/\frac{dU}{d\alpha} &= -\frac{\left(\alpha_j-\frac{1}{2}-\theta_i\right)\gamma r\bar{b}e^{-\gamma rx}}{-\bar{b}e^{-\gamma rx}}\\ &= \left(\alpha_j-\frac{1}{2}-\theta_i\right)\gamma r.\end{aligned}$$

This suggests that this indifference curve is strictly decreasing in θ. ■

Proof of Proposition 1 We need to show that L's strategy is optimal given the belief and strategies of R when L believes $R = \theta_R$.

Suppose $L \geq \theta_L^0$. An immediate counter offer by L implies $L = \theta_L^0$. The counter offer $\alpha(\theta_L^0, \theta_R)$ is accepted by R with probability one. Then L accepts the offer α if $L - \alpha \geq \delta(L - \alpha(\theta_L^0, \theta_R))$, given that offering $\alpha(\theta_L^0, \theta_R)$ without delay is the optimal.

If L offer a α' after a delay Δ, R believes $\theta_L = \theta_L(\Delta \mid \theta_R, \theta_L^0)$. The deviation from offering $\alpha(\theta_L, \theta_R)$ makes losses; offering $\alpha' > \alpha(\theta_L, \theta_R)$ yields losses, as R accepts this with probability one. offering $\alpha' < \alpha(\theta_L, \theta_R)$ also yields losses, as R counter offer $\alpha(\theta_R, \theta_L) > \alpha(\theta_L, \theta_R)$. Then L's optimal offer is $\alpha(\theta_L, \theta_R)$ with optimal delay Δ.

L's expected payoff from offering $\alpha(\theta_L, \theta_R)$ after Δ is $U^L(\Delta) = e^{-r\Delta}(L - \alpha(\theta_L, \theta_R))$.

Recalling (2) and (7),

$$\begin{aligned}\frac{\partial U^L}{\partial \Delta} &= -r\,e^{-r\Delta}(L-\alpha(\theta_L)) + e^{-r\Delta}\left(-\frac{\partial \alpha}{\partial \theta_L}\frac{\partial \theta_L}{\partial \Delta}\right)\\ &= -r\,e^{-r\Delta}\left(L - \frac{\delta L - R}{1+\delta} - \frac{(\theta_R+\theta_L^0)e^{-\frac{r\Delta}{\delta}}}{1+\delta}\right)\\ &= -r\,e^{-r\Delta}\left(\theta_R - (\theta_R+\theta_L^0)e^{-\frac{r\Delta}{\delta}} + L\right) < 0\end{aligned}$$

Then the optimal delay Δ is zero.

Suppose $L < \theta_L^0$. As above, if $L \geq \theta_L$, optimal offer is $\alpha(\theta_L)$ and R infers $L = \theta_L$. As $\theta_L(\Delta) = (\theta_R + \theta_L^0)e^{-\frac{r\Gamma}{\delta}} - \theta_R$ holds, $\partial U^L/\partial\Delta = 0$ if $\Delta = \Gamma(L)$. Hence for $L < \theta_L$, L's optimal behavior is by rejecting $\alpha(\theta_R)$ and offering $\alpha(L, \theta_R)$ after delay $\Gamma(L\,|\,\theta_R, \theta_L^0)$.

Along the equilibrium path $L = \theta_L$ and $R = \theta_R$, stabilization occurs with probability one at each share.

Proof of Proposition 2 Suppose $R \geq \theta_R^0$. if R makes a counter offer after Δ, L infers $R = \theta_R(\Delta \mid \theta_L, \theta_R^0)$. But, Proposition 1 suggests R's optimal counter offer is $\alpha(\theta_R^0, \theta_L)$ without delay. Thus R accepts $\alpha(\theta_L)$ without delay if $R + \alpha \geq \delta(R + \alpha(\theta_R^0, \theta_L))$.

Suppose $R < \theta_R^0$. counter-offer after Δ reveals $R = \theta_R(\Delta \mid \theta_L, \theta_R^0)$. But then we proceed to the subgame with complete information in Proposition 1. In this subgame, R's optimal response is to offer $\alpha(R, \theta_L)$ after delay of $\Gamma(R \mid \theta_L, \theta_R^0)$, which is accepted without delay by L.

Along equilibrium path, $\theta_R^0 = \tilde{\theta_R}$ and $R < \theta_R(\Delta)$. Thus, if $R \geq \tilde{\theta_R}(\theta_L, \alpha)$, acceptance of α is optimal, as $R \geq \tilde{\theta_R}(\theta_L, \alpha)$ holds if and only if $R + \alpha \geq \delta(R + \alpha(\tilde{\theta_R}, \theta_L))$.

Proof of Proposition 3 Suppose L makes a revealing offer $\alpha(\theta_L, \tilde{\theta_R})$. The offer is accepted if $R \in [\tilde{\theta_R}, \theta_R]$, otherwise, after a delay Γ, L accepts R's counter offer $\alpha(R, \theta_L)$, where the payoff is discounted by

$$\delta e^{-r\Gamma(R|\theta_L,\tilde{\theta_R})} = \delta \left(\frac{R+\theta_L}{\tilde{\theta_R}+\theta_L}\right)^{\delta} \quad \text{as} \quad \Gamma = -\frac{\delta}{r}\log\frac{R+\theta_L}{\tilde{\theta_R}+\theta_L}$$

Then L's expected flow payoff from offering $\alpha(\theta_L,\tilde{\theta_R})$ is given by $\tilde{U}^L$, which is continuous on $[0,\theta_R]$, such as

$$\tilde{U}^L(L,\tilde{\theta_R}\,|\,\theta_L,\theta_R) = [F(\theta_R)-F(\tilde{\theta_R})][L-\alpha(\theta_L,\tilde{\theta_R})]+\int_0^{\tilde{\theta_R}}\delta(L-\alpha(R,\theta_L))\left(\frac{R+\theta_L}{\tilde{\theta_R}+\theta_L}\right)^{\delta}dF(R).$$

L could choose $\tilde{\theta_R}$ to maximize her utility as α and $\tilde{\theta_R}$ are the correspondence. In equilibrium path at $L=\theta_L$, L's marginal utility from $\tilde{\theta_R}$ is as follows;

$$\begin{aligned}\frac{\partial\tilde{U}^L(\theta_L)}{\partial\tilde{\theta_R}} &= -F(\theta_R)\frac{\partial\alpha(\theta_L,\tilde{\theta_R})}{\partial\tilde{\theta_R}} - f(\tilde{\theta_R})L + f(\tilde{\theta_R})\alpha + F(\tilde{\theta_R})\frac{\partial\alpha(\theta_L,\tilde{\theta_R})}{\partial\tilde{\theta_R}}\\ &\quad + \frac{\partial}{\partial\tilde{\theta_R}}\int_0^{\tilde{\theta_R}}\delta(L-\alpha(R,\theta_L))\left(\frac{R+\theta_L}{\tilde{\theta_R}+\theta_L}\right)^{\delta}dF(R)\\ &= \frac{1}{1+\delta}\Big(F(\theta_R)-F(\tilde{\theta_R})-(\tilde{\theta_R}+\theta_L)f(\tilde{\theta_R})\Big)\\ &\quad + \frac{\delta^2}{1+\delta}\left((\tilde{\theta_R}+\theta_L)f(\tilde{\theta_R})-\delta\int_0^{\tilde{\theta_R}}\left(\frac{R+\theta_L}{\tilde{\theta_R}+\theta_L}\right)^{1+\delta}dF(R)\right)\end{aligned}$$

Thus, if $\tilde{U}^L$ is maximized,

$$F(\theta_R)-F(\tilde{\theta_R})-(1-\delta^2)(\tilde{\theta_R}+\theta_L) = \delta^3\int_0^{\tilde{\theta_R}}\left(\frac{R+\theta_L}{\tilde{\theta_R}+\theta_L}\right)^{1+\delta}dF(R)$$

holds. Furthermore, as $\tilde{U}'<0$ at $\tilde{\theta_R}=\theta_R$ and $\tilde{U}'>0$ at $\tilde{\theta_R}=0$, at some point of $\tilde{\theta_R}\in[0,\theta_R]$, the maximum occurs. Then $\tilde{U}''$ is given by

$$\begin{aligned}(1+\delta)\frac{\partial\tilde{U}'}{\partial\tilde{\theta_R}} &= (\delta^2-2)f(\tilde{\theta_R})-(1-\delta^2)(\tilde{\theta_R}+\theta_L)f'(\tilde{\theta_R})-\delta^3\frac{\partial}{\partial\tilde{\theta_R}}\int_0^{\tilde{\theta_R}}\left(\frac{R+\theta_L}{\tilde{\theta_R}+\theta_L}\right)^{1+\delta}dF(R)\\ &= (-\delta^3+\delta^2-2)f(\tilde{\theta_R})-(1-\delta^2)(\tilde{\theta_R}+\theta_L)f'(\tilde{\theta_R})\\ &\quad +\delta^3(1+\delta)\int_0^{\tilde{\theta_R}}\frac{(R+\theta_L)^{1+\delta}}{(\tilde{\theta_R}+\theta_L)^{2+\delta}}dF(R).\end{aligned}$$

Thus, in order to have a unique solution, we assume the distribution F satisfies

$$(-\delta^3+\delta^2-2)f(\tilde{\theta_R})-(1-\delta^2)(\tilde{\theta_R}+\theta_L)f'(\tilde{\theta_R})+\delta^3(1+\delta)\int_0^{\tilde{\theta_R}}\frac{(R+\theta_L)^{1+\delta}}{(\tilde{\theta_R}+\theta_L)^{2+\delta}}dF(R)<0, \quad (2.12)$$

as $\tilde{u}'$ is strictly decreasing over $\tilde{\theta_R}$ if this holds.

Proof of Proposition 4 We assume (2.9) holds to specify $\tilde{\theta_R}(\theta_L)$. L makes a revealing offer after delay $\Delta \geq \Gamma(L)$, given that R's strategy is $\theta_R(\Delta)$ and that R believes L makes $\theta_L(\Delta)$.

Case 1; $R \in [0, \tilde{\theta_R}(\theta_L(\Delta))]$. L reveals first after Δ, and R reject the offer. Then R counter $\alpha(R, \theta_L)$ after delay Γ. The offer is accepted immediately. Thus the expected payoff of L is

$$e^{-r\Delta}\ e^{-r\Gamma}\ \delta(L - \alpha(R, \theta_L)) = \frac{1}{1+\delta}\delta\ e^{-r\Delta}\ \left(\frac{R + \theta_L}{\tilde{\theta_R} + \theta_L}\right)^{\delta} ((1+\delta)L + \delta R - \theta_L).$$

Case 2; $R \in [\tilde{\theta_R}(\theta_L(\Delta)), \theta_R(\Delta)]$. L offer $\alpha(\theta_L, \tilde{\theta_R})$ after Δ and R accepts immediately. The expected payoff is

$$e^{-r\Delta}\ (L - \alpha(\theta_L, \tilde{\theta_R})) = \frac{1}{1+\delta}\ e^{-r\Delta}\ \left((1+\delta)L + \tilde{\theta_R} - \delta\theta_L\right).$$

Case 3; $R \in [\theta_R(\Delta), \theta_R(\Gamma(\theta_L))]$. R reveals first with $\alpha(R, \tilde{\theta_L})$ after $\Gamma(R)$, and L accepts immediately as $L > \tilde{\theta_L}(\theta_L \Gamma(R))$. Then the expected payoff is

$$e^{-r\Gamma(R)}\ (L - \alpha(R, \tilde{\theta_L})) = \frac{1}{1+\delta}\ e^{-r\Gamma(R)}\ \left((1+\delta)L + \delta R - \tilde{\theta_L}\right).$$

The total expected payoff of L is calculated by integrating the above payoffs for each range such as

$$\begin{aligned}(1+\delta)U^L(L, \Delta) \quad = \quad & \int_0^{\tilde{\theta_R}(\theta_L)} e^{-r\Delta}\ \left((1+\delta)L + \tilde{\theta_R} - \delta\theta_L\right) f(R)dR \\ & + [F(\theta_R(\Delta)) - F(\tilde{\theta_R}(\theta_L))]e^{-r\Delta}\ \left((1+\delta)L + \tilde{\theta_R} - \delta\theta_L\right) \\ & + \int_{\theta_R(\Delta)}^{\theta_R(\Gamma(L))} e^{-r\Gamma(R)}\ \left((1+\delta)L + \delta R - \tilde{\theta_L}\right) f(R)dR.\end{aligned}$$

A necessary condition for $\Gamma(L)$ to be a best response is that the marginal utility of delay is zero at $L = \theta_L(\Delta)$. Taking the derivative of the above with respect to Δ and substituting

$L = \theta_L(\Delta)$ yields

$$
\begin{aligned}
(1+\delta)\frac{\partial U^L}{\partial \Delta} &= \delta e^{-r\Delta}\left(\frac{R+\theta_L}{\tilde{\theta_R}+\theta_L}\right)^{\delta}\left[(\delta^2-1)\theta_L' - \delta(R+\theta_L)\left(r+\delta\,\frac{\tilde{\theta_R}'+\theta_L}{\tilde{\theta_R}+\theta_L}\right)\right] \\
&\quad + \tilde{\theta_R}' e^{-r\Delta}\delta^2(\tilde{\theta_R}+\theta_L)f(\tilde{\theta_R}) \\
&\quad + e^{-r\Delta}(F(\theta_R)-F(\tilde{\theta_R}))\times \\
&\qquad [(\tilde{\theta_R}' - \delta\theta_L' - r(\tilde{\theta_R}+\theta_L)) + (\tilde{\theta_R}+\theta_L)(f(\theta_R)\,\theta_R' - f(\tilde{\theta_R})\,\tilde{\theta_R}')] \\
&\quad - e^{-r\Delta}\,\theta_R'\,(\delta\theta_R - \tilde{\theta_L} + (1+\delta)\theta_L)\,f(\theta_R).
\end{aligned}
$$

Hence, $\partial U^L/\partial\Delta = 0$ can be written as

$$
\begin{aligned}
0 &= [F(\theta_L)-F(\tilde{\theta_R})][\tilde{\theta_R}' - \delta\theta_L' - r(\tilde{\theta_R}+\theta_L)] + \theta_R' f(\theta_R)(\tilde{\theta_R}+\tilde{\theta_L}-\delta(\theta_R+\theta_L)) \\
&\quad - \tilde{\theta_R}' f(\tilde{\theta_R})(1-\delta^2)(\tilde{\theta_R}+\theta_L) + \delta(\delta^2-1)\theta_L' \int_0^{\tilde{\theta_R}}\left(\frac{R+\theta_L}{\tilde{\theta_R}+\theta_L}\right)^{\delta} dF(R) \\
&\quad - \left(\frac{r}{\delta}(\tilde{\theta_R}+\theta_L) + (\tilde{\theta_R}'+\theta_L')\right)\int_0^{\tilde{\theta_R}} \delta^3\left(\frac{R+\theta_L}{\tilde{\theta_R}+\theta_L}\right)^{1+\delta} dF(R).
\end{aligned}
$$

By using the first order condition (2.8) and multiplying δ, we obtain

$$
\begin{aligned}
0 &= [F(\theta_L)-F(\tilde{\theta_R})]\times \\
&\qquad [-\delta(1+\delta)\theta_L' - r(1+\delta)(\tilde{\theta_R}+\theta_L)) + \delta\theta_R' f(\theta_R)(\tilde{\theta_R}+\tilde{\theta_L}-\delta(\theta_R+\theta_L)) \\
&\quad + r(1-\delta^2)(\tilde{\theta_R}+\theta_L)^2\,f(\tilde{\theta_R}) + \delta\,f(\tilde{\theta_R})(\tilde{\theta_R}+\theta_L)(1-\delta^2)\theta_L' \\
&\quad + \delta^2(\delta^2-1)\theta_L' \int_0^{\tilde{\theta_R}}\left(\frac{R+\theta_L}{\tilde{\theta_R}+\theta_L}\right)^{\delta} dF(R).
\end{aligned}
$$

As $\theta_L(\Delta) = \theta_R(\Delta)$ and then $\tilde{\theta_L}(\theta_R(\Delta)) = \tilde{\theta_R}(\theta_L(\Delta))$, substituting these and dividing by $1+\delta$ yields

$$
\begin{aligned}
0 &= -(\delta\theta_L' + r(\tilde{\theta_R}+\theta_L)[F(\theta_L)-F(\tilde{\theta_R}) - (1-\delta)(\tilde{\theta_R}+\theta_L)f(\tilde{\theta_R})] \\
&\quad + \delta^2(\delta-1)\theta_L' \int_0^{\tilde{\theta_R}}\left(\frac{R+\theta_L}{\tilde{\theta_R}+\theta_L}\right)^{\delta} dF(R) + \frac{\delta}{1+\delta}\theta_L' f(\theta_L)(2\tilde{\theta_R} - 2\delta\theta_L).
\end{aligned}
$$

Assuming that $c(\theta_L) = F(\theta_L) - F(\tilde{\theta_R}) - (1-\delta)(\tilde{\theta_R} + \theta_L) f(\tilde{\theta_R})$, $q(\theta_L) = \delta^2(\delta-1)\int \left(\frac{R+\theta_L}{\tilde{\theta_R}+\theta_L}\right)^\delta dF(R)$ and $k(\theta_L) = \frac{\delta}{1+\delta} f(\theta_L)(2\tilde{\theta_R} - 2\delta\theta_L)$, the first order differential equation can be obtained as

$$\begin{aligned} \theta_L' &= \frac{\partial\theta_L(\Delta)}{\partial\Delta} = \frac{r(\tilde{\theta_R} + \theta_L)c(\theta_L)}{q(\theta_L) + k(\theta_L) - \delta c(\theta_L)} \\ \Leftrightarrow \quad \Gamma(L) &= \int_0^L \frac{q(\theta_L) + k(\theta_L) - \delta c(\theta_L)}{r(\tilde{\theta_R} + \theta_L)c(\theta_L)} d\theta_L. \end{aligned}$$

Proof of Proposition 5 Consider $\tilde{\theta_R}(\theta_L)$ which maximizes $\tilde{U}^L(\theta_L, \tilde{\theta_R} \mid \theta_L, \theta_R)$. Since (2.9) is satisfied for $\delta > 0$, $\tilde{\theta_R}(\theta_L)$ maximizes the expected payoff by binding (2.8). As $F(R) = R$ and $L = \theta_L$, (2.8) becomes;

$$\begin{aligned} \theta_R - \tilde{\theta_R} - (1-\delta^2)(\tilde{\theta_R} + \theta_L) &= \frac{\delta^3}{(\tilde{\theta_R} + \theta_L)^{1+\delta}} \int_0^{\tilde{\theta_R}} (R + \theta_L)^{1+\delta} dR = \frac{\delta^3}{2+\delta}(\tilde{\theta_R} + \theta_L) \\ &\Leftrightarrow \quad \theta_R - 2\tilde{\theta_R} - \theta_L + \frac{2\delta^2}{2+\delta}(\tilde{\theta_R} + \theta_L) = 0 \\ &\Leftrightarrow \quad \tilde{\theta_R} = \frac{2+\delta}{4+2\delta-2\delta^2}\theta_R + \frac{2\delta^2 - 2 - \delta}{4+2\delta-2\delta^2}\theta_L. \end{aligned}$$

Since $\theta_L(\Delta) = \theta_R(\Delta)$, we can transform this as

$$\tilde{\theta_R} = \frac{2\delta^2}{4+2\delta-2\delta^2}\theta_L = (2\gamma - 1)\theta_L \quad \text{where} \quad \gamma = \frac{2+\delta}{4+2\delta-2\delta^2}.$$

Hence, by substituting, we obtain

$$q(\theta_L) = \frac{2\delta^2(\delta-1)\gamma}{1+\delta}\,\theta_L, \quad k(\theta_L) = \frac{2\delta(2\gamma-\delta-1)}{1+\delta}\,\theta_L, \text{ and } c(\theta_L) = 2(\delta\gamma - 2\gamma + 1)\theta_L.$$

As $\theta_L' = r(\tilde{\theta_R} + \theta_L)c(\theta_L)/(q(\theta_L) + k(\theta_L) - \delta c(\theta_L))$, θ_L' can be written as

$$\theta_L' = \frac{2r(1+\delta)\gamma(\gamma\delta - 2\gamma + 1)}{\delta(4\gamma - 2\delta - \gamma\delta - 2)}\theta_L.$$

Then, since $\theta_L' = \partial\theta_L/\partial\Delta$,

$$\Gamma(L) = \int_0^L \frac{\delta(4\gamma - 2\delta - \gamma\delta - 2)}{2r(1+\delta)\gamma(\gamma\delta - 2\gamma + 1)}\,\frac{1}{\theta_L}\,d\theta_L = \frac{\delta(4\gamma - 2\delta - \gamma\delta - 2)}{2r(1+\delta)\gamma(\gamma\delta - 2\gamma + 1)}\,\log L.$$

Proof of Lemma 2 Differentiating the expected payoff with respect to T_i, we obtain

$$\begin{aligned}
\frac{\partial EV}{\partial T} &= (1-H)\left(\underline{u}(T)e^{-rT} - re^{-rT}\frac{u^L}{r} + e^{-rT}\frac{\partial(u^L/r)}{\partial T}\right) \\
&\quad - h\left(\int_0^T \underline{u}(t)e^{-rt}dt + e^{-rT}\frac{u^L}{r}\right) + \left(\int_0^T \underline{u}(t)e^{-rt}dt + e^{-rT}\frac{u^W}{r}\right)h \\
&= e^{-rT}\left[h(T)\left(\frac{-u^L+u^W}{r}\right) + (1-H(T)(\underline{u}-u^L)\right] \\
&= e^{-rT}\left[h(T)\frac{(2\kappa-1)\tau}{r} + (1-H(T))\left(-\theta-\frac{1}{2}+\kappa\right)\tau\right].
\end{aligned}$$

Differentiating with respect to θ_i, we obtain

$$\frac{\partial^2 EV}{\partial T \partial \theta} = e^{-rT}\left(-(1-H(T)\right) < 0.$$

This implies that when others are acting optimally, dEV/dT is decreasing in θ. Therefore concession time T_i is monotonically decreasing in θ_i.

Proof of Proposition 6 Suppose the other interest group acts according to the optimal concession time $T(\theta)$. Choosing T_i would be equal to choosing a value $\hat{\theta}$ and conceding at time $T_i = T(\hat{\theta}_i)$. As T is monotonically decreasing in θ, we can derive the relation between $H(T_i)$ and $F(\theta_i)$, as $1 - H(T(\theta_i)) = F(\theta_i)$. By changing the variables, we obtain

$$\begin{aligned}
EP(\hat{\theta},\theta) &= F(\hat{\theta})\left[\int_{\hat{\theta}}^{\bar{\theta}} -\underline{u}(x)e^{-rT(x)}T'(x)dx + e^{-rT(\hat{\theta})}\frac{u^L(T(\theta_i))}{r}\right] \\
&\quad + \int_{\hat{\theta}}^{\bar{\theta}}\left[\int_x^{\bar{\theta}} -\underline{u}(x)e^{-rT(z)}T'(z)dz + e^{-rT(x)}\frac{u^W(T(x))}{r}\right]f(x)dx.
\end{aligned}$$

Differentiating with respect to $\hat{\theta}$, we can obtain

$$\begin{aligned}
\frac{\partial EP}{\partial \hat{\theta}} &= f(\hat{\theta}) \left[\int_{\hat{\theta}}^{\bar{\theta}} -\underline{u} e^{-rT(x)} T'(x) dx + e^{-rT(\hat{\theta})} \frac{u^L}{r} \right] \\
&\quad + F(\hat{\theta}) \left[-\underline{u} e^{-rT(\hat{\theta})} T'(\hat{\theta}) - rT'(\hat{\theta}) e^{-rT(\hat{\theta})} \frac{u^L}{r} + e^{-rT} \frac{\partial (u^L/r)}{\partial T} \frac{\partial T}{\partial \hat{\theta}} \right] \\
&\quad + \left(\int_{\hat{\theta}}^{\bar{\theta}} \underline{u}(x) e^{-rT(x)} dx + e^{-rT(\hat{\theta})} \frac{u^W}{r} \right) f(\hat{\theta}) = 0 \\
\Leftrightarrow &\quad -f(\hat{\theta}) \left(\frac{u^W - u^L}{r} \right) + F(\hat{\theta}) \left(\underline{u}(\theta, \hat{\theta}) - r \frac{u^L}{r} \right) T'(\hat{\theta}) \\
&= -f(\hat{\theta}) \left(\frac{2\kappa - 1}{r} \right) \tau + F(\hat{\theta}) \left(-\theta - \frac{1}{2} + \kappa \right) \tau T'(\hat{\theta}) = 0.
\end{aligned}$$

As $T(\theta)$ is the optimal time of concession for a group with cost θ, $\hat{\theta} = \theta$ when $\hat{\theta}$ is chosen optimally. Hence first order condition evaluated $\hat{\theta} = \theta$ becomes the equation in this proposition.

As for the boundary condition, for any value of $\theta < \hat{\theta}$, the gain from waiting until other's concession is positive. Thus groups with $\theta < \hat{\theta}$ will not concede immediately. Then a group with $\theta = \hat{\theta}$ will find it optimal to choose $T(\hat{\theta}) = 0$ as the group knows it has the highest possible cost of waiting.

Chapter 3

Leader's Reputation and Sovereign Default

3.1 Introduction

The question of whether reputational concerns are sufficient to sustain repayment incentives for sovereign borrowers is a long standing one. Eaton and Gersovitz (1981) were the first to formalize the reputational argument that if debtors do not build up a reputation for repayment, they would lose access to future lending. Bulow and Rogoff (1989), however, showed in their seminal paper that the reputational incentive breaks down if countries can save, as then there will be some period when they would prefer to default on debt. A series of papers subsequently tried to restore the reputational argument: e.g. Cole et al. (1995); Cole and Kehoe (1997) use reputational spillovers from other valuable relationships while Kletzer and Wright (2000) focused on technological restrictions on the assets available for saving or collusions among creditors to reduce the assets available to the country after

[0] As declared, this chapter is a joint work with Amrita Dhillon and Tomas Sjöström, partly based on the previous version, Dhillon and Sjostrom (2009).

default.

A more recent literature (Guembel and Sussman (2009) and Amador (2003)) has focused on resolving Bulow and Rogoff (1989) critique by focusing on the politics of repaying foreign debt. A basic assumption of the reputational models is that there is one representative agent who is essentially "the country", and reputation always attaches to the country. Incentives to repay come from the need to have access to lending in the future. Some of the political economy models relax this assumption. While Amador (2003) shows how democracies end up with too little savings, due to the pressures of party politics, they are able to commit to repay the debt which becomes valuable because of its contingent nature. Guembel and Sussman (2009) focus on the heterogeneity of groups in the population of the debtor country: there are some groups in the country (bondholders) who want repayment and others who do not and repayment takes place when the pivotal voter is a domestic bondholder.

In this chapter, we handle the Bulow-Rogoff critique in a different way. A debtor country starts off by needing loans from foreigners as they do not have enough savings to begin with. In the second period, however, they are able to save enough so that domestic debt can substitute for foreign debt (capturing the situation described by Bulow and Rogoff (1989)). For simplicity, we assume that there is a representative citizen who is only a taxpayer in the first period but a bondholder in the second period. Leaders and citizen's incentives are aligned and thus, both citizens and leaders have incentives to default on repayment in the first period. However, leaders are of two types, and the type is private information to the leader: the leader can be of a competence, and the ability level is known only to himself.[1] Citizens are interested in knowing the type of leader for their

[1]One of notable characteristics of our model is to generalize the type of leaders and analyze the incentive structure. The low ability leader could have a different cost function to repay the debt.

second period decision of lending. If the leader is revealed to be of low ability, they would prefer to lend their money abroad rather than to the leader in a dictatorship, or replace the leader in a democracy. The high ability leader is able to guarantee high enough returns that citizens would like to lend to him. In addition, the high ability leader can repay the debt to foreigners without incurring too high a cost in the first period relative to the low ability leader. This creates situations where low ability leaders default in the first period, and the high ability leader repays in order to separate himself from the low ability leader. We show that the rate of interest at which the debtor country can borrow is lower when the difference between the two types is smaller and when the probability of the low ability leader is lower. Incomplete information about the type of leader provides a way to link incentives of domestic bondholders with those of foreign bondholders so that there is an endogenous positive probability that the loan will be repaid. Ultimately reputation in the repayment of foreign debt is linked to repayment of domestic debt. As long as the leader is "accountable" to the citizenry, the reputational basis for lending is restored.

A natural question then is to ask how the incentives to repay differ among different political systems? In this chapter, we compare the incentives to repay in democracies where leaders are easily replaced and dictatorships where they are not. We show that in the optimal state contingent contract, citizens replace leaders who default inefficiently in democracies, so that lenders are willing to lend again as the reputation of the new leader starts from the baseline priors again. In dictatorship, citizens may not lend to dictators after default, whenever this reveals that he is not credit-worthy. We show what would happen in an optimal (implicitly) state contingent contract, where the only problem is enforceability of the debt. We compare democracies and dictatorships again, to examine the risk sharing features of the two systems. While the political science literature has focused on the better commitment power of democracies (e.g. Schultz and Weingast (2003)), there is not a lot of theoretical work examining exactly why they can commit even if "accountability" is cited as the main reason. We define accountability in this chapter as the ability to throw out an incompetent or dishonest leader. This does lead to a certain type of commitment power but even in autocracies, as long as domestic citizens are able to deny credit to a leader, then there is an ability to commit to repay.

There is much evidence to suggest that lenders and rating agencies care about the leader's reputation. Indeed, Pukthuanthong-Le et al. (2007) say that "When assessing a country's willingness and ability to service its debt, rating agencies will generally take into consideration a country's political risk and economic risk. Political risk assessment evaluates a country's underlying political and social stability, which impacts the central government's willingness to meet its debt obligations. The main criteria used include the characteristics of a political system, executive leadership, government institutions, social coalitions, social indicators, and external relations." A recent and emerging empirical literature recognizes the fact that there may be a link between political turnover and default incentives, e.g. Brewer and Rivoli (1990) show that perception of creditworthiness is negatively correlated with the frequency of regime change. Bordo and Oosterlinck (2005) analyze the gold standard period (1880-1913) for 29 countries and study whether defaults are linked to political turnover. They find that average (over 33 years) political instability in defaulting countries is not much higher than non-defaulting countries. Saiegh (2005) studies 43 countries from 1971-1997, but concludes that being a democracy is insufficient to predict default. He compares countries which have multi-party coalitional governments with single party governments and finds that the former have lower default rates. His theory is that multi party coalitions prevent re-distributive transfers from asset holders to tax payers (assuming that if international debt is repudiated then at some point it induces a transfer among the domestic agents). McGillivray and Smith (2003) (henceforth

MS) compare democracies and autocracies for default risk and fluctuations in bond prices. They find higher fluctuations in non democracies. Overall conclusion in theory comes out in favor of democracies: higher turnover associated theoretically with lower default, lower risk premia, lower volatility. Empirically, on the other hand, results on turnover and default seem to be mixed.

The chapter is organized as follows: Section 2 presents the model. Section 3 then discusses the optimal contracts under both dictatorship and democracy. Section 4 compares the two cases. Section 5 discusses the ideas of extensions, and an extended case of income heterogeneity among the agents, and Section 6 concludes.

3.2 The Model

3.2.1 Set-up

There is one borrower country with a set of citizens normalized to size one. The leader of the country under democracy is a politician who is chosen from among the citizens. In dictatorship, the leader cannot be ousted at all.

The leader of the country is a "High" ability type with probability $1-\epsilon$; and a "Low" ability type with probability ϵ. His true type, $\alpha \in (H, L)$, is his private information. If the leader is a high ability type, then he is able to successfully handle the economic policy to finance the repayment with a lower cost in the first period, and in the second period he creates a higher vale from the project than the low ability leader. With a probability $\epsilon > 0$, the leader is a "low" ability type who bears a higher cost α to manage the debt repayment. The difference in ability would impose the additional cost on making a policy, e.g. delayed reform, and inefficient process in the government discussion. The existence of "low" types makes different default decisions possible.

The leader's interests are perfectly aligned with the representative agent in the economy, as he internalizes the representative agent's payoff. In addition, under democracy, the leader also get ego rents E from being in office. He receives the utility from enacting policies that are in the public interest, and building a legacy by being re-elected. We can interpret this to mean that the leader is the representative citizen of the country, who gets the same payoff as other citizens, plus the rents from office under democracy.

There are two periods. In each period, the leader has access to an investment project. The size of the period t project is denoted q_t. A project q_t generates income $y_t = (1+\rho)q_t$ for the representative citizen, which is equally distributed through transfers. For now, we assume the size q_t is exogenously fixed. Then in period t, the leader either implements a project of fixed size q_t, or implements no project.

3.2.2 Period 1

At the beginning of period 1, the representative citizens receive an endowment w_1. We assume $w_1 < q_1$ so that the citizens do not have sufficient funds to finance the project in $t = 1$. Then the first period project must be financed by a loan of q_1 dollars from foreign lenders. The interest rate is r_1, so that the government repayment including interests is $(1 + r_1)q_1$.

After the project q_1 is implemented, there is a stochastic shock λ to the economy. The cumulative distribution is F: The support of F is an interval $[1, K]$. We refer to λ as the state of the world. We assume that λ is observable, so the loan contract can be state-contingent. This captures the possibility of re-negotiation conditional on the state. A state-contingent contract specifies that the country must repay $R(\lambda) = q_1(1 + r_1(\lambda))$ at the end of period 1. The higher is λ, the more likely it is that the country repay, so the risk premium is lower. Therefore, r_1 is decreasing in λ.

The state λ determines the shadow value of money: making a repayment of R costs the representative citizen and the leaders $\alpha\lambda R$ dollars. The shock λ is public information but how it is managed is not public. We assume that a competent leader will have $\alpha = 1$ but the incompetent leader will have $\alpha > 1$. Thus the low ability leader incurs the additional cost of repayment to the leader's payoff such that $\alpha\lambda R > \lambda R$, which could make a difference on default decisions among leaders. The payoff of repayment to citizens in the first period is $y_1 - \alpha\lambda R(\lambda)$ if the bad leader is in power, and $y_1 - \lambda R(\lambda)$ otherwise.

After observing λ, the incumbent leader decides whether to (a) raise $(1+r_1)q_1$ dollar tax revenue at a cost $\alpha\lambda R(\lambda)$, and repay the loan; or (b) default and repay nothing. Because no international court of law is set to be able to force the country to honor the contract, the contract must be incentive compatible: the leader is expected to voluntarily repay $R(\lambda)$ in state λ if his payoff on repaying is larger than non repayment and default. The representative agent's first-period income must be large enough that the government can raise enough taxes to repay the loan. The feasibility constraint is as below:

$$y_1 \geq \alpha\lambda R(\lambda), \tag{3.1}$$

for every λ, otherwise there is no lending in the period one.[2]

Under democracy, at the end of period 1, elections are held and the leader would stay on or be replaced by a political draw from the pool. Citizens have incentives to replace the incumbent leader who defaults when the default is not efficient, otherwise the leader is re-elected. The citizens maximize their consumption in $t = 1$. We do not model the savings decision, leaving it for an extension.

[2]In an extreme case such as $\lambda \to \infty$, (3.1) may not be met. Then the leader would choose a default because of the feasibility constraint, rather than a strategic default. Notice that in this case, incentive compatibility constraint must be binding.

We assume that the international credit market is competitive and that the foreign lenders must expect to make zero profit.[3] Since there is no discounting, the lender's (ex-ante) zero profit condition is

$$\int_1^L R(\lambda)dF(\lambda) = q_1. \tag{3.2}$$

If in state λ the leader pays strictly less than $R(\lambda)$, we define that he defaults on the loan. As shown in below, it is clear that if he defaults, his best option is to pay nothing at all due to the optimal contract.

3.2.3 Period 2

At the beginning of period 2, the representative citizen receives an endowment w_2, which is equally distributed. Because the model has only two periods, the action in the second period is different from the period one. Since there is not period three, there is no need to build a reputation in period two. Thus there is no reason to repay for foreign bond-holders. Therefore, in the second period, borrowing can only be from domestic agents. The model could be easily extended to many periods model, where the reputation motive operates in all periods except the last. To make lending possible in period 2, we assume $w_2 \geq q_2$; so the representative citizen has enough loanable funds in to finance a public project in period 2. With these funds, the leader implements the project y_2.

We assume for simplicity that there are no shocks in period 2, and the shadow value of a dollar at the end of period 2 is one, i.e., $\lambda = 1$. Under these assumptions, second-period behavior becomes straightforward. Domestic lenders can choose to lend to the leader or to invest their money abroad at a rate of interest r_2. We assume that the earnings abroad

[3] Assuming a small open economy, the foreign investor should demand the interest rate equivalent to the world rate r_1^*. For simplicity, we assume $r_1^* = 0$ without loss of generality.

in the second period are such that the high ability leader can make more by investing in the project y_2 while the low ability leader is less productive than investing abroad: $y_2 - q_2 > r_2 q_2 > \frac{y_2}{\alpha} - q_2$.[4] If a project takes place, the leader is willing to repay since the bond-holder is the representative citizen, i.e., the leader himself.

In Section 3, we derive the optimal contracts under the two assumptions: In Section 3.1 the first-period leader always remains the leader in period 2. This might correspond to a "dictatorship" or "autocracy" or even a "democracy with low turnover". In Section 3.2, we assume instead that the citizens can replace the first-period leader by a new leader at the end of period 1, corresponding to a de facto" democracy".

3.3 Optimal Contract

In this section we will discuss the optimal contracts in the two cases.

3.3.1 Optimal Contract with No Replacement of Leader: Autocracy

In this section, we assume the leader cannot be replaced after period 1.[5] λ is observed by creditors but they cannot enforce repayment. We will show that there is a Perfect Bayesian Equilibrium, where there exists a threshold $\lambda = \hat{\lambda}$ such that the citizens choose not to lend to the leader in the second period if there is default for $\lambda < \hat{\lambda}$ in the first period, and lend to the leader otherwise. The low ability leader always defaults and the high ability leader defaults only when $\lambda \geq \hat{\lambda}$.

[4] When a dictator defaults in $t = 1$, it would be a possibility to impose additional interest rates or spreads on the lending in $t = 2$ as a punishment to a defaulting leader. Nevertheless, the representative citizen is indifferent in raising the interest rate, as he is a taxpayer to pay the additional interest, but also a bondholder who receives the interest.

[5] This can be generalised to replacement with a certain cost.

Consider the low ability leader: the cost of repayment is $\alpha\lambda R(\lambda)$ and the additional benefit of repayment is 0: since he has the same utility as the representative citizen, he benefits by defaulting and letting citizens lend their money abroad. This is because he can only produce $\frac{y_2}{\alpha} < (1 + r_2)q_2$ in period 2.

Given this, when does the high ability leader repay? The incentive compatibility constraint requires that, in each state λ, the leader prefers to repay $R(\lambda)$, at a cost $\lambda R(\lambda)$, rather than defaulting and paying nothing.

When the leader cannot be replaced, the incentive to repay comes from the value of his reputation: if he fails to repay when $\lambda < \hat{\lambda}$, he will be believed to be a low ability leader and then will not get a new loan in period two. Citizens will invest abroad instead.If he repays $R(\lambda)$, in period 2 he will be able to borrow q_2 from the representative citizen, and implement a second-period project, which yields a net benefit $y_2 - q_2$, the same as the representative citizen's benefit. Accordingly, the incentive-compatibility constraint for the high ability leader to repay is

$$y_1 - \lambda R(\lambda) + y_2 - q_2 \quad \geq \quad y_1 + r_2 q_2,$$

or

$$\lambda R(\lambda) \quad \leq \quad y_2 - (1 + r_2)q_2 \tag{3.3}$$

for all λ.

The optimal contract minimizes the expected cost of repayment of the borrower:

$$\int_1^K (1 - \epsilon)\lambda R(\lambda) dF(\lambda) \tag{3.4}$$

by choice of $R(\lambda)$ subject to the lender's feasibility constraint (3.2) and the incentive constraint (3.3) above. Clearly, it is optimal to pay as much as possible in good states where λ is low, and as little as possible in bad states where λ is high. In terms of the IC constraint (3.3), the optimal contract will have a following form: There is a cutoff point $\hat{\lambda}$, such that $R(\lambda) = (y_2 - (1 + r_2)q_2)/\lambda$ for $\lambda \leq \hat{\lambda}$, and $R(\lambda) = 0$ for $\lambda > \hat{\lambda}$.

Citizen's beliefs are that whenever they see a default for $\lambda < \hat{\lambda}$, they believe the leader is the low ability type, and will invest abroad in $t = 2$. These beliefs are consistent with the equilibrium strategies of the two types. Given this belief, the H type has no incentive to deviate from the equilibrium repayment $R(\lambda)$ for $\lambda < \hat{\lambda}$, as the expected utility from investing the project in $t = 2$ with repaying $R(\lambda)$ in $t = 1$ is always higher than the expected utility from investing abroad with lower repayment or default in $t = 1$.[6] The low type leader always defaults, given his incentive constraints. This is consistent with the beliefs of the citizens.

With this contract, the lender's zero-profit constraint (3.2) can be written as

$$\int_1^{\hat{\lambda}} (1 - \epsilon) \, \frac{(y_2 - (1 + r_2)q_2)}{\lambda} dF(\lambda) + \int_{\hat{\lambda}}^{K} 0 \; dF(\lambda) = q_1,$$

or

$$\int_1^{\hat{\lambda}} \frac{1}{\lambda} dF(\lambda) = \frac{q_1}{(1 - \epsilon)(y_2 - (1 + r_2)q_2)}. \tag{3.5}$$

This equation determines cutoff point $\hat{\lambda}$. For example, if λ is uniformly distributed on

[6]Technically, the H leader could choose a strategic default $R = 0$ in $t = 1$. Given the possibility, the citizens could not update their beliefs on the type of the leader, even when they see a default for $\lambda < \hat{\lambda}$. Under these circumstances, the expected utility for the citizens to invest the project in $t = 2$ would be $(1 - \epsilon + \epsilon/\alpha)y_2 - q_2$. Since this is set to be higher than $r_2 q_2$, the citizens may invest the project even if he defaults, and therefore the H leader also could have an incentive to default always. However, such an equilibrium will have no lending in $t = 1$, i.e. $q_1 = 0$ by (3.2), causing an opportunity loss of $y_1 - \lambda R$. In addition, this is unrealistic, as the country will never get the loan from foreign lenders. Hence, we do not consider the possibility.

$[1, K]$, then equation (3.5) yields $\hat{\lambda} = \exp\left\{\frac{q_1(K-1)}{(1-\epsilon)(y_2-(1+r_2)q_2)}\right\}$. The condition for $\hat{\lambda} \geq 1$ is $K - 1 \geq 0$, given $q_1 > 0$ and $\rho > r_2$.

Proposition 8 *When the leader cannot be replaced, the optimal contract specifies* $R(\lambda) = (y_2 - (1 + r_2)q_2)/\lambda$ *for* $\lambda \leq \hat{\lambda}$*, and* $R(\lambda) = 0$ *for* $\lambda > \hat{\lambda}$*, where* $\hat{\lambda}$ *is implicitly defined by (3.5). If the leader defaults on this contract, the citizens will not give new loans in period two and invest abroad. The beliefs that support this equilibrium are that whenever they see a default for* $\lambda < \hat{\lambda}$*, they believe the leader is the low ability type.*

Proof. See Appendix. ■

Notice is that the repayment $R(\lambda)$ is maximal in the best state λ_0, i.e., $\lambda = 1$. While we could interpret $R(\lambda_0) = (y_2 - (1 + r_2)q_2)$ as the face value of the debt, there should be partial forgiveness of the debt whenever λ is such that $1 < \lambda \leq \hat{\lambda}$. In these states, the leader's repayment $R(\lambda)$ satisfies $0 < R(\lambda) < R(\lambda_0)$. If the state is very bad, $\lambda > \hat{\lambda}$, then the lenders would forgive 100% of the debt, i.e., $R(\lambda) = 0$.

This contract is optimal because it allows the country to repay nothing in bad states as possible. The primary motivation is risk-sharing: it is very costly for the country to repay in bad states. A low cut-off $\hat{\lambda}$ means the risk-sharing works very well, because repayment occurs only in good states.[7] From (3.5), $\hat{\lambda}$ is increasing in q_1 and decreasing in $y_2 - (1 + r_2)q_2$. Intuitively, it is obvious that if the loan size q_1 increases, the country must repay more often to allow foreign lenders to break even. Thus, $\hat{\lambda}$ increases in q_1.

[7] While the foreign lender is risk neutral, he allows borrowers to default when economic shock is large enough. In return, repayments in good states are set to be larger under the optimal contract. We call this situation as a risk sharing, as cost of the consequenses of a risk, i.e., economic shock, is distributed between lender and borrower in a form of variation in repayment, maximizing their utilities.

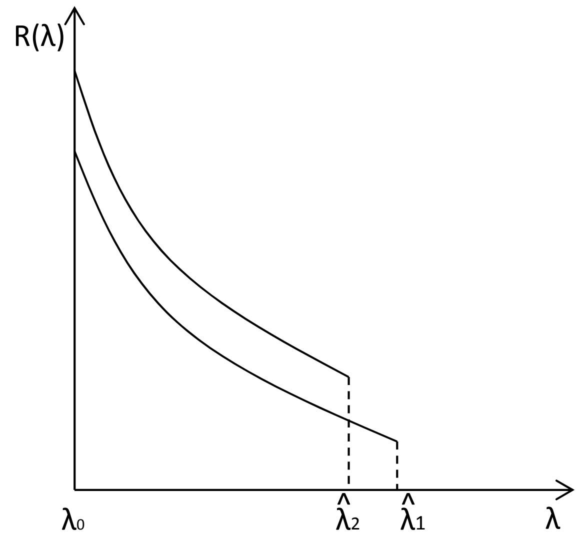

Figure 3.1: Repayment Schedule in Dictatorship

Also, notice is that the leader's incentive to repay depends on his reputation: if he is believed to be a low ability type, he will not be able to borrow money in period 2. The opportunity cost of losing second period loan is worth $y_2 - (1 + r_2)q_2$. When the leader cannot be replaced, the value of his reputation is simply the value that he will forgo if his reputation is bad. If $y_2 - (1 + r_2)q_2$ increases, then his incentive to repay the loan goes up. Therefore, it is incentive-compatible to promise to repay more with an increase in R. On the other hand, given the zero profit constraint (3.2), as a consequence of the upward shift of his repayment schedule, $\hat{\lambda}$ is decreasing, i.e., from $\hat{\lambda}_1$ to $\hat{\lambda}_2$ in Figure 3.1. This makes it possible to reduce the repayment in bad states, thus improve risk-sharing. Hence when the value of his reputation goes up, he will repay more in each good state but default more often under the optimal contract.

3.3.2 Optimal Contracts with Replacement of Leader: Democracy

The contract of the previous section would break down if the representative citizen could replace the leader between period one and two. If a leader continues to be in office in $t = 2$, he gets an ego rent E. When a leader is replaced, the probability of having a high type leader in $t = 2$ is still $1 - \epsilon$. We assume that ϵ is small enough that domestic lenders are willing to lend to the new leader rather than investing abroad in $t = 2$. Then when the citizens replace a leader in $t = 1$, the expected utility in $t = 2$ of the domestic lenders is $(1 - \epsilon + \epsilon/\alpha)y_2 - q_2$, and is set to be higher than $r_2 q_2$. Citizens would replace the leader when he is likely to be a low type, since $\frac{y_2}{\alpha} - q_2 < (1 - \epsilon + \epsilon/\alpha)y_2 - q_2$.

We will show that there is an optimal contract where there exists a threshold λ_H^* such that the citizens replace the leader in the first period if there is a default for $\lambda < \lambda_H^*$ in the first period, and re-elect the leader otherwise. Citizen's beliefs are that if default is observed below threshold λ_H^**, they believe the leader is a low type, and above the threshold, they have the prior beliefs. The low ability leader always defaults and the high ability leader repays only when $\lambda \leq \lambda_H^*$.

Under incentive-compatibility constraints, a low ability leader repays the loan only when he can continue to be in office in $t = 2$ to get E, even if he is less productive in the next period. Thus he would repay only if

$$-\alpha\lambda R(\lambda) + \frac{y_2}{\alpha} + E \geq \left(1 - \epsilon + \frac{\epsilon}{\alpha}\right) y_2,$$

or

$$\alpha\lambda R(\lambda) \leq E + (1 - \epsilon)\left(\frac{1}{\alpha} - 1\right) y_2. \tag{3.6}$$

Then there is a cutoff point λ_L^* such that he repays

$$R_L(\lambda) = \frac{E + (1 - \epsilon)(\frac{1}{\alpha} - 1)y_2}{\alpha\lambda}, \tag{3.7}$$

whenever $\lambda \leq \lambda_L^*$. When $\lambda > \lambda_L^*$, then the low ability type prefers to default in any cases.

The incentive-compatibility constraint of the high ability leader to repay is

$$-\lambda R(\lambda) + y_2 + E \geq \left(1 - \epsilon + \frac{\epsilon}{\alpha}\right) y_2,$$

or

$$\lambda R(\lambda) \leq E + \epsilon \left(1 - \frac{1}{\alpha}.\right) y_2. \tag{3.8}$$

This generates a cut off λ_H^* such that he pays back

$$R_H(\lambda) = \frac{E + \epsilon\left(1 - \frac{1}{\alpha}\right) y_2}{\lambda}, \tag{3.9}$$

whenever $\lambda \leq \lambda_H^*$. However, when $\lambda > \lambda_H^*$, then even the high ability type prefers to default.

The amount of repayment in $t = 1$ is observed by the citizens, as they need to pay taxes in $t = 1$ to finance the repayment. Comparing between (3.7) and (3.9), we could get

$$\begin{aligned} R_H - R_L &= \frac{E + \epsilon\left(1 - \frac{1}{\alpha}\right) y_2}{\lambda} - \frac{E + (1-\epsilon)(\frac{1}{\alpha} - 1)y_2}{\alpha\lambda} \\ &= \frac{1}{\alpha\lambda}\left((\alpha - 1)E + \left(1 - \frac{1}{\alpha}\right)(\alpha\epsilon + (1-\epsilon))\, y_2\right) > 0. \end{aligned}$$

Then the high ability leader could separate himself by paying more.

When $\lambda < \lambda_H^*$, the high type leader can strategically repay less than R_H, including $R_H = 0$, i.e. strategic default. In that case, the citizens would replace the leader, as they suppose the leader is not a high type because of the deviation from R_H. For $\lambda < \lambda_H^*$, comparing between the expected utility when the high type would repay at R_H and the expected utility when the high type repay at R_L, the difference can be written as

$$\left(y_1 - \lambda R_H + E + y_2 - q_2\right) - \left(y_1 - \lambda R_L + \left(1 - \epsilon + \frac{\epsilon}{\alpha}\right) y_2 - q_2\right) = \lambda R_L > 0.$$

Hence, the high type leader does not have incentives to deviate from the equilibrium with repayment at R_H when $\lambda < \lambda_H^*$.

Under these circumstances, the low ability leader can never be re-elected. When $\lambda < \lambda_H^*$, the maximum repayment by the low type is R_L by (3.6), which is deviated from R_H. Then citizens can update their beliefs and prefer to replace him. When $\lambda > \lambda_H^*$, the high type leaders always default. Then when the L type repays something, he is not re-elected. This implies that the low type will prefer to always default, as the expected utility from default $y_1 + (1 - \epsilon + \frac{\epsilon}{\alpha})y_2 - q_2$ is always larger than the expected utility from repayment $y_1 - \alpha\lambda R_L + (1 - \epsilon + \frac{\epsilon}{\alpha})y_2 - q_2$.

Then with the same argument as in the previous section, the optimal contract would minimize the expected cost of repayment of the borrower:

$$\int_1^K (1 - \epsilon)\lambda R_H(\lambda) dF(\lambda) \tag{3.10}$$

by choice of $R_H(\lambda)$ subject to the lender's feasibility constraint (3.2) and the incentive constraint (3.8) above. This suggests that it is optimal to pay as much as possible in good states where λ is low, and as little as possible in bad states where λ is high. By incentive compatibility constraint (3.8), the optimal contract will have the following form. There is a cutoff point λ_H^*, such that $R(\lambda) = \frac{E+\epsilon\left(1-\frac{1}{\alpha}\right)y_2}{\lambda}$ for $\lambda \leq \lambda_H^*$, and $R(\lambda) = 0$ for $\lambda > \lambda_H^*$.

With this contract, the lender's zero-profit constraint (3.2) can be described as

$$\int_1^{\lambda_H^*} (1 - \epsilon) \frac{E + \epsilon \left(1 - \frac{1}{\alpha}\right) y_2}{\lambda} dF(\lambda) = q_1.$$

or

$$\int_1^{\lambda_H^*} \frac{1}{\lambda} dF(\lambda) = \frac{q_1}{(1 - \epsilon)\left(E + \epsilon \left(1 - \frac{1}{\alpha}\right) y_2\right)}. \tag{3.11}$$

This lender's zero-profit condition determines cutoff point λ_H^*. For example, if λ is uniformly distributed on $[1, K]$, then equation (3.11) yields $\lambda_H^* = \exp\left\{\frac{q_1(K-1)}{(1-\epsilon)\left(E+\epsilon\left(1-\frac{1}{\alpha}\right)y_2\right)}\right\}$. The condition for $\lambda^* \geq 1$ are $K-1 \geq 0$ and $E > 0$, given $q_1 > 0$ and $\alpha > 1$.

We summarize this results as follows.

Proposition 9 *When the leader can be replaced, the optimal contract specifies* $R(\lambda) = \frac{E+\epsilon\left(1-\frac{1}{\alpha}\right)y_2}{\lambda}$ *for* $\lambda \leq \lambda_H^*$, *and* $R(\lambda) = 0$ *for* $\lambda > \lambda_H^*$, *where* λ_H^* *is implicitly defined by (3.11). The beliefs that support this equilibrium are that whenever they see a default for* $\lambda < \lambda_H^*$, *they believe the leader is the low ability type. Then if the leader defaults on this contract, the citizens will replace the leader at the election in* $t = 1$.

Proof. See Appendix. The proof follows the same logic as in the previous section. ■

This contract is optimal because it allows the country to repay nothing in bad states as possible. The primary motivation is risk-sharing: it is very costly for the country to repay in bad states. A low cut-off λ_H^* means the risk-sharing is very good, because repayments occur only in good states.

From (3.11), the country defaults more often if the need for funds (q_1) is lower, and the ego rents and the difference in ability are higher: λ_H^* are increasing in q_1 and decreasing in E and α. Intuitively, again it is obvious that if the loan size q_1 increases, the country must repay more often to allow foreign lenders to break even. Thus, λ_H^* increases in q_1.

If E increases, his incentive to be re-elected and continue to be in office in $t = 2$ goes up. Therefore, it is incentive-compatible to promise to repay more in good states as in (3.7) and (3.9). On the other hand, given the lender's zero profit constraint (3.11), λ_H^* would decrease as a consequence of the upward shift of repayment schedule. This makes it

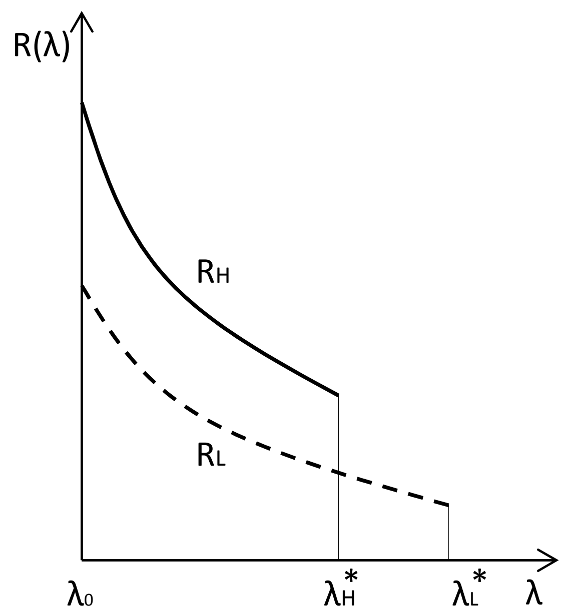

Figure 3.2: Repayment Schedule in Democracy

possible to reduce the repayment in bad states, thus improving risk-sharing. Hence when the value of ego rents increases, he will repay more in each good state but default more often under the optimal contract.

If α increases, the expected utility from being replaced would decrease. Hence, the leader's incentive to be re-elected would increase. As in the case of increase in E, it is incentive-compatible to promise to repay more in good states. At the same time, under the optimal constraint (3.11), λ_H^* would decrease with the improvement of the risk sharing.

3.4 Comparison

In this section, we will compare the default incentives between democracy and dictatorship. First, we will consider the high ability leader in both cases. Comparing (3.5) and (3.11), we find that if $E+\epsilon\left(1-\frac{1}{\alpha}\right)y_2 < y_2-(1+r_2)q_2$, then $\lambda_H^* > \hat{\lambda}$. In this case where ego rents are small and the value of reputation to dictators is high, the dictator defaults more often, i.e. the lenders are more likely to forgive the debt for a dictator than for a democratically elected leader. With low ego rents, the democratic leader has a strong incentive to default on the debt, since all he would lose from defaulting are his ego rents. To prevent the good leader from defaulting in $t=1$, the face value of repayment $R(\lambda)$ for the democratic leader becomes lower under the optimal contract along with lower E. On the other hand, with such a low face value, the lenders need to get repayment even in worse states in order to break even.

If $E+\epsilon\left(1-\frac{1}{\alpha}\right)y_2 > y_2-(1+r_2)q_2$, then $\lambda_H^* < \hat{\lambda}$. Thus if ego rents are large and the value of reputation to dictators is small, the democratic leader defaults more often and repays less in worse states, i.e. risk sharing is getting better under democracy. The representative agent is unambiguously better off under democracy when the leader can be replaced, as the second period project is always implemented, in addition to better risk sharing,

In both democracy and dictatorship, the L type leaders always default. Nonetheless, given that the probability of having a low type leader ϵ is sufficiently small, the probability of default in the country on average are highly dominated by the behavior of H type leaders, discussed the above.

3.5 Ideas for Extensions

Since this model is described in a simple way, it has potentials to be extended in many ways to see if logics here could broadly work. First, this could be extend to a fully dynamic model, while currently there are only two period. The reputation motive operates in all periods except the last.

Secondly, one can allow ϵ to be higher than in this model. This would show that when countries have low quality leaders with high probability, then default happens more often and risk sharing becomes worse. Also we could increase types on ability of leaders and ultimately extend to the model with continuum of types. If there is a leader who never repays, even the low ability leader will try to separate from him by repaying, and the higher ability leader will try to separate from the low ability one. As a result, total default probability would decrease.

Third, we could endogenize the saving function, which is not included in our model. In order to save in $t = 1$ to consume in $t = 2$, we may need to assume that the initial endowment of domestic citizens in $t = 1$ is enough to purchase the sovereign bonds q_1. Then representative citizen can purchase the bonds in $t = 1$ and receive its repayment in $t = 2$ as a saving. In our model, there is only a net taxpayer in $t = 1$, who has incentives to default. If we relax the constraint, the existence of net bond-holders in $t = 1$, who have less incentive to default, may lead to the decrease in the probability of default. Introduction of the share of net taxpayers and net bondholders could give another parameter for the probability of default.

Another derivative of this approach would be to introduce the income heterogeneity among citizens. Given unequal initial endowments, whether the agent is a bond-holder or not varies among them. In democracy, if the median voter theorem could be applied, the median voter would decide whether to re-elect the leader. When the median voter is a taxpayer in the first period, the model does not change, but when he is a bondholder, then the median voter has his own threshold of repayment. If this threshold is higher than before, then he will throw out anyone who does not repay frequently enough. Thus adding the heterogeneity of incomes may lead to higher repayment than before, if the median voter is a bondholder. When the shock is large, the median voter is likely to continue to be a net taxpayer, and have incentives to allow default. When the shock is small, the median is likely to be a net bondholder and so will not allow default for lower λ. This will make the interest rate more favorable to the country. It is unlikely, however, that in a dictatorship, this change dramatically affect the outcome of decisions, since no voting behavior is expected.

3.6 Conclusion

In this chapter, we considered the optimal contract in the repayment of sovereign debt – since contract enforcement is difficult in this environment, this problem is akin to the usual principal-agent problem with moral hazard. The optimal contract in the PA problem takes the form of punishing the agent by firing him when the observed output is low (e.g.

Shapiro and Stiglitz (1984)). In our model, under democracies, this punishment entails a re-election where the leader can be replaced. The punishment therefore takes the form of a loss of ego rents. On the other hand, under autocracies, no lending in the period two is the punishment.

We compare optimal contracts for both democracies and autocracies. There is a trade off between repayment and risk sharing. Contracts are implicitly state contingent through the re-structuring of loans that takes place after default. We show that when ego rents are high and value of reputation to dictators is low, then democracies have incentive to repay more in good states and then repay less in bad states under the optimal contract. Thus the democratic leader defaults more often than autocracies, improving risk-sharing. Also we introduced the different type of leaders to see how the ability of leaders affect the default decisions. The results suggest that the high ability leader defaults less often, and repays more than the low ability leader, since default is relatively costly to him.

Our model can deliver some testable predictions on default rates for democracies or autocracies as a function of their level of development and economic shocks. Tomz and Wright (2007) find weaker relationship between default and bad output shocks than predicted by the theoretical literature on sovereign debt defaults. Our chapter could offer an explanation: if the sovereign debt market is characterized by competitive lending, then state contingent contracts can be implemented through default and partial forgiveness in bad times. The trade-off of the contract is that if a country defaults too often, then access to credit would be restricted. However, in democracies, default is not that costly because leaders can be replaced. Hence default may occur even when output shocks are not that bad.

3.7 Appendix

Proof of Proposition 8 The Lagrangian for the problem is written by the following maximization:

$$\mathcal{L} = -\int_1^K (1-\epsilon)\lambda R(\lambda) dF(\lambda) + \mu\Big(q_1 - \int_1^K R(\lambda)dF(\lambda)\Big) + \int_1^K \phi_\lambda \Big(R(\lambda) - \frac{y_2 - (1+r_2)q_2}{\lambda}\Big) d\lambda \tag{3.12}$$

The Kuhn-Tucker conditions can be derived as:

$$\frac{\partial \mathcal{L}}{\partial R} = -(1-\epsilon)\lambda f(\lambda) - \mu f(\lambda) + \phi_\lambda \leq 0 \ ; \ R(\lambda) \geq 0 \tag{3.13}$$

$$\frac{\partial \mathcal{L}}{\partial \mu} = q_1 - \int_1^L R(\lambda) dF(\lambda) \leq 0 \ ; \ \mu \geq 0 \tag{3.14}$$

$$\frac{\partial \mathcal{L}}{\partial \phi_\lambda} = R(\lambda) - \frac{y_2 - (1+r_2)q_2}{\lambda} \leq 0 \ ; \ \phi_\lambda \geq 0 \tag{3.15}$$

The feasibility constraint for lenders must be binding, otherwise free entry of creditors enables $R(\lambda)$ to be reduced, making the borrower better off. Then given (3.14), the solution must satisfy $\mu > 0$.

If both μ and ϕ_λ are positive for some λ, then $R(\lambda) = \frac{y_2-(1+r_2)q_2}{\lambda} > 0$ by (3.15). If $\phi_\lambda = 0$ for some λ and $R(\lambda) > 0$, then by (3.13), $\mu = -(1-\epsilon)\lambda < 0$, which is a contradiction. Thus if $\phi_\lambda = 0$ for some λ, then $R(\lambda) = 0$ and $-\lambda < \mu$ by (3.13).

Suppose $-\lambda_1 < \mu$ for some λ_1, then this must be binding for every $\lambda \leq \lambda_1$. This proves that there exists a cutoff $\hat{\lambda}$ such that the incentive constraints are binding for all $\lambda \leq \hat{\lambda}$, and not binding for $\lambda > \hat{\lambda}$.

Proof of Proposition 9 The Lagrangian for the problem is written by the following maximization:

$$\mathcal{L} = -\int_1^K (1-\epsilon)\lambda R(\lambda) dF(\lambda) + \mu\Big(q_1 - \int_1^K R(\lambda) dF(\lambda)\Big)$$
$$+\int_1^K \phi_\lambda \Big(R(\lambda) - \frac{E + \epsilon\left(1-\frac{1}{\alpha}\right) y_2}{\lambda}\Big) d\lambda \tag{3.16}$$

The Kuhn-Tucker conditions can be derived as:

$$\frac{\partial \mathcal{L}}{\partial R} = -(1-\epsilon)\lambda f(\lambda) - \mu f(\lambda) + \phi_\lambda \leq 0 \ ; \ R(\lambda) \geq 0 \tag{3.17}$$

$$\frac{\partial \mathcal{L}}{\partial \mu} = q_1 - \int_1^L R(\lambda) dF(\lambda) \leq 0 \ ; \ \mu \geq 0 \tag{3.18}$$

$$\frac{\partial \mathcal{L}}{\partial \phi_\lambda} = R(\lambda) - \frac{E + \epsilon\left(1-\frac{1}{\alpha}\right) y_2}{\lambda} \leq 0 \ ; \ \phi_\lambda \geq 0 \tag{3.19}$$

The feasibility constraint for lenders must be binding, otherwise free entry of creditors enables $R(\lambda)$ to be reduced, making the borrower better off. Then given (3.18), the solution must satisfy $\mu > 0$.

If both μ and ϕ_λ are positive for some λ, then $R(\lambda) = \frac{E+\epsilon\left(1-\frac{1}{\alpha}\right)y_2}{\lambda} > 0$ by (3.19). If $\phi_\lambda = 0$ for some λ and $R(\lambda) > 0$, then by (3.17), $\mu = -(1-\epsilon)\lambda < 0$, which is a contradiction. Thus if $\phi_\lambda = 0$ for some λ, then $R(\lambda) = 0$ and $-\lambda < \mu$ by (3.17).

Suppose $-\lambda_1 < \mu$ for some λ_1, then this must be binding for every $\lambda \leq \lambda_1$. This proves that there exists a cutoff λ_H^* such that the incentive constraints are binding for all $\lambda \leq \lambda_H^*$, and not binding for $\lambda > \lambda_H^*$.

Chapter 4

Can Democracy Reduce the Risk of Debt Crises?

4.1 Introduction

Sovereign debt crises have been under spotlight since the global financial crisis. Most defaults and restructuring episodes were triggered by a wide range of economic factors: (i) a worsening of the terms of trade; (ii) an increase in international borrowing costs (e.g., due to tighter monetary policy in creditor countries); (iii) consistently poor macroeconomic policies, leading to built-up of vulnerabilities such as debt-to-GDP ratio; and (iv) a crisis in a systemic country that causes contagion across goods and financial markets (Sturzenegger and Zettelmeyer (2006)). However, debt defaults have been observed at very different economic levels. For instance, some countries, such as Belgium, have tolerated more than 100% of GDP of debt, while countries such as Argentina have repeatedly defaulted at much lower levels (Van Rijckeghem and Weder (2009)).

As recent case of Greece suggests, the outcomes of defaults tend to lead to significant challenges to the society as well as its economy. Then it is likely that political conditions matter in the decision to enter into sovereign default. In fact, the literature on sovereign defaults has long emphasized that the country's willingness to pay" should be important as well as its ability to pay", as described in Bulow and Rogoff (1989). It has been shown both theoretically and empirically that macroeconomic policy decisions are influenced by political factors, such as political institutions and the timing of election. (Alesina (1997)). Naturally there is a good body of supporting theoretical research on political and institutional factors for default decisions (Amador (2003); Tomz (2007); Cuadra and Sapriza (2008)). However, as in Panizza et al. (2009), to date, comparatively little empirical analysis of the political economy of sovereign default has been conducted.

Compared with existing empirical literature, this chapter studies the role of political institutions more comprehensively, using newly constructed database that maps the timing of sovereign debt rescheduling decisions in 81 countries for 1975-2010. I analyze not only the difference between democratic and non-democratic regimes but also a large number of political characteristics, while controlling macro-economic variables that account for debt dynamics. A notable innovation of this chapter is to study *The Paris Club* (sovereign creditors) and *The London Club* (private creditors) debt reschedules separately. To my best knowledge, the literature has ignored the difference along with the data limitation.

I empirically investigate several political economy arguments of sovereign default, in line with the theoretical literatures: (1) how do the differences in political institutions such as parliamentary regime or presidency affect the default decisions of countries when loans are granted; (2) whether the degree of government concentration affects the probability of debt crises through promoting fiscal consolidation; (3) how does political instability, in a form of electoral competitiveness, affect the decision; (4) whether the political incentives to continue to be in office helps ensure sovereign debts are repaid; (5) whether the outcome of elections has significant effects on default decisions, and (6) whether sovereign creditors (Paris Club) give a "democratic advantage" as a foreign assistance to the country which is democratic, on the basis of strategic and political considerations.

The chapter finds empirical support, under some conditions, for the hypothesis that parliamentary democracies have a lower propensity to reschedule their external liabilities than presidency scheme. This result is consistent with the implication of theoretical literatures, for example Kohlscheen (2010), that the parliamentary regime has a strong check-and-balance system on executives. It then finds that the probability of default is lower in countries under government concentration. This finding may be seen as being in line with a theoretical implication by Alesina and Drazen (1991) that fiscal adjustments tend to be delayed under a divided government. I also find that the rescheduling propensity of a country could be increased by the extent of political instability such as electoral competitiveness. If the competitiveness increases, the chance to be re-elected in the next election would be lower, which may lead to disincentives to save. Interestingly, in contrast, the occurrence of default seems to be lower when the executive is expected to remain in office for the next term. Finally, the result shows that the Paris Club members tend to give more support to those borrowers who are democratic than to those who are not, while this has not been observed in the London Club. This may correspond to a "democratic advantage" in international community. Importantly, these results are robust to extensive controls and to numerous specifications and estimation methods. The empirical results in this chapter imply that the evaluation of the sustainability would be incomplete without taking into accounts the politics of debt repayment. These findings could provide useful implications for both academics and policy-makers who deal with the sovereign defaults crisis.

The organization of this chapter is as follows. The next section develops a literature review on political economy of sovereign debt crises, while the following section describes a data collection. Estimation strategy of this chapter, namely panel probit model, is the subject of section four. Analysis for the estimated results is conducted in section five. Section six offers robustness checks, and the next section finally provides conclusions.

4.2 Literature Review

As noted by Panizza et al. (2009), although the theoretical importance of political economy considerations to sovereign default decisions has been postulated, comparatively little empirical work has been undertaken to verify or test alternative mechanisms. This is partly because of data limitations, both in cross-country political economy data and sovereign default data. But the work that has been done suggests that various political factors could affect the frequency and probability of sovereign crises, i.e., reschedulings of external debts. Among these, three aspects related to the political defaults" have attracted particular attention.

First, characteristics of the political system could affect default decision. In theory, democratic countries are expected to be less prone to default on their external obligations. Democracies are more credit-worthy than autocracies, not only because of constitutional checks and balances (and greater frequency of checks and balances, or vetoes), but also because in democracies leaders could be easily replaced if the executives chose inefficient choices. For instance, Dhillon and Sjostrom (2009) consider whether democracies offer greater commitment to debt repayment than non-democracies. The results show that democracies repay more often when the ego rents from being in office are low under the risk sharing system, where less incentive to continue to be in office leads to the reduction of repayment and then frequent repayment in order to keep the profits of lender. Empirically, for instance, McGillivray and Smith (2003) compare democracies and autocracies for default risk and fluctuations in bond prices. They find higher fluctuations in non democracies. In a democracy where it is easier to remove a leader, the leader is unlikely to decide defaults. In an absolute system where leaders are hard to be removed, the sovereign could default without jeopardizing their tenure in office, but one would lose the market access in return. On the other hand, Saiegh (2005) shows that democracies were more likely to reschedule their debts than autocracies, and pay interest rates at least as high as autocracies, with a sample of 62 developing countries from 1971-1997. Then empirical results seem to be mixed.

Within the democracies, policymakers may differ in their willingness to repay the debt, as they represent constituencies with different interests in the sovereign default. Then the parameters on internal politics of fiscal adjustment or default decision could turn to be relevant variables. A higher level of political constraints and many players with veto powers can restrain the executive's decisions. For instance, Kohlscheen (2010) argues that the probability of default is less under a parliamentary system than a presidential system, since the parliamentary system imposes more constraints on the executive's behaviour. In this regard, default is less likely under coalition governments. Saiegh (2009) shows that multi-party coalitions tend to prevent re-distributive transfers from asset holders to tax payers because of conflicts of interest. Given that the external default will most likely induce a transfer among the domestic agents, coalition governments tend to avoid defaulting. Alesina and Drazen (1991) suggest that a more polarized government tends to lead to a game of attrition and delayed fiscal stabilization. Accordingly, a system characterized by polarization amongst veto players could have a higher propensity to default.

Empirical studies regarding the above-mentioned theoretical implications are following. Kohlscheen (2010) finds that the probability of default on external debt is lower in parliamentary democracies compared to presidential democracies, when there are a large number of veto players in the government, and when the tenure of the government is long enough. He estimates a probit model based on a sample covering 59 democracies from 1976-2003. Saiegh (2009) shows that the probability of default on external debt is lower in coalition governments than in single-party governments, using a sample of 48 developing countries for 1971-1997. Van Rijckeghem and Weder (2009) categorize regimes as democratic and non-democratic and differentiate between defaults on external and domestic debt, using a sample of 73 countries between 1974-2000. In democracies, a parliamentary system or sufficient checks-and-balance system almost guarantees the absence of external debt default when economic fundamentals are sufficiently strong. Curtis et al. (2012) analyze the 2011 referendum on debt repayment in Iceland. They found that citizens tend to vote for their own interests. People with extensive investment assets and those likely suffer from higher borrowing costs voted for repayment, while unemployed voted for default. This result suggest that the effect of checks and balances may depend critically on the preferences of citizens and interest groups.

Secondly, an increase in political instability may increase default risks. The more political instability, the more political turnover an economy has. The increase in instability also means the increase in the likelihood of the political turnover to occur. Amador (2003) and Cuadra and Sapriza (2008) show that political uncertainty reduces the ability of a country to save. If an incumbent party has low probability of remaining in power, the government is unwilling to save. The party would bring resources from the future to the present through issuing a larger debt. In this case, a higher debt level increases the default probability, since the government would benefit more from not repaying its debt. On the other hand, if there is more stability, the government is less eager to transfer resources to the present. The stable government is then less likely to default. Aghion and Bolton (1990) study a setup in which policymakers differ in their willingness to pay. They show that the electoral concerns induce the right-wing party to issue a larger amount of debt to affect the election outcomes. Cole et al. (1995) and Alfaro and Kanczuk (2005) assume the two types of parties alternate stochastically in power. Their models suggest a type change from impatient government to patient one may lead to making a settlement payment, since the patient policymaker is able to siganl his type. This would explain the cycle of excluding from the market and regaining the access.

On the empirical front, Citron and Nickelsburg (1987) use a logit model to estimate the probability of default in Argentina, Brazil, Mexico, Spain and Sweden for 1960-1983. They find that their measurement for political instability, a number of political changes in the government in past five years, has a significant positive effect on the default probability. The results in Brewer and Rivoli (1990) also find that political instability, the frequency of regime change, has a significant negative effect on a country's perceived credit ratings from institutional investors. They use a sample of 30 countries for 1967-1986. Balkan (1992) also uses an index of political instability, based on the amount social unrest in a given year. The study estimates the probability of default using a sample of 31 countries from 1971-1984. A higher index increases the probability of observing a debt rescheduling in the subsequent year. Manasse et al. (2003) find that the probability of a debt crises increases in years with presidential elections. The sample is 37 countries for 1970-2002. Roubini and Manasse (2005) focused on 47 emerging economies from 1970-2002. This shows that countries with presidential elections in less than five years have a high probability of default, when international capital markets are tight. A note though is that in these studies, the causality between the sovereign default and turnover is unclear, as long as using annual data. While in some cases, the government decided to default for some reasons, given the scheduled election in the year, there must be a case where a default decision itself induced a turnover in the same year as a reaction to the decision.

Thirdly, the outcome of political turnover, namely elections, would affect the probability of default, when policymakers differ in their willingness to default. In some cases, political turnover may increase the likelihood of discontinuation of debt services. Hatchondo and Martinez (2009) have a model where the effect of political turnover on the default probability may depend on the type of current government. When a debtor-friendly government is in office, the level of default risk does not depend on the probability of political turnover, as political turnover would not trigger a political default.[1] On the other hand, when a creditor-friendly government is in office, the level of default risk would increases along with the probability of political turnover, since political turnover could trigger a political default.

Empirically, a political turnover seems to decrease the level of default risk. Block and Vaaler (2004) shows that credit rating agencies downgrade developing country ratings more often in election years, and bond spreads are higher in the 60 days before an election compared to spreads in the 60 days after an election. This result is based on 18 presidency elections in 19 countries for 1987-1998. More generally, Alesina (1997) discuss different theories of electoral cycles and find evidence of policy changes in the immediate aftermath of elections. Also turnovers of high rank government officials, regardless of elections, could signal changes in a government's willingness to default. Moser and Dreher (2010) find that bond spreads increase and local currencies depreciate as a result of changes in central bank governors, based on a sample of 20 emerging countries from 1992-2006.

[1] Hatchondo and Martinez (2009) even show that post-default equilibrium spreads tend to be lower than pre-default spreads, as political turnover would actually mean good news to bondholders.

4.3 Data

4.3.1 Dependent Variable

Data Selection

The dependent variable is a dichotomous debt crisis indicator that takes the value one if a country rescheduled or restructured its external sovereign debt (either principal or interest) in a given year, and 0 otherwise. Sovereign debt restructuring episodes have been widespread around the world. I use a newly established dataset by Trebesch (2011) and Das et al. (2013), which show 564 individual cases of reschedules in 81 countries between 1975 and 2010. Appendix 4.8.1 provides a list of countries in the sample. Out of 564 cases, 168 debt exchanges (61 countries) were with private creditors (foreign banks and bondholders, so called "the London club"), and 396 agreements (81 countries) restructured bilateral debt with official creditors through "the Paris Club" (government to government debt).[2] I construct the data series of *Total*, *Paris Club*, and *London Club* reschedule for each country. *Total* get one if either Paris Club or London Club reshcedule was agreed in the given year. The advantage of using this dataset is not only the broader coverage but also the identification of whether the creditor is public or private (the Paris Club or the London Club) per each rescheduling, which leads to a unique dataset to my best knowledge.

The database population is defined as all countries that experienced at least one default in 1975-2010.[3] This treatment could eliminate countries that have not been particularly

[2]Original dataset by Trebesch (2011) and Das et al. (2013) includes more than 600 individual cases in 95 countries for 1950-2010. Of these, 186 were debt restructurings with private creditors, and more than 450 involved restructurings with the Paris Club. I use a part of this data set because of data availability on other variables.

[3]For instance, see Foley-Fisher (2012) for a similar treatment.

active in soveregn bond markets and lending and may have depended on multilateral or bilateral foreign assisstance in a form of donation. For those countries, political interactions on default decision should be much less clear. In other words, inclusion of those countries could lead to a severer bias, since some countries have not rescheduled their debts simply because these countries were not able to borrow in the first place.[4]

Sovereign debt in this chapter refers to debt issued or guaranteed by the government of a sovereign state. Although a sovereign debt restructuring has no universal definition, following Trebesch (2011) and Das et al. (2013), I define a restructuring as an exchange and/or haircut of outstanding sovereign debt instruments such as loans or bonds, for new debt instruments or cash through a formal process. The database focuses on distressed debt exchanges, defined as restructurings at less favorable terms than the original bond or loan terms. Restructurings that are part of routine liability management aimed at improving the profile of public debt such as debt swaps and buybacks in normal times, are disregarded.[5]

Default and Restructuring

As Das et al. (2013) notes, default events and debt restructurings are closely related but technically not identical, while the cost of debt restructuring is considered as the same as that of default. The definition of default actually varies among the dataset. Narrow definition of default is a violation of the legal terms of a debt contract such as a failure

[4]One should note that this may also exclude several developed countries, which are unlikely to be linked to a significant default risk. Given that most of these countries are parliamentary democracies throughout the sample period, the empirical result could have a lower default propensity under parliamentary democracies.

[5]For a detailed description of the variables used in this study, see Trebesch (2011) and Das et al. (2013).

to pay interest or principal on the due date (or within the specified grace period).[6] In most cases, debt restructuring processes are triggered by a default event as in Trebesch (2011). Such restructurings, known as post default restructurings, can be defined as debt exchanges that occur after a payment default, i.e., after the government has gone into arrears on a part or all of its debt to creditors.

However, the narrow definition of default sometimes overlooks situations where the sovereign threatens to default and creditors respond by "voluntarily" revising the contract (Das et al. (2012)). In recent years, we have also seen a number of preemptive debt restructurings, which can be defined as debt exchanges that occur prior to a default, that is, without any failure of the government's payments. For instance, recent Greece's actions had not triggered a narrow default: the government had not missed any payments, and creditors had not alleged a technical breach. Nevertheless, Greece demanded new terms and creditors consented.

While not all defaults are followed by a restructuring, it is also important to underline that not all restructurings are preceded by a default.[7] Then the event of sovereign crises should take into account voluntary restructurings of debt.[8] As in Das et al. (2012), in 2001, all three major ratings agencies classified Argentina as a default state in November 2001 when it announced its intention to suspend payments, although the government did not break a contract until January 2002 when it first failed to make a due payment. In order

[6]Defaults can be partial. For example, it is often the case that interest payments continue, while principal payments are suspended. Yet, a default can also imply a complete halt of all debt payments towards creditors.

[7]Das et al. (2012) show that of the 186 sovereign debt restructurings with foreign private creditors between 1950 and 2010, 109 cases occurred post-default, while 77 were preemptive.

[8]In recognition of this problem, credit ratings agencies such as S&P define a default as beginning either when the sovereign breaks the contract, or when the sovereign "tenders an exchange offer of new debt with less favorable terms than the original issue" (Beers and Chambers (2006)).

to capture these preemptive debt restructurings, I use the event of debt restructurings as a sovereign crisis indicator[9].

Paris Club and London Club

The "Paris Club" is the main institutional framework to restructure external bilateral sovereign debt that debtor countries owe to other governments.[10] The origins of the Paris Club date back to 1956, when Argentina met its sovereign creditors in Paris in an effort to prevent an imminent default. With the 1980s debt crisis, the Paris Club became one of the key vehicles to resolve debt crises around the world.

The Paris Club is an informal group of creditors and an ad-hoc negotiation forum with no legal status and statutory rules of procedure, while it has a secretariat based in Paris. The Paris Club members compose of the governments of 19 largest world economies, plus additional creditor governments that are invited to participate in the negotiations on a case-by-case basis. A country government that wants to restructure its debt would need to approach the Club's secretariat and demonstrate its payment difficulties and the need for debt relief, based on its macro economic and financial situation. Debtor countries are also required to agree with a structural adjustment program by the IMF. Once a country satisfies these criteria, it could meet and negotiate with a group of its creditors at the Paris Club so as to come to a bilateral agreement on broad restructuring term.

The clause foresees equal burden-sharing across all creditor groups, in particular private creditors but also other official bilateral creditor countries that are not members of the Paris Club. In other words, the scope of debt relief granted by the Paris Club creditors

[9] For instance, see Saiegh (2009) for same treatments

[10] This section is based on the discussions of Das et al. (2013).

tends to determine how much debt relief other creditors should also grant to the country. As the Paris Club agreements often precede restructurings with other creditors, the Club's comparability of treatment rule significantly affects the negotiations with banks or bondholders.

The process of debt renegotiations between governments and commercial banks is typically labeled as "the London Club" restructuring. The London Club is also not a statutory institution based in London. The case-by-case restructuring routine was developed between major Western banks and developing country governments in the late 1970s and early 1980s.

In the early stage of financial distress, a debtor government contacts its one or two major bank creditors, asking them to organize and chair a steering committee. A group of 520 representative banks establishes the Bank Advisory Committee (BAC), or Creditor Committee, which negotiates on behalf of all banks affected by the restructuring. The banking representatives would meet the country's government officials on a regular basis. These negotiations typically cover the full types of crisis resolution measures, including the provision of new financing, short-term liquidity support, as well as the restructuring of loans with maturity prolongation and/or reductions in face value. Once the main restructuring terms are agreed, "agreement in principle" is signed between the representative BAC banks and the government. Then the terms are sent to all other banks for approval under unanimity.

In the era of bank debt restructuring of the 1980s and 1990s, holdouts (creditors refuse to participate in agreements arranged by a representative group) and intra-creditor disputes were a major problem. According to data collected in Trebesch (2008), about 30 percent of London Club restructurings suffered from intra-creditor disputes that led to delays of 3 months or more in implementing the deal. The BAC system was introduced to overcome coordination problems among hundreds of individual banks.

Table 4.1 could suggest that the Paris Club reschedules tend to precede the London Club reschedules.[11] The Paris Club reschedule is most likely to go along with the IMF program, which would guarantee to recover the country's economy and hence strengthen the repayment capacity of the country. Thus the London Club creditors may have an incentive to wait for the Paris Club's decision on the reschedule and its conditionality to minimize the losses, even if the reschedule is inevitable.

Table 4.1: The Timing of Paris Club Reschedules

Prior to London Club			Posterior to London Club		
6-12 months	3-6 months	0-3 months	0-3 months	3-6 months	6-12 months
26	11	22	9	5	13
59			27		

On the other hand, the relation and causality between Paris club and London Club reschedules is not statistically stylized when I conduct a Granger causality test.[12] The results of the Granger causality tests in Table 4.16 show that there is a strong evidence that rejects the null hypothesis that the Paris Club *does not cause* the London Club significantly for 21 out of 48 sample countries, while 20 countries support the London

[11]This excludes the cases where Paris Club reschedules took place both prior and posterior to a London Club reschedule within one year, as this situation suggests the country was so indebted that the causality and relationship should be unclear. Also there are some London Club reschedules which did not accompany Paris club reschedules within a year before or after.

[12]See details in Appendix 4.8.2. Granger causality measures if statistically "A happens before B" rather than "A is the cause of B".

Club led hypothesis. Considering strong empirical support for two-way Granger causality between the Paris Club and the London Club reschedules in 10 countries, overall this study does not provide strong evidence supporting the view that the Paris Club reschedule is an important determinant of the London Club reschedule. This study also highlights that the causality differs across countries. Possible reasons for the mixed results are differences in debt structure and the degree of market access among countries.

Taking advantage of the property of dataset I use, there is a hypothesis for empirical investigation: Exogenous sources of a "democratic advantage"(Saiegh (2005)) could be observed. In principle, lenders should be motivated by economic objectives. However, as in Schultz and Weingast (2003), this is certainly true for private lending, while the role of foreign assistance, in the form of grants and loans that richer countries and/or international financial institutions (IFIs) would give to poorer countries, is also an important aspect for the discussion. As Drazen (2001) notes, foreign assistance is sometimes given for non-economic reasons, based on strategic and/or geopolitical considerations of the donor country and organization. Hence, if sovereign lenders, the Paris Club members in this case, are willing to give more support to those borrowers who are democratic than to those who are not, then we may observe a "democratic advantage", where the public lender is likely to allow the democratic sovereign borrower to reschedule its debt.

4.3.2 Political Variables

This chapter uses a large number of political variables. Main data source is *the Data of Political Institutions* (DPI) by The World Bank, but I also supplement with data from other sources. Political institutional variables are divided into two parts. As we aimed to avoid endogeneity bias, we used lagged variables whenever practicable. Structural variables such as degree of democracy are less likely to be immediately affected by the default decision, while event variables such as election could be impacted by default decesion.[13] Detailed discussions are followed in each section.

Political System

In order to check if parliamentary systems have fewer reschedulings as in the previous studies, I use a *Parliamentary* parameter, which distinguishes parliamentary from presidential and mixed systems. If the country has a parliamentary form of government, the variable equals two.[14] If it has an assembly-elected presidency, the variables is going to be one. Systems with presidents, who are elected directly, or unelected executives get a zero. A parliamentary system or sufficient checks and balance systems are expected to restrain the executive and lead to fewer defaults. Then its coefficient is expected to be negative.

The developments of democracy may lead to a "democratic advantage"(Saiegh (2005)), especially for the Paris Club reschedulings. To observe this correlation, I use *Democracy* indicators defined by POLITY project. The variable is originally an additive scale (0-10), derived from codings of the competitiveness and openness of executive recruitment, constraints on the chief executive, and the competitiveness of political participation.[15] I presume to see the difference between the Paris Club and the London Club, as the public lenders such as the Paris Club member are expected to be more likely to allow the democratic sovereign borrowers to reschedule its debt, to give more support to those borrowers who are democratic, compared with the private lenders who would try to maximize their

[13]Periods of revolution or wartime where drastic changes in any variables are expected are excluded from observations.

[14]To compare the impacts with other variables directly, in estimation, I use the rescaled index, normalized between 0 and 1. See Table 4.2.

[15]To compare the impacts with other variables directly, in estimation, I use the rescaled index, normalized between 0 and 1. See Table 4.2.

profits.[16]

As Alesina and Drazen (1991) suggests, a divided government may lead to a game of attrition and delayed fiscal stabilization along with a higher propensity to default, as it would take a longer time to reach an agreement on the allocation of the cost of stabilization. To measure a government's partisan concentration, I use a *Government Concentration* parameter, which is Herfindahl-Hirschman (HH) index of concentration. This variable is computed as

$$HH = \sum_i p_i^2,$$

where $p_i = s_i/S$, s_i is the number of seats of party i, and S is the total number of seats held by the government. This indicators reaches its maximum value one under single-party governments. The minimum zero is approached when all parties included in the government have equal numbers of seats and the number of parties increases. Therefore, it is expected to have a negative sign.

Political Instability and Turnover

As in Amador (2003), political uncertainty reduces the ability of a country to save, and increase default risks, because an incumbent executive with lower probability of remaining in power is unwilling to save. To examine this, I use the *Electoral Competitiveness for Executive* index, which originally varies between 1 and 7; 1 if no legislature, 2 if acclamation on unelected executives , 3 if executives are elected from one party, 4 if elected from multiple

[16]Apparently the development of democracy could be an indicator for a good business envirionment through transparency and accountability framework. Then the private lenders would prefer the higher score of the indicator, although they wouldn't allow the borrowers to reschedule the debt in any setting to maximize their profits.

candidates within one party, 5 if elected under the situation where multiple parties are legal but only one party won seats, 6 if the largest party received more than 75% of the seats, or 7 if the largest party received less than 75% of the seats.[17] This suggests that competitively elected prime ministers get 6 or 7. If the index is higher, the likelihood of political changes would increase, implying a higher political instability. Hence its coefficient is expected to be positive.

A binary index of *Re-Elected* is used to check if the increase in the probability of a leader to be re-elected would lead to a lower default probability. Executives get 1 if he can be re-elected following the current term, when the executive's term is constitutionally limited. If a term limit is not explicitly stated, 1 is also recoded. As a lame duck leader may have less incentive to save and then have a higher probability to default, the sign is expected to be negative.

To see the effect of political turnover on the default probability, I use an *Election* index, which takes 1 if there was an executive election in the previous year. Notice that there is concern on causality in the relationship between sovereign defaults and election. An election would affect the probability of posterior default in the given year, while a default decision itself could induce an election in the same year. Considering that the dataset I use is annual, this variable is lagged for one year to focus on the effect of turnover, dealing with its potential endogeneity. Since the effect of political turnover on the default probability may depend on the type of current government, the sign of its coefficient is uncertain.

[17] To compare the impacts with other variables directly, in estimation, I use the rescaled index, normalized between 0 and 1. See Table 4.2.

4.3.3 Control Variables

As discussed in the previous section, countries are sometimes unable to repay their debt regardless of their willingness to pay, when they are insolvent or illiquid. Thus a number of macroeconomic variables could affect the likelihood of sovereign debt default. I use the following explanatory variables as economic control variables, which are included in the core specifications. These have been used in previous studies on debt default. The main data source is the World Bank's *Development Indicators*, while some of them are obtained from the IMF's *International Financial Statistics*. All variables are rescaled to ratios, not in percent figures (See Table 4.2).

In most theoretical models of sovereign default, the level of debt, *Debt to GDP Ratio*, plays an importnat role. Whether a country is solvent or not depends on its debt relative to its ability to pay. This variable captures the degree of solvency of a country. Therefore, it is expected to have a positive sign.

Debt Services to Exports Ratio measures possible liquidity problems. A debt crisis can also occur if a country is illiquid rather than insolvent. Higher debt service ratios has an adverse effect on a country's ability to repay its debt. Thus its coefficient is expected to be positive.

International Reserves to Total Debt Ratio measures the level of international liquidity held by a country. In contrast to the previous variable, the lower the international reserves to debt ratio, the greater there might be a threat of having a sudden liquidity crisis. Then it is expected that the coefficient on this variable is negative.

Real GDP Growth Ratio is used to measure the impact of economic shock. It has been argued that a decline in the growth rate could contribute to a long-term insolvency problem, leading to higher default probabilities. On the other hand, a decline in growth may mitigate an external liquidity constraint through lower imports, and can lead to a lower probability of a sovereign default; therefore, the impact of this variable on default is uncertain.[18] Also the direction of causality in the relationship between sovereign defaults and growth could be argued. While some of studies, e.g. Kohlscheen (2010), suggest a robust association between debt defaults and low growth, they only indicate a correlation between the two variables. Borensztein and Panizza (2009) show that debt defaults are usually a consequence of some economic shocks that also hurt growth at the same time. Therefore, in this chapter, the series of this variable used in estimates are lagged to make sure the causality can be maintained.

Short-Term Debt to Total Debt Ratio is considered to link with crises through rollover capacity. Assume that a debtor country needs to service a large amount of due obligations. If creditors can not roll over some or all of the maturing debt, default is the optimal choice. If the loan could be rolled over, the debtor country is better off repaying. This variable thus captures whether countries are able to borrow short-term funds in international market to avoid a rescheduling of their sovereign debt. Then it should be negatively correlated to rescheduling probability.

As Palac-McMiken (1995) notes, the literatures include at least 13 different model specifications for sovereign default and economic variables, while no representative model exists in the literatures. A number of alternative explanatory variables were tested, namely central government budget surplus and current account surplus.[19] None of these variables

[18]Tomz and Wright (2007) find that 38 percent of 169 sovereign default episodes in their sample occurred in years when the output level in the defaulting country was above the trend value.

[19]A demographical change could be a proxy for controlling the social security spending in the country, which is expected to increase rapidly when the population is aging. The increase in the social security spending tends to limit the flexibility of fiscal managment and then would lead to defaulting in theory.

has the expected sign and a p-value below 0.10 when added to the baseline specification.

4.4 Estimation Strategy

In order to examine the interaction between the probability of sovereign crises to happen and political variables, this section builds the estimation strategy for panel probit model mainly based on Greene (2003), using the data set described in the previous section. The baseline specification takes 81 countries data with an average time span of 25 years.

When analyzing binary responses in the context of panel data, it is often useful to begin with a linear model. However, a linear probability model for binary outcomes has a problem as the predicted values for the dependent variables cannot be ensured to lie between zero and one, depending on the estimated coefficients of independent variables.

Then we use a probit model to illustrate partial likelihood methods with panel data. The model can be described as

$$\begin{aligned} y_{it}^* &= \mathbf{x}_{it}\beta + c_i + e_{it}, \quad t = 0, ..., T \\ y_{it} &= 1 \ [y_{it}^* > 0], \end{aligned} \tag{4.1}$$

and

$$\Pr(y_{it} = 1|\mathbf{x}_{it}, c_i) = \Phi(\mathbf{x}_{it}\beta + c_i), \tag{4.2}$$

where Φ denotes the cumulative distribution function of a standard normal distribution, taking on values in the unit interval; y_{it} is the binary indicator of debt crises in terms of rescheduling episodes, each corresponding to country i at time t; $\mathbf{x}_{it}$ denotes a vector of determinants of default; β is a vector of parameters to be estimated; and c_i denotes the

However, it is difficult to conduct the specification due to data limitation.

unobserved country-specific heterogeneity. $\mathbf{x}_{it}$ can contain a variety of factors, including time dummies, interactions of time dummies with time-consistent or time-varying variables, and lagged dependent variables.

The most restrictive approach assumes to take all the cross period correlation away and treats the panel essentially as a cross section. This produces the "pooled" estimator which is the standard, single equation probit model. The model could be written as

$$\Pr(y_{it} = 1|\mathbf{x}_{it}) = \Phi(\mathbf{x}_{it}\beta), \quad t = 0, ..., T \tag{4.3}$$

where $y^*_{it} = \mathbf{x}_{it}\beta + c_i + e_{it} = \mathbf{x}_{it}\beta + \delta + e_{it}$. c_i contains only a constant term δ. Then ordinary least squares provides consistent and efficient estimates of the slope vector β. The focus of this study is on the incidence of rescheduling episodes rather than their precise timing, and on the persisitence of political factors after controlling for liquidity and solvency variables. Given this purpose, in this chapter, I use a simple pooled probit regression as a baseline model[20].

Another popular model for binary outcomes is a fixed effects probit model. The main assumption of this model is

$$\Pr(y_{it} = 1|\mathbf{x}_i, c_i) = \Pr(y_{it} = 1|\mathbf{x}_{it}, c_i) = \Phi(\mathbf{x}_{it}\beta + c_i), \quad t = 0, ..., T \tag{4.4}$$

where individual specific effect c_i is unobserved but correlated with $\mathbf{x}_{it}$, and $\mathbf{x}_i$ contains $\mathbf{x}_{it}$ for all t. This means that $\mathbf{x}_{it}$ is strictly exogenous conditional on c_i. Also a standard assumption is that the outcomes, y_{it}, are independent conditional on $(\mathbf{x}_i, c_i)$. Then the y_{it} are dependent across t conditional only on the observables, $\mathbf{x}_i$. As this embodies all the observable effects and specifies an estimable conditional mean, the fixed effect approach

[20] See Kraay and Nehru (2006) and Kohlscheen (2010) for a similar treatment

takes c_i to be a group-specific constant term. Without restricting the relationship between c_i and the $\mathbf{x}_i$, this model treats the c_i as parameters to be estimated along with β, as this treatment obviates the need to make assumptions about the distribution of c_i given $\mathbf{x}_{it}$. However, estimation of c_i along with β introduces an incidental parameters problem stated by Neyman and Scott (1948). When the number of time periods, T, is small and the number of individuals, N, is large ($N \to \infty$ for a fixed T), the number of parameters c_i increases with N unlike in the linear case. Then c_i cannot be consistently estimated for a fixed T. Thus the maximum likelihood estimator of β is biased and inconsistent as a consequence of an omitted variable. Several estimators have been proposed to tackle this inconsistency problem due to the lack of independence between c_i and $\mathbf{x}_i$. The estimator proposed by Chamberlain (1984) to circumvent this problem appears to require a very large N, such as individual micro dataset, in order to yield satisfactory results (see Lechner and Breitung (1996) for details). Then as for panel data, fixed effects probit models tend not to be taken into accounts. Also note that fixed effect may not be included in this case, as the stringent conditions for a full-fledged unobserved effects probit analysis are not met.

The unobserved effects probit model has been also popular for the random effects model. The random effects model analyzed by Butler and Moffitt (1982) maintains the homoscedasticity (unit variances) assumption but extends the pooled model by allowing cross period correlation.[21] This random effect approach specifies that c_i is a group-specific random element, similar to e_{it}. This is a linear regression model with a compound disturbance that can be consistently estimated by least squares. The traditional random effects probit model assumes that the c_i and $\mathbf{x}_{it}$ are uncorrelated, and that c_i has a normal

[21]The difference from the fixed effect is whether the unobserved individual effects are correlated with the regressors in the model.

distribution:

$$c_i|\mathbf{x}_i \sim \text{Normal}(0, \sigma_c^2) \tag{4.5}$$

In section 6, I will estimate random-effects probit models as a robustness check.

Bertschek and Lechner (1998) proposed GMM estimators for the probit model based on panel data, while this estimator needs strict exogeneity. While strict exogeneity would be plausible to be met for some institutional variables, this would be very difficult to hold for the ratio variables. A debt rescheduling, for instance, may have a direct impact on the ratio variables in the following periods.

Dynamic models which contain unobserved effects are also important in assessing policies. A random effect model that explicitly allows for lagged dependent variable approach is called the dynamic random effects probit model, defined as

$$\Pr(y_{it} = 1|y_{i,t-1}, ..., y_{i0}, \mathbf{x}_{it}, c_i) = G(\mathbf{x}_{it}\beta + \rho y_{i,t-1} + c_i), \quad t = 1, ..., T \tag{4.6}$$

where G can be the probit function. Again, the hypothesis $\text{H}_0 : \rho = 0$ is of interest. The larger the value of ρ, the greater the degree of state dependence in default probabilities. These models, however, suffer from the well-known initial conditions problem; how we treat the initial value of the dependent variable y_{i0}, in terms of whether y_{i0} is independent of c_i. Most studies assume that each y_{i0} is non-stochastic for each i or exogenous. This implies a very strong assumption that c_i and y_{i0} are independent. When a correlation is induced between them, ignoring this problem will result in biased and inconsistent parameter estimates.

There are several approaches to handling endogenous initial conditions, of which the most popular one is proposed by Heckman (1981a,b). He approximates the reduced form linear equation for the initial observation such as $y_{i0} = \lambda' \mathbf{z}_i + \eta_i$, where $\mathbf{z}_i$ is a vector of strictly exogenous instruments, and maximum likelihood estimation using the full set of sample observations. Orme (1997, 2001) suggest a two-step procedure for corrections for sample selection, in which c_i is substituted with another unobservable component uncorrelated with the initial observation. Wooldridge (2005) suggests an alternative Conditional Maximum Likelihood (CML) estimator that models the distribution of the full observed $y_1, y_2, ...y_T$ conditional on the value of the initial period y_{i0} and exogenous variables. Arulampalam and Stewart (2009) compare results obtained using these three estimation methods and show that all yield similar results, and that none of the three dominates the other two.

In section 6, I estimate the dynamic random effects model to see the persistence of the events as a robustness check. Among others, I use the Wooldridge estimator in this chapter.[22] Following Wooldridge (2005), the joint density for the observed sequence $(y_1, y_2, ...y_T|y_0)$ is written as $f(y_1, y_2, ...y_T|y_0, \mathbf{x}, c_i)$. In order to integrate out the unobservable c_i, Wooldridge specifies an approximation for the density of c_i conditional on the initial observation y_0, via the auxiliary model such as

$$c_i = \alpha_0 + \alpha_1 y_{i0} + \mathbf{x}_i^{+'} \alpha_2 + a_i, \tag{4.7}$$

where $\mathbf{x}_i^+$ is the row vector of all explanatory variables in all time periods such as $(\mathbf{x}_{i1}^{'}, ..., \mathbf{x}_{iT}^{'})^{'}$, including variables that are correlated with the unobservable c_i. Henceforth, a_i is normal with mean 0 and variance σ_a^2, given the regressors in the model. The idea is that the correlation between y_{i0} and c_i is handled by the use of (4.7), giving another unobservable individual-specific error term a_i, which is uncorrelated with the initial observation y_0.

[22]This is mainly computational purpose. Capellari and Jenkins (2008) and Arulampalam and Stewart (2009) suggest an estimation of Heckman indicators is considerably more expensive in terms of computing time than the others.

Then the dynamic equation to be estimated becomes,

$$y_{it}^* = \mathbf{x}_{it}\beta + \rho y_{i,t-1} + \alpha_0 + \alpha_1 y_{i0} + \mathbf{x}_i^{+'}\alpha_2 + a_i + e_{it} \quad t = 1, ..., T. \tag{4.8}$$

In this model, the contribution to the likelihood function for individual i is given by

$$L_i = \int \left\{ \prod_{t=1}^{T} G[(\mathbf{x}_{it}\beta + \rho y_{i,t-1} + \alpha_0 + \alpha_1 y_{i0} + \mathbf{x}_i^{+'}\alpha_2 + a)(2y_{it} - 1)] \right\} g^*(a)da, \tag{4.9}$$

where $g^*(a)$ is the normal probability density function of the *new* unobservable heterogeneity a_i, given in (4.7). Since (4.9) has the exactly the same structure as in the standard random effects probit model likelihood contribution, we can proceed with the maximization using standard software. According to literatures such as Akay (2012), $\mathbf{x}_i^+$ could be replaced by $\bar{\mathbf{x}}_i = \frac{1}{T}\sum_{t=0}^{T}\mathbf{x}_{it}$, which are within-means of the time varying covariates across all periods.[23]

4.5 Results

4.5.1 Summery Statistics

Table 4.2 provides the descriptive statistics for the country-year observations of our estimation. Based on the original dataset by Trebesch (2011) and Das et al. (2013), the observations, which don't include all economic variables in the given year due to data availability, are excluded from the sample. As a result, the sample consists of 2200 individual observations on 81 countries between 1975 and 2010 period, including 417 reschedule episodes. Of these, 137 debt exchanges (53 countries) were with private creditors ("the

[23] Wooldridge (2005) proposed the model with either $\mathbf{x}_i$ or $\bar{\mathbf{x}}_i$, which includes time-constant covariates. Rabe-Hesketh and Skrondal (2013) suggests that the constrained model with $\bar{\mathbf{x}}_i$, including the initial period, may lead to a bias if the data is a short panel, e.g. $T = 5$, and instead $\bar{\mathbf{x}}_i^+ = \frac{1}{T-1}\sum_{t=1}^{T}\mathbf{x}_{it}$, which does not include the initial-period explanatory variables, can be used.

London club"), and 330 agreements (71 countries) restructured bilateral debt with official creditors through "the Paris Club". (government to government debt).

The unconditional probability of the Paris Club rescheduling in any given year during the sample period was 15 percent, compared with 6.2 percent for the London Club reschedules. These figures can imply that the London Club allow to reschedule their debts less often than the Paris Club. I use a t-test to examine differences in average debt rescheduling under the Paris Club and the London Club systems. The results of t-test ($t = -10.9708$ and $p < 0.0001$) reject the null hypothesis that the difference in means of the Paris Club and the London Club reschedules is zero.

4.5.2 Empirical Results

Table 4.3 – 4.5 report the core specifications; Total, *the Paris Club* and *the London Club* reschedulings. The second column presents the results of the model without the political variables. The third column and beyond report the specifications with the political variables, controlling the economic variables.

Among these, column II shows that parliamentary systems have a negative effect on sovereign debt defaults relative to presidency as in the previous studies, while the effect was not statistically significant in some cases. This result is consistent with the theoretical predictions that a parliamentary system or sufficient checks and balance systems are expected to restrain the executive and lead to fewer defaults. Robustness checks support this results with statistical significance.

Next, the *Democarcy* variable has the positive coefficients for total reschedules and the Paris Club reschedules but not for London Club. This suggests that for the Paris Club lenders, the probability of allowing the reschedule increases significantly if the borrower

Table 4.2: Summery Statistics for Country-year Observations

	Obs	Means	Std. dev.	Min	Max
Debt reschedule					
All	2200	0.190	0.392	0	1
Paris Club	2200	0.150	0.357	0	1
London Club	2200	0.062	0.242	0	1
Debt to GDP	2200	0.801	0.855	0.026	12.524
Debt Service to Export	2200	0.199	0.156	0.003	1.569
Reserves to Total Debt	2200	0.288	1.026	-0.002	23.847
Growth Rate (t-1)	2200	0.034	0.054	-0.502	0.352
Short-Term to Total Debt	2200	0.128	0.102	0	0.817
Parliamentary	2188	0.171	0.337	0	1
Democracy	2147	0.902	0.177	0	1
Government Concentration	1906	0.830	0.270	0	1
Electoral Competitiveness	2196	0.715	0.356	0	1
Re-elected	1705	0.760	0.427	0	1
Election (t-1)	2200	0.140	0.347	0	1

Notes: All economic variables are ratios, not in percentage figures.

Political variables are rescaled between 0 and 1.

countries are democratic, while there is not a case for the London Club lenders. This results support the "democratic advantage" discussed in section 3 – the Paris Club members are more likely to allow the democratic sovereign borrower to reschedule its debt than to those who are not, in a form of foreign assistance. Also one could argue that this type of "democratic advantages" may be applied to the private lenders in a sense that the level of democracy of the country could be a key determinant on their investment decisions, even based on profit-driven motives. However, the result suggests that the "democratic advantage" on sovereign debt restructuring is unlikely to be given by private lenders, as the restructure would directly lead to causing a loss to lenders.

The results of Column IV show that the higher the government's partisan concentration, the smaller is the probability of a debt crisis. These empirical results remain strong both in statistical and substantive term. As Alesina and Drazen (1991) implies, a fictionalized government tends to have delayed fiscal reforms, which would lead to a higher propensity of default, because such governments are likely to suffer from a war of attrition over the allocation of the cost of stabilization. As an analogy of this argument, one can consider that if the degree of the government concentration is higher, the decisions on fiscal adjustment would be reached faster due to relatively less conflicts over the allocation of the cost. In this sense, a debt crisis is likely to be avoided under the concentrated government. This result may be controversial, as some previous studies such as Saiegh (2009) suggest that the coalition government is likely to have fewer defaults to avoid conflicts over re-distributive transfer from asset holders to tax payers when defaulting. Again theoretically speaking, a single or concentrated government is more likely to have less conflict within the government because of less number of veto players. This characteristic would enable to achieve faster fiscal consolidation but also provide less incentive to avoid re-distributive transfers, which would be induced by the default. The estimation result could imply that the positive effect of promoting fiscal reforms exceeds the negative effect of political disincentive of avoiding default.

Also the effect of competitive electoral environments on the probability to default is robust as in the column V. When the competitiveness for being re-elected is getting tighter, the probability of debt reschedulings increases. This implies that if the likelihood of being in office in the next term decreases, the leader has less incentive to save. More broadly, the difficulty to be re-elected in the next term can be considered as a proxy for political instability. Then the results could support a theoretical implication that more the political instability, more the debt rescheduling would occur.

In the column VI, I report the results obtained when the *Re-Elected* variables is included in the estimation. When the leader can be re-elected following the current tenure, the probability of defaulting decreases significantly. In some cases, default decisions may lead to punishments in a form of replacing the executives. This suggests that when the leader can be re-elected, he could continue to enjoy ego rents from being office, and has a strong incentive to avoid defaults, otherwise the leader would try to get the ego rent within the current term as much as possible by increasing spending.

Column VII suggests that whether an election took place in the previous year is not likely to affect the probability of default in a given year significantly. This result is consistent with theoretical implications by Hatchondo and Martinez (2009), i.e. the effect of political turnover on the default probability may depend on the type of incumbent government. When a debtor-friendly government was in office, the political turnover would not trigger a political default. On the other hand, incumbent government was a creditor-friendly and lost the election, the probability of default should increase. In this regard, the election outcome, e.g. a shift from center-left to right-wing government, could be taken into account for the future research.

The estimated coefficients for the economic variables are statistically significant in most cases, and consistent with the aforementioned projected signs. The coefficient for the debt to GDP ratio is positive and statistically significant in most cases, suggesting that a higher level of indebtedness is associated with a higher probability of debt rescheduling. In terms of debt services to exports ratio, the probability of debt reschedulings increases as liquidity problems are more acute with a higher debt services to exports ratio. On the contrary, the coefficients of reserve ratio show a negative sign as expected. The lower the international reserves to debt ratio, the greater there might be a threat of facing a sudden liquidity crisis. Short-term debt has the expected effects. As financial conditions become worse, countries may seek the acquisition of short-term debt to cover liquidity problems. In other words, the ability of borrowing short-term loans decreases the probability of debt rescheduling. While the effect of growth rate is statistically indistinguishable from zero in some cases, the signs are mostly negative, implying that a lower growth is associated with a higher default probability through deteriorating its insolvency.

Comparing between Table 4.4 and 4.5, the London Club reschedulings seem to be less affected by these variables, as the coefficient of several economic variables and most political variables are statistically insignificant, compared with the case of the Paris Club. Especially, for the London Club reschedule, the effect of debt-to-GDP ratio and short-term debt is not statistically significant, in contrast to the Paris Club reschedule. As discussed in Section 3, this is partly because the rescheduling negotiations under the London Club tend to be precluded by the discussion in the Paris Club. Although both institutions are independent in principle, in some cases, the private creditors may follow the decisions by the public lenders, including the international financial institutions, regardless of the nature of the country.

A more substantive understanding of this relationship could be obtained by observing Table 4.3. Having a leader with possiblity to be in the office for the next term diminishes the probability of debt reschedules by 25%. When the degree of government concentration increases by 10%, the default probability would decrease by 4%.[24] Also coefficient of economic variables suggest that when debt-to-GDP ratio increases by 10%, then the default possiblity would increase by more or less 1%. On the other hand, if reserves to total debt ratio increases by 10%, then the probability of debt reschedules would decrease by 14%. To place ths percentage in context, we recall that the unconditional probability of debt reschedules for the Paris Club is 15% in the sample.

4.6 Sensitivity and Robustness Checks

4.6.1 Alternative Estimation Model

While a pooled cross-sectional time-series sample is used as a baseline estimation, this may raise concerns regarding time and country effects, i.e. a pooled probit model ignores the cross-correlation. In particular, if the observations are temporally dependent, the results of a pooled probit analysis may be misleading. I retain the basic specification, but explore sensitivity by estimating the random-effects model, which allows individual-specific effects in the equation as discussed in section 4.

Table 4.6 – 4.8 present the estimation results when a random effect panel probit model was used in the estimation. By and large, the results obtained in the random effects probit model confirm our previous findings. For instance, the probability of London Club

[24]Other political variables are ranked by a relatively subjective scale, which would not be suitable for analyzing quantatively.

Table 4.3: Baseline Model: Total Reschedules

	I	II	III	IV	V	VI	VII
Dependent variable: All debt reschedules							
Estimated model: Pooled Probit							
Real Growth (t-1)	-0.842	-0.977	-0.980	-0.867	-0.911	-1.341*	-0.837
	(1.43)	(1.58)	(1.64)	(1.31)	(1.53)	(1.77)	(1.42)
Debt to GDP	0.109***	0.108***	0.110***	0.114***	0.105***	0.145***	0.109***
	(2.89)	(2.86)	(2.89)	(2.67)	(2.78)	(2.89)	(2.89)
Short term debt to total debt	-2.637***	-2.612***	-2.708***	-2.545***	-2.672***	-3.178***	-2.639***
	(6.67)	(6.58)	(6.77)	(6.07)	(6.72)	(6.63)	(6.68)
Reserves to total debt	-1.367***	-1.350***	-1.391***	-1.488***	-1.457***	-1.398***	-1.364***
	(6.14)	(6.09)	(6.24)	(6.32)	(6.32)	(5.55)	(6.14)
Debt service to exports	0.777***	0.771***	0.746***	0.585***	0.836***	0.586**	0.778***
	(3.74)	(3.71)	(3.56)	(2.62)	(3.98)	(2.33)	(3.75)
Parliamentary		-0.137					
		(1.33)					
Democracy			0.468**				
			(2.34)				
Government Concentration				-0.383***			
				(3.01)			
Electoral Competitiveness					0.247**		
					(2.36)		
Re-elected						-0.252***	
						(2.68)	
Election (t-1)							0.021
							(0.22)
Constant	-0.568***	-0.544***	-0.956***	-0.172	-0.714***	-0.276**	-0.571***
	(6.19)	(5.85)	(4.79)	(1.15)	(6.45)	(2.00)	(6.15)
Observations	2200	2188	2147	1906	2196	1705	2200
Pseudo R^2	0.091	0.093	0.093	0.095	0.094	0.103	0.091
Log likelihood	-961.77	-955.03	-945.50	-839.51	-957.00	-727.65	-961.75

Notes: Robust z-statistics are in parentheses.

*Significant at a 10% level, **significant at a 5% level, and *** significant at a 1% level.

Table 4.4: Baseline Model: Paris Club

	I	II	III	IV	V	VI	VII
Dependent variable: Paris Club debt reschedules							
Estimated model: Pooled Probit							
Real growth (t-1)	-0.882	-1.035	-1.059*	-1.405**	-0.958	-1.205	-0.865
	(1.42)	(1.58)	(1.67)	(2.02)	(1.52)	(1.50)	(1.39)
Debt to GDP	0.136***	0.135***	0.138***	0.141***	0.133***	0.170***	0.137***
	(3.58)	(3.55)	(3.56)	(3.30)	(3.47)	(3.39)	(3.59)
Short term debt to total debt	-3.000***	-2.950***	-3.124***	-2.774***	-3.025***	-3.097***	-3.010***
	(6.95)	(6.81)	(7.13)	(6.12)	(6.97)	(6.13)	(6.96)
Reserves to total debt	-1.265***	-1.246***	-1.282***	-1.357***	-1.348***	-1.333***	-1.265***
	(5.404)	(5.34)	(5.46)	(5.48)	(5.56)	(5.03)	(5.40)
Debt service to exports	0.482**	0.476**	0.493**	0.374	0.535**	0.292	0.486**
	(2.22)	(2.19)	(2.25)	(1.61)	(2.44)	(1.10)	(2.23)
Parliamentary		-0.189*					
		(1.70)					
Democracy			0.546**				
			(2.49)				
Government Concentration				-0.355***			
				(2.65)			
Electoral Competitiveness					0.306**		
					(2.06)		
Re-elected						-0.131	
						(1.33)	
Election (t-1)							0.088
							(0.89)
Constant	-0.663***	-0.635***	-1.125***	-0.312**	-0.799***	-0.503***	-0.676***
	(6.96)	(6.58)	(5.15)	(2.01)	(6.91)	(3.48)	(7.00)
Observations	2200	2188	2147	1906	2196	1705	2200
Pseudo R^2	0.089	0.091	0.093	0.095	0.091	0.096	0.089
Log likelihood	-847.26	-840.04	-833.75	-742.11	-843.06	-645.64	-846.86

Notes: Robust z-statistics are in parentheses.

*Significant at a 10% level, **significant at a 5% level, and *** significant at a 1% level.

Table 4.5: Baseline Model: London Club

	I	II	III	IV	V	VI	VII
Dependent variable: London Club debt reschedules							
Estimated model: Pooled Probit							
Real growth (t-1)	-0.977	-1.074	-1.021	-0.585	-1.027	-1.699*	-0.986
	(1.24)	(1.30)	(1.28)	(0.66)	(1.28)	(1.66)	(1.25)
Debt to GDP	-0.057	-0.058	-0.056	-0.085	-0.064	-0.050	-0.057
	(0.98)	(0.99)	(0.96)	(1.26)	(1.10)	(0.70)	(0.98)
Short term debt to total debt	-0.807	-0.857	-0.795	-0.925	-0.873	-1.967***	-0.803
	(1.52)	(1.61)	(1.48)	(1.61)	(1.63)	(2.76)	(1.51)
Reserves to total debt	-1.463***	-1.475***	-1.504***	-1.592***	-1.619***	-1.409***	-1.461***
	(4.06)	(4.08)	(4.14)	(4.19)	(4.28)	(3.48)	(4.06)
Debt service to exports	1.210***	1.209***	1.174***	1.032***	1.264***	1.143***	1.209***
	(4.80)	(4.78)	(4.56)	(3.76)	(4.97)	(3.66)	(4.79)
Parliamentary		0.129					
		(0.99)					
Democracy			0.322				
			(1.19)				
Government Concentration				-0.241			
				(1.42)			
Electoral Competitiveness					0.261**		
					(2.03)		
Re-elected						-0.435***	
						(3.66)	
Election (t-1)							-0.042
							(0.32)
Constant	-1.392***	-1.400***	-1.664***	-1.086***	-1.549***	-0.926***	-1.387***
	(11.02)	(10.88)	(6.19)	(5.34)	(10.33)	(4.95)	(10.89)
Observations	2200	2188	2147	1906	2196	1705	2200
Pseudo R^2	0.072	0.074	0.072	0.070	0.076	0.098	0.073
Log likelihood	-475.83	-474.51	-468.09	-416.44	-473.60	-348.28	-475.78

Notes: Robust z-statistics are in parentheses.

*Significant at a 10% level, **significant at a 5% level, and *** significant at a 1% level.

reschedules are less associated with the economic and political variables than that of Paris Club reschedule. The noticeable difference from the results, however, is that in random effects model, the ratio of short term debt to total debt is associated with the probability of reschedule in all specifications, while no statistical significance of short-term debt with London Club reschedules is observed in baseline model. This proves that controlling the heterogeneity, the ability to roll over through the short-term debt to deal with liquidity problems decreases the probability of reschedule in the case of London Club.

4.6.2 Dynamic Model

Table 4.9 reports the results of dynamic random effects models with Wooldridge estimators. This allows for different processes based on the lagged value of dependent variable to examine the persistence of the debt reschedule (See details in section 4). In most of specifications, the coefficients of ρ in equation (4.6) are positive with statistical significance. This suggests that the debt reschedule in the previous year increases the probability of having a reschedule in the given year with greater state dependence. Also the results of other estimates are broadly consistent with those in baseline estimations, but there are some differences. For example, debt-to-GDP ratio is not associated with the probability of debt reschedule. Under such a 'transition' model, the debt stock has less impact on the decision on reschedule.

Table 4.10 shows the empirical illustration on different estimators for dynamic probit models of core specification. Column I gives the pooled probit estimates. Column II provides the equivalent standard random effects probit estimates, treating lagged debt reschedule as exogenous. The corresponding Wooldridge CML estimates, which allows for the endogeneity of the initial conditions, are given in column III (same as in Table 4.9). The coefficients on y_{t-1} are significantly positive in all cases, implying that debt reschedule at $t-1$ increases the probability of having a reschedule at t, although the magnitude of coefficients looks different.

Using random effects model results in a considerable reduction in the estimate of γ compared to the pooled estimates, and Wooldridge estimators have led to a further decline. As the random effects probit model and Wooldridge estimators use different normalization from the pooled probit models, to compare coefficients, rescaling them are needed by multiplying by an estimate of $\sqrt{1-\rho}$. [25] The rescaled coefficient estimates at $t-1$ are 0.170 for random effects model, and 0.150 for Wooldridge model, respectively, which means a reduction by almost half of the pooled probit estimate. These results of biased estimates are consistent with the empirical results shown in Arulampalam and Stewart (2009).

4.6.3 Democracies

As some of political variables are designed for democracies, non-democratic regimes could be excluded from our sample to see the political effects closely. I use POLITY score to exclude the non-democratic regimes.[26] A country is considered as a *democracy* if its POLITY score is between +6 to +10 in a given year.[27] Country-year observations that do not meet this condition are eliminated.

The empirical results on democratic countries are reported in Table 4.11. While broadly the pattern of the results does not change, the main difference is that the parliamentary regime variable has a statistically significant coefficient. This suggests the rejection of the

[25] ρ is the constant cross-period error correlation given by $\rho = \sigma_\alpha^2/(\sigma_\alpha^2+1)$. See Arulampalam and Stewart (2009) for details.

[26] The POLITY dataset doesn't cover Belize and Grenada, and some countries for 1975-1990 (Bosnia, Georgia, Croatia, Kyrgyzstan Republic, Moldova, Macedonia, Slovenia, and Ukraine).

[27] See Polity IV Project: http://www.systemicpeace.org/polity/polity4.htm

hypothesis of no effects on the form on government on the rescheduling propensity, as in the previous studies. Also the estimates for debt-to-GDP ratio and debt service ratio don't have statistical significance. This may suggest that democratic countries is likely to decide the default decision based on the "willingness to pay" rather than the "ability to pay". The *Democracy* and *Electoral Competitiveness* indicators lose the statistical significance, because the dataset used in the estimates only includes democratic countries.

4.6.4 Large T Samples

Due to data availability, year coverage varies across countries. This may raise the concern that the results could be affected by the fact that some countries are sampled more often than others, and that short period panels lead to a bias. To deal with this issue, I separate the sample countries into two subgroups, depending on the size of the year observations. The renewed dataset keeps those countries with 20 or more year-observations (59 countries), and those countries with less than 20 (22 countries) are eliminated.

Table 4.12 presents the results of the split sample analysis. While this reduces the sample size, irrespective of these sample size, the effect of political and economic variables remains robust and statistically significant. Reassuringly, the estimates from columns I-VI are broadly consistent with those from Table 4.3 discussed earlier. Most obvious difference is that the coefficients of growth ratio and parliamentary index have statistically significant signs in Table 4.12. This suggests the rejection of the hypothesis that the form on government has no effects on the rescheduling propensity. In this sense, parliamentary democracies are less prone to reschedule than the presidential system, as the previous studies show. Also theoretical literatures suggest that the sign of the coefficient of growth could be mixed, but this result provides empirical evidence that a lower growth is associated with a higher probability of debt crises.

4.6.5 Augmented specification

Table 4.13 presents a model in which all political variables are included to analyze competing hypotheses from the theoretical literature. The results demonstrate that by and large the effect of political and economic variables under this setting is consistent with the outcome in the previous studies. In particular, this finds that the probability of default is lower in countries under government concentration and with leaders who have a chance to continue to be in office for the next term. The idea of "democratic advantage" in international community is also supported only for the Paris Club lenders in this exercise. On the other hand, notice is that political instability in a form of electoral competitiveness has less influences on the Paris Club reschedules, when all variables are included in this analysis. Their respective effects become statistically indistinguishable from zero. This may suggest that if the effect of government concentration is significantly strong, the effect of political instability on debt reschedules could be cancelled off.

4.7 Conclusion

The result of this chapter validates the view that debt policies and institutional factors matter for debt sustainability. I finds empirical support, under some conditions, for the hypothesis that under democracy, the parliamentary system is less likely to reschedule their external debt than presidency scheme. It then finds that the probability of default is lower in countries under government concentration. This finding may be seen as being in line with a theoretical implication by Alesina and Drazen (1991) that fiscal adjustments tend to be delayed under a divided government. I also find that the rescheduling propensity of a country is increased by political instability such as electoral competitiveness. Interestingly, in contrast, the occurrence of default seems to be lower when the executive is expected to remain in office for the next turn. Finally, the result shows that the Paris Club members tend to give more support to those borrowers who are democratic than to those who are not, while this has not been observed in the London Club. This supports the idea of "democratic advantage" in international community.

Importantly, these results are robust to extensive controls and to numerous changes of specifications and estimation method. Overall conclusion is that the choice of sample does not have a major impact on the conclusions drawn.

More broadly, the findings in this chapter may pose important implications for the lending strategies. Beyond providing a contribution to the existing literatures, these finding has important implications for both academics and policy-makers who analyze the sovereign defaults. As Kraay and Nehru (2006) mention, official creditors, including the World Bank and the IMF, tend to focus exclusively on economic variables to assess a country's debt sustainability. The empirical results in this chapter imply that the evaluation of the sustainability would be incomplete without taking into consideration the politics of debt repayment.

On the other hand, the empirical results in this chapter is not complete. In part this is due to data limitations, both in cross-country political economy data and sovereign default data. This chapter is no exception, and is truly challenged by these limitations to identify the interactions. Nevertheless, whatever small contributions can be made are valuable to understanding the broader picture of sovereign default processes, especially in light of recent events in European sovereign debt markets.

Table 4.6: Random Effects Model: Total Debt Reschedules

	I	II	III	IV	V	VI	VII
Dependent variable: All Club debt reschedules							
Estimated model: Random-effects Probit							
Real growth (t-1)	-0.639	-0.785	-0.816	-0.702	-0.759	-1.122	-0.637
	(1.03)	(1.22)	(1.31)	(1.02)	(1.22)	(1.41)	(1.03)
Debt to GDP	0.102**	0.102**	0.104**	0.109**	0.093**	0.154***	0.102**
	(2.34)	(2.34)	(2.37)	(2.23)	(2.08)	(2.69)	(2.34)
Short term debt to total debt	-3.250***	-3.206***	-3.223***	-2.977***	-3.212***	-3.542***	-3.251***
	(6.93)	(6.82)	(6.91)	(6.17)	(6.89)	(6.55)	(6.93)
Reserves to total debt	-1.397***	-1.388***	-1.417***	-1.481***	-1.513***	-1.380***	-1.398***
	(5.78)	(5.75)	(5.87)	(5.82)	(5.99)	(5.20)	(5.78)
Debt service to exports	0.874***	0.872***	0.845***	0.692***	0.968***	0.632**	0.875***
	(3.67)	(3.66)	(3.54)	(2.73)	(3.98)	(2.25)	(3.67)
Parliamentary		-0.120					
		(0.91)					
Democracy			0.465**				
			(2.17)				
Government Concentration				-0.423***			
				(2.90)			
Electoral Competitiveness					0.279**		
					(2.54)		
Re-elected						-0.308***	
						(2.64)	
Election (t-1)							0.013
							(0.14)
Constant	-0.553***	-0.533***	-0.944***	-0.148	-0.745***	-0.247	-0.555***
	(5.05)	(4.80)	(4.29)	(0.87)	(5.60)	(1.54)	(5.02)
Observations	2200	2188	2147	1906	2196	1705	2200
ρ	0.088	0.086	0.078	0.080	0.091	0.074	0.088
Log likelihood	-950.34	-944.22	-936.03	-831.13	-945.01	-721.73	-950.33

Notes: Robust z-statistics are in parentheses.

*Significant at a 10% level, **significant at a 5% level, and *** significant at a 1% level.

Table 4.7: Random Effects Model: Paris Club

	I	II	III	IV	V	VI	VII
Dependent variable: Paris Club debt reschedules							
Estimated model: Random-effects Probit							
Real growth (t-1)	-0.762	-0.937	-0.990	-1.380*	-0.880	-1.141	-0.748
	(1.18)	(1.39)	(1.51)	(1.92)	(1.34)	(1.35)	(1.15)
Debt to GDP	0.143***	0.142***	0.146***	0.147***	0.136***	0.188***	0.143***
	(3.37)	(3.36)	(3.39)	(3.05)	(3.13)	(3.30)	(3.37)
Short term debt to total debt	-3.262***	-3.195***	-3.328***	-2.951***	-3.238***	-3.285***	-3.269***
	(6.73)	(6.59)	(6.88)	(5.87)	(6.66)	(5.86)	(6.74)
Reserves to total debt	-1.206***	-1.192***	-1.226***	-1.279***	-1.310***	-1.232***	-1.206***
	(4.92)	(4.89)	(5.00)	(4.92)	(5.13)	(4.49)	(4.93)
Debt service to exports	0.601**	0.596**	0.619**	0.499*	0.696***	0.371	0.606**
	(2.47)	(2.45)	(2.53)	(1.92)	(2.78)	(1.26)	(2.49)
Parliamentary		-0.176					
		(1.33)					
Democracy			0.602**				
			(2.58)				
Government Concentration				-0.406***			
				(2.69)			
Electoral Competitiveness					0.275**		
					(2.41)		
Re-elected						-0.191	
						(1.54)	
Election (t-1)							0.087
							(0.86)
Constant	-0.718***	-0.690***	-1.230***	-0.332*	-0.912***	-0.529***	-0.730***
	(6.56)	(6.23)	(5.16)	(1.92)	(6.63)	(3.20)	(6.61)
Observations	2200	2188	2147	1906	2196	1705	2200
ρ	0.064	0.063	0.061	0.055	0.065	0.072	0.064
Log likelihood	-841.36	-834.73	-829.01	-737.29	-836.22	-640.85	-840.99

Notes: Robust z-statistics are in parentheses.

*Significant at a 10% level, **significant at a 5% level, and *** significant at a 1% level.

Table 4.8: Random Effects Model: London Club

	I	II	III	IV	V	VI	VII
Dependent variable: London Club debt reschedules							
Estimated model: Random-effects Probit							
Real growth (t-1)	-0.609	-0.671	-0.528	-0.193	-0.686	-1.182	-0.621
	(0.71)	(0.75)	(0.60)	(0.20)	(0.79)	(1.08)	(0.72)
Debt to GDP	-0.072	-0.071	-0.070	-0.094	-0.082	-0.050	-0.071
	(0.99)	(0.98)	(0.97)	(1.16)	(1.13)	(0.62)	(0.98)
Short term debt to total debt	-2.132***	-2.194***	-2.051***	-1.812**	-2.051***	-2.860***	-2.132***
	(2.97)	(3.03)	(2.85)	(2.51)	(2.88)	(3.18)	(2.97)
Reserves to total debt	-1.832***	-1.847***	-1.865***	-1.823***	-1.917***	1.625***	-1.828***
	(4.08)	(4.11)	(4.12)	(4.06)	(4.20)	(3.48)	(4.07)
Debt service to exports	1.129***	1.128***	1.060***	0.980***	1.188***	1.029***	1.127***
	(3.63)	(3.62)	(3.33)	(3.00)	(3.82)	(2.85)	(3.63)
Parliamentary		0.198					
		(1.09)					
Democracy			0.021				
			(0.07)				
Government Concentration				-0.196			
				(0.97)			
Electoral Competitiveness					0.195		
					(1.25)		
Re-elected						-0.479***	
						(3.20)	
Election (t-1)							-0.062
							(0.45)
Constant	-1.290***	-1.312***	-1.298***	-1.076***	-1.416***	-0.839***	-1.283***
	(7.93)	(7.92)	(4.22)	(4.47)	(7.43)	(3.74)	(7.85)
Observations	2200	2188	2147	1906	2196	1705	2200
ρ	0.167	0.167	0.171	0.125	0.152	0.117	0.168
Log likelihood	-465.59	-464.39	-458.45	-410.17	-464.66	-344.60	-465.49

Notes: Robust z-statistics are in parentheses.

*Significant at a 10% level, **significant at a 5% level, and *** significant at a 1% level.

Table 4.9: Dynamic Random Effects Model

	I	II	III	IV	V	VI	VII
Dependent variable: Total reschedules							
Estimated model: Dynamic Random-effects Probit with Wooldridge estimators							
Reschedule (t-1)	0.157*	0.163*	0.149*	0.058	0.166**	0.013	0.157*
	(1.87)	(1.94)	(1.76)	(0.64)	(1.98)	(0.13)	(1.87)
Real Growth (t-1)	-0.362	-0.498	-0.556	-0.358	-0.578	-0.696	-0.363
	(0.57)	(0.75)	(0.86)	(0.50)	(0.90)	(0.85)	(0.57)
Debt to GDP	0.079	0.080	0.078	0.079	0.060	0.130*	0.079
	(1.53)	(1.56)	(1.51)	(1.34)	(1.13)	(1.84)	(1.53)
Short-term Debt to Total Debt	-3.687***	-3.653***	-3.637***	-3.472***	-3.498***	-4.003***	-3.686***
	(7.20)	(7.10)	(7.07)	(6.43)	(6.77)	(6.51)	(7.20)
Reserves to Total Debt	-1.422***	-1.382***	-1.426***	-1.517***	-1.485***	-1.410***	-1.419***
	(5.64)	(5.49)	(5.68)	(5.63)	(5.75)	(5.00)	(5.63)
Debt Service to Exports	0.973***	0.982***	0.981***	0.872***	1.121***	0.812***	0.974***
	(3.55)	(3.58)	(3.53)	(2.97)	(3.97)	(2.46)	(3.55)
Parliamentary		-0.032					
		(0.16)					
Democracy			0.400*				
			(1.74)				
Government Concentration				-0.472***			
				(2.78)			
Electoral Competitiveness					0.316**		
					(2.49)		
Re-elected						-0.536***	
						(2.84)	
Election (t-1)							0.002
							(0.02)
Reschedule (t=0)	0.376**	0.405**	0.349**	0.303*	0.412***	0.384**	0.375**
	(2.41)	(2.56)	(2.26)	(1.84)	(2.58)	(2.28)	(2.40)
Xi (Political)		-0.177	-0.071	0.168	-0.496**	0.397*	0.114
		(0.70)	(0.13)	(0.50)	(2.08)	(1.66)	(0.19)
Xi (Growth t-1)	-4.333*	-3.855	-3.490	-5.172*	-4.703*	-4.575	-4.200
	(1.65)	(1.46)	(1.34)	(1.82)	(1.75)	(1.48)	(1.55)
Xi (Debt)	0.015	0.010	0.018	0.022	0.015	-0.042	0.017
	(0.17)	(0.12)	(0.21)	(0.23)	(0.17)	(0.40)	(0.20)
Xi (Short term debt)	2.961***	2.995***	2.719***	2.423***	3.010***	2.180**	2.945***
	(3.68)	(3.71)	(3.31)	(2.74)	(3.63)	(2.12)	(3.64)
Xi (Reserve)	-0.224	-0.230	-0.227	-0.261	-0.216	-0.288	-0.225
	(1.56)	(1.61)	(1.59)	(1.51)	(1.52)	(1.60)	(1.57)
Xi (Debt Service)	-0.486	-0.530	-0.572	-0.600	-0.652	-0.294	-0.487
	(0.89)	(0.97)	(1.05)	(1.00)	(1.18)	(0.46)	(0.89)
Constant	-0.643***	-0.626***	-0.906**	-0.202	-0.504***	-0.342	-0.663***
	(3.57)	(3.49)	(2.02)	(0.60)	(2.15)	(1.31)	(3.18)
Observations	2200	2188	2147	1906	2196	1705	2200
ρ	0.042	0.041	0.038	0.050	0.042	0.047	0.042
Log likelihood	-936.45	-929.83	-923.85	-821.51	-930.72	-712.77	-936.43

Notes: Robust z-statistics are in parentheses.

*Significant at a 10% level, **significant at a 5% level, and *** significant at a 1% level.

Table 4.10: Dynamic Random Effects Model: Alternative Estimators

	I	II	III
	Probit	RE probit	Wooldridge
Dependent variable: Total reschedules			
Reschedule (t-1)	0.286***	0.176**	0.157*
	(3.68)	(2.09)	(1.87)
Real growth (t-1)	-0.872	-0.699	-0.362
	(1.47)	(1.13)	(0.57)
Debt to GDP	0.101***	0.099**	0.079
	(2.68)	(2.30)	(1.53)
Short term debt to total debt	-2.452***	-3.017***	-3.687***
	(6.16)	(6.37)	(7.20)
Reserves to total debt	-1.275***	-1.333***	-1.422***
	(5.73)	(5.55)	(5.64)
Debt service to exports	0.761***	0.856***	0.973***
	(3.66)	(3.64)	(3.55)
Default (t=0)			0.376**
			(2.41)
Xi (Growth t-1)			-4.333*
			(1.65)
Xi (Debt)			0.015
			(0.17)
Xi (Short term debt)			2.961***
			(3.68)
Xi (Reserve)			-0.224
			(1.56)
Xi (Debt Service)			-0.486
			(0.89)
Constant	-0.658***	-0.614***	-0.643***
	(6.91)	(5.55)	(3.57)
Observations	2200	2200	2200
ρ		0.071	0.090
Log likelihood	-955.08	-948.18	-954.90

Notes: Robust z-statistics are in parentheses.

*Significant at a 10% level, **significant at a 5% level, and *** significant at a 1% level.

Table 4.11: Robustness Check: Democracies

	I	II	III	IV	V	VI	VII
Dependent variable: All reschedules of country-year observations with a polity score between +6 and +10							
Estimated model: Pooled Probit							
Real growth (t-1)	0.997	0.929	1.070	1.135	0.968	1.853	1.002
	(0.83)	(0.77)	(0.88)	(0.93)	(0.80)	(1.40)	(0.83)
Debt to GDP	0.081	0.077	0.091	0.110*	0.079	0.128*	0.081
	(1.41)	(1.35)	(1.57)	(1.79)	(1.39)	(1.94)	(1.41)
Short term debt to total debt	-2.802***	-2.730***	-2.889***	-2.953***	-2.850***	-3.649***	-2.800***
	(4.44)	(4.31)	(4.52)	(4.60)	(4.48)	(4.99)	(4.43)
Reserves to total debt	-2.146***	-2.185***	-2.164***	-2.224***	-2.168***	-2.240***	-2.146***
	(5.27)	(5.31)	(5.30)	(5.36)	(5.30)	(5.19)	(5.27)
Debt service to exports	0.530	0.558	0.463	0.528	0.557	0.402	0.529
	(1.52)	(1.61)	(1.30)	(1.48)	(1.59)	(1.05)	(1.52)
Parliamentary		-0.282*					
		(1.72)					
Democracy			3.966				
			(0.86)				
Government Concentration				-0.353*			
				(1.82)			
Electoral Competitiveness					0.227		
					(0.65)		
Re-elected						-0.312***	
						(2.60)	
Election (t-1)							0.018
							(0.13)
Constant	-0.312*	-0.267	-4.170	-0.028	-0.522	-0.046	-0.316*
	(1.93)	(1.63)	(0.93)	(0.12)	(1.44)	(0.24)	(1.93)
Observations	842	842	842	820	842	788	842
Pseudo R^2	0.115	0.119	0.116	0.126	0.116	0.144	0.115
Log likelihood	-342.24	-340.70	-341.87	-329.04	-342.02	-309.11	-342.23

Notes: Robust z-statistics are in parentheses.

*Significant at a 10% level, **significant at a 5% level, and *** significant at a 1% level.

Table 4.12: Robustness Check: Large T Sample

	I	II	III	IV	V	VI	VII
Dependent variable: All debt reschedules of countries which have 20 and more year-observations							
Estimated model: Pooled Probit							
Real growth (t-1)	-1.195*	-1.416**	-1.307*	-1.019	-1.258*	-1.736*	-1.190*
	(1.78)	(1.98)	(1.92)	(1.39)	(1.86)	(1.94)	(1.77)
Debt to GDP	0.122***	0.118***	0.119***	0.114**	0.117***	0.148***	0.123***
	(2.91)	(2.80)	(2.82)	(2.54)	(2.76)	(2.75)	(2.91)
Short term debt to total debt	-3.048***	-3.061***	-3.125***	-2.990***	-3.079***	-4.233***	-3.050***
	(6.56)	(6.57)	(6.64)	(6.05)	(6.59)	(7.06)	(6.56)
Reserves to total debt	-1.604***	-1.621***	-1.619***	-1.769***	-1.711***	-1.800***	-1.604***
	(6.00)	(6.06)	(6.06)	(6.27)	(6.18)	(5.71)	(6.00)
Debt service to exports	0.709***	0.700***	0.677***	0.514**	0.787***	0.527*	0.710***
	(3.14)	(3.10)	(2.96)	(2.13)	(3.43)	(1.93)	(3.14)
Parliamentary		-0.234**					
		(2.02)					
Democracy			0.330				
			(1.48)				
Government Concentration				-0.387***			
				(2.80)			
Electoral Competitiveness					0.228**		
					(2.24)		
Re-elected						-0.338***	
						(3.45)	
Election (t-1)							0.018
							(0.17)
Constant	-0.463***	-0.410***	-0.723***	-0.044	-0.615***	-0.009***	-0.466***
	(4.24)	(3.68)	(3.21)	(0.26)	(4.76)	(0.06)	(4.22)
Observations	1879	1871	1826	1639	1879	1447	1879
Pseudo R^2	0.104	0.108	0.105	0.106	0.107	0.128	0.104
Log likelihood	-832.48	-826.18	-817.91	-735.99	-829.94	-617.24	-832.46

Notes: Robust z-statistics are in parentheses.

*Significant at a 10% level, **significant at a 5% level, and *** significant at a 1% level.

Table 4.13: Robustness Check: Augmented specification

	Pool Total	Pool LC	Pool PC	RE Total	RE LC	RE PC
Dependent variable: Total, London Club or Paris Club debt reschedules						
Estimated model: Pooled Probit or Random-effects Probot						
Real growth (t-1)	-1.244	-0.886	-1.573*	-1.113	-0.356	-1.640*
	(1.52)	(0.76)	(1.84)	(1.32)	(0.28)	(1.84)
Debt to GDP	0.145***	-0.079	0.169***	0.161***	-0.070	0.184***
	(2.70)	(0.97)	(3.11)	(2.69)	(0.78)	(3.05)
Short term debt to total debt	-3.302***	-3.194***	-3.159***	-3.526***	-2.698***	-3.283***
	(6.65)	(2.87)	(6.02)	(6.52)	(3.00)	(5.78)
Reserves to total debt	-1.637***	-1.793***	-1.485***	-1.596***	-1.823***	-1.409***
	(6.12)	(4.03)	(5.30)	(5.74)	(3.84)	(4.85)
Debt service to exports	0.476*	0.901***	0.368	0.510*	0.843**	0.440
	(1.79)	(2.60)	(1.33)	(1.77)	(2.21)	(1.45)
Parliamentary	-0.107	0.282*	-0.200	-0.081	0.306	-0.188
	(0.84)	(1.65)	(1.47)	(0.54)	(1.51)	(1.17)
Democracy	0.496*	-0.102	0.669**	0.523*	-0.249	0.756**
	(1.67)	(0.29)	(2.00)	(1.68)	(0.66)	(2.13)
Government Concentration	-0.434***	-0.269	-0.383**	-0.436***	-0.257	-0.386**
	(2.88)	(1.33)	(2.40)	(2.65)	(1.15)	(2.20)
Electoral Competitiveness	0.317**	0.382	0.266	0.294*	0.321	0.272
	(2.01)	(1.63)	(1.61)	(1.74)	(1.26)	(1.53)
Re-elected	-0.140	-0.489***	0.037	-0.209*	-0.547***	-0.019
	(1.37)	(3.60)	(0.33)	(1.70)	(3.43)	(0.14)
Election (t-1)	-0.112	-0.68	-0.069	-0.105	-0.056	-0.064
	(1.07)	(0.47)	(0.63)	(0.99)	(0.37)	(0.57)
Constant	-0.568	-0.791*	-1.050***	-0.553	-0.589	-1.150***
	(1.56)	(1.69)	(2.62)	(1.41)	(1.14)	(2.65)
Observations	1591	1591	1591	1591	1591	1591
Pseudo R^2	0.118	0.106	0.114			
rho				0.050	0.074	0.056
Log likelihood	-684.52	-319.11	-604.27	-681.58	-317.60	601.51

Notes: Robust z-statistics are in parentheses.

*Significant at a 10% level, **significant at a 5% level, and *** significant at a 1% level.

4.8 Appendix

4.8.1 Data of Debt Reschedule

The countries and the numbers of reschedules for *Total*, *Paris Club* (PC), and *London Club* (LC) are shown in Table 4.14 below. Note that the number of year observation for *Total* is not necessarily equivalent to the sum of PC and LC reschedules. Since this is annal data, *Total* get only one if PC and LC reschedules happened in a given year.

Table 4.14: List of Countries and Reschedules: 1975-2010

Country	Total	PC	LC	Country	Total	PC	LC
Afghanistan	2	2	0	Liberia	7	6	1
Angola	1	1	0	Sri Lanka	1	1	0
Albania	4	3	1	Morocco	7	6	3
Argentina	7	5	4	Moldova	3	1	2
Burundi	3	3	0	Madagascar	12	11	4
Benin	6	6	0	Mexico	7	3	5
Burkina Faso	5	5	0	Macedonia	3	2	1
Bulgaria	3	3	1	Mali	8	8	0
Bosnia-Herzegovina	3	2	1	Mozambique	9	8	2
Belize	1	0	1	Mauritania	9	8	1
Bolivia	8	7	2	Malawi	5	5	2
Brazil	7	4	6	Niger	11	10	3
Central African Rep.	9	9	0	Nigeria	9	5	6
Chile	7	3	5	Nicaragua	10	6	5
Cote d'Ivoire	10	9	2	Pakistan	3	3	1

Country	Total	PC	LC	Country	Total	PC	LC
Cameroon	9	7	2	Panama	4	2	3
Congo	15	9	8	Peru	8	6	3
Comoro Islands	2	2	0	Philippines	8	6	4
Costa Rica	6	5	3	Poland	12	5	7
Cuba	4	2	3	Paraguay	1	0	1
Djibouti	2	2	0	Romania	3	2	3
Dominican Republic	6	4	4	Rwanda	6	5	2
Algeria	4	2	2	Russia	3	3	0
Ecuador	11	8	6	Sudan	5	4	1
Egypt	2	2	0	Senegal	17	15	4
Ethiopia	6	5	1	Sierra Leone	11	10	1
Gabon	8	8	2	El Salvador	1	1	0
Georgia	2	2	0	Somalia	2	2	0
Ghana	4	4	0	Slovenia	1	0	1
Guinea	9	7	2	Chad	4	4	0
Gambia	5	4	1	Togo	13	12	2
Guinea-Bissau	5	5	0	Trinidad-Tobago	2	2	1
Equatorial Guinea	5	4	1	Turkey	5	3	3
Grenada	2	1	1	Tanzania	8	7	1
Guatemala	1	1	0	Uganda	10	9	1
Guyana	7	6	2	Ukraine	3	0	3
Honduras	7	6	1	Uruguay	5	0	5
Croatia	2	1	1	Venezuela	3	0	3

Country	Total	PC	LC	Country	Total	PC	LC
Haiti	3	3	0	Vietnam	2	1	1
Indonesia	5	5	0	Yemen	3	3	1
Iraq	2	1	1	Yugoslavia	5	4	4
Jamaica	10	7	7	South Africa	3	0	3
Jordan	7	6	1	DR Congo	12	12	0
Kenya	4	3	1	Zambia	10	9	1
Kyrgyzstan	2	2	0				
Cambodia	1	1	0	Total	507	396	168

4.8.2 Granger Causality Tests

In order to examine whether the Paris Club (PC) reschedules tend to precede the London Club (LC) reschedules, I use Granger-causality tests, which has been established as a widely-used analytical tool in applied economics.

According to the definition of causality by Granger (1969), a stationary time series x_t is said to 'granger cause' another stationary time series y_t if the inclusion of past values of x_t significantly reduces the predictive error variance of y_t, rather than using the history of y alone. This means that it would be more relevant to be referred to the term 'improved predictability' rather than 'causality'. Thurman and Fisher (1988), for instance, tried to ridicule the concept by applying it to the 'chicken-egg problem', showing that eggs 'cause' chicken in the Granger sense but not vice versa.

In econometric practice, Granger-causality tests are carried out by regressing y_t on its own lags and on lags of x_t. Following literatures, e.g. Konya (2006), the possibility of

Granger causality between PC and LC can be examined using the bivariate finite-order vector autoregressive (VAR) model as follows:

$$y_{it} = \alpha_{1,t} + \sum_{j=1}^{k_i} \beta_{1,i,j} y_{i,t-j} + \sum_{j=1}^{k_i} \gamma_{1,i,j} x_{i,t-j} + \epsilon_{1,i,t} \tag{4.10}$$

$$x_{it} = \alpha_{2,t} + \sum_{j=1}^{k_i} \beta_{2,i,j} y_{i,t-j} + \sum_{j=1}^{k_i} \gamma_{2,i,j} x_{i,t-j} + \epsilon_{2,i,t}, \tag{4.11}$$

where index i refers to the country $(i = 1, ..., N)$, t to the time period $(t = 1, ..., T)$, and j to the lag. $\epsilon_{1,i,t}$ and $\epsilon_{2,i,t}$ are supposed to be white-noise errors that may be correlated for a given country, but not across countries. Also it is assumed that y and x are stationary, or cointegrated.

The null hypothesis that x_t does not Granger-cause y_t or vice versa amounts to testing whether γ_1 and β_2 are zero for $t = 1, ..., T$: (i) in country i, there is one-way Granger causality from x to y if not all γ_1 in (4.11) are zero but all β_2 in (4.11) are zero, (ii) there is one-way Granger causality from y to x if all γ_1 in (4.11) are zero but not all β_2 in (4.11) are zero, (iii) there is two-way Granger causality between y and x if neither all β_2 nor γ_1 are zero, and (iv) there is no Granger causality between y and x if all β_2 and γ_1 are zero. Since for a given year the two equations have the same predetermined variables, the OLS estimators of the parameters are consistent and asymptotically efficient. The test statistic is calculated from the sum of squared residuals of the unrestricted equation. Then an F-test, which provides Wald statistics W_i, is used to examine the null hypothesis.

The first step I take is to check the integrated properties of the series for all countries. As Granger-causality tests require stationary data, all time series need to be tested for the presence of unit roots. Table 4.15 reports the Augmented Dicky Fuller (ADF) tests on the levels (no unit root) and first differences (one unit root) of the series. The null hypothesis is that the variable contains a unit root, and the alternative is that the variable is generated by a stationary process. Many country series strongly reject the null hypothesis, while some panels (32 countries) can not even if taking the first difference and second difference. There may be a case where the country has no London Club (or Paris Club) reschedule in the observed years. As a result, these counties are excluded from the panel estimation models for the Granger causality tests. Accordingly, the maximum order of integration in the VAR system is determined for each country.

Secondly, we have to specify the number of lags, k_i. Since the results from the causality test could be sensitive to the lag structure, determination of the optimal lag length is crucial. Insufficient lags yield autocorrelated errors (and incorrect test statistics), while too many lags reduce the power of the test. While there is no simple rule to decide the maximal lag, following Konya (2006), I do not allow maximal lags to vary across countries, for reducing computational burden. I then estimate the system for each possible pair respectively, by assuming from 1 to 4 lags, and choose the combinations minimizing the Akaike Bayesian Criterion. I allow the lag structure to vary across countries, but keeping it the same across equations. In Table 4.16, k_i is given as the number of the appropriate lag orders in level VAR systems for country i.

The results of Granger causality test are shown in Table 4.16. This presents that both null hypothesis of "Granger no causality from PC to LC" and "Granger no causality from LC to PC" cannot be rejected even at 10% level for 17 out of 48 countries. On the other hand, there is strong evidence that rejects the null hypothesis that PC *does not cause* LC significantly for 21 countries, while 20 countries support the LC led hypothesis. Considering strong empirical support for two-way Granger causality between PC and LC reschedules in 10 countries, overall, this study does not provide strong evidence supporting the argument that PC reschedule is an important determinant of LC reschedule in Granger sense. This study also highlights that the causality between PC and LC differ across countries. Possible reasons for the mixed results are differences in debt structure and the degree of market access among countries.

Results may be constrained by the technical limitation. Spurious causality could arise in a bivariate setting when both variables have common causes that are not included in the regression equation. In this case, even if there is no other relationship between x_t and y_t, the test will misleadingly find Granger-causality. If all common cause variables are included in the regression as control variables, however, the spurious causation between x_t and y_t would vanish. Hsiao (1982) suggests that such multivariate settings can help to alleviate the problem of spurious causality. As Kar et al. (2011) notes, testing for the cross-sectional dependence in a panel study could lead to selecting the appropriate estimator.

Table 4.15: The Results of ADF Tests

Country	Paris Club		London Club	
	Levels	First differences	Levels	First differences
Afghanistan	0.000*	-	1.000	1.000
Angola	0.000*	-	1.000	1.000
Albania	0.000*	-	0.000*	-
Argentina	0.000*	-	0.000*	-
Burundi	0.000*	-	1.000	1.000
Benin	0.000*	-	1.000	1.000
Burkina Faso	0.000*	-	1.000	1.000
Bulgaria	0.000*	-	0.000*	-

Note: The values in Table are Mackinnon (1996) one sided p-values.

*Rejects the null hypothesis of unit root at 5% at significant level.

Table 4.15: The Results of ADF Tests

Country	Paris Club		London Club	
	Levels	First differences	Levels	First differences
Bosnia-Herzegovina	0.000*	-	0.000*	-
Belize	1.000	1.000	0.000*	-
Bolivia	0.000*	-	0.000*	-
Brazil	0.000*	-	0.000*	-
Central African Rep.	0.000*	-	1.000	1.000
Chile	0.000*	-	0.000*	-
Cote d'Ivoire	0.000*	-	0.000*	-
Cameroon	0.000*	-	0.007*	-
Congo	0.000*	-	0.001	-
Comoro Islands	0.007*	-	1.000	1.000
Costa Rica	0.000*	-	0.000*	-
Cuba	0.007*	-	0.061	0.029*
Djibouti	0.000*	-	1.000	1.000
Dominican Republic	0.000*	-	0.000*	-
Algeria	0.007*	-	0.000*	-
Ecuador	0.000*	-	0.000*	-
Egypt	0.000*	-	1.000	1.000
Ethiopia	0.000*	-	0.000*	-
Gabon	0.000*	-	0.000*	-

Note: The values in Table are Mackinnon (1996) one sided p-values.

*Rejects the null hypothesis of unit root at 5% at significant level.

Table 4.15: The Results of ADF Tests

Country	Paris Club		London Club	
	Levels	First differences	Levels	First differences
Georgia	0.000*	-	1.000	1.000
Ghana	0.000*	-	1.000	1.000
Guinea	0.000*	-	0.000*	-
Gambia	0.000*	-	0.000*	-
Guinea-Bissau	0.000*	-	1.000	1.000
Equatorial Guinea	0.000*	-	0.000*	-
Grenada	0.000*	-	0.000*	-
Guatemala	0.000*	-	1.000	1.000
Guyana	0.000*	-	0.000*	-
Honduras	0.000*	-	0.000*	-
Croatia	0.000*	-	0.000*	-
Haiti	0.000*	-	1.000	1.000
Indonesia	0.000*	-	1.000	1.000
Iraq	0.000*	-	0.000*	-
Jamaica	0.000*	-	0.000*	-
Jordan	0.000*	-	0.000*	-
Kenya	0.000*	-	0.000*	-
Kyrgyzstan	0.000*	-	1.000	1.000
Cambodia	0.000*	-	1.000	1.000

Note: The values in Table are Mackinnon (1996) one sided p-values.

*Rejects the null hypothesis of unit root at 5% at significant level.

Table 4.15: The Results of ADF Tests

Country	Paris Club		London Club	
	Levels	First differences	Levels	First differences
Liberia	0.000*	-	0.000*	-
Sri Lanka	0.000*	-	1.000	1.000
Morocco	0.000*	-	0.000*	-
Moldova	0.000*	-	0.000*	-
Madagascar	0.000*	-	0.000*	-
Mexico	0.000*	-	0.000*	-
Macedonia	0.000*	-	0.000*	-
Mali	0.001	-	1.000	1.000
Mozambique	0.000*	-	0.000*	-
Mauritania	0.000*	-	0.000*	-
Malawi	0.000*	-	0.000*	-
Niger	0.000*	-	0.000*	-
Nigeria	0.000*	-	0.002*	-
Nicaragua	0.000*	-	0.000*	-
Pakistan	0.000*	-	0.000*	-
Panama	0.000*	-	0.000*	-
Peru	0.000*	-	0.000*	-
Philippines	0.000*	-	0.000*	-
Poland	0.000*	-	0.000*	-

Note: The values in Table are Mackinnon (1996) one sided p-values.

*Rejects the null hypothesis of unit root at 5% at significant level.

Table 4.15: The Results of ADF Tests

Country	Paris Club		London Club	
	Levels	First differences	Levels	First differences
Paraguay	1.000	1.000	0.000*	-
Romania	0.007*	-	0.000*	-
Rwanda	0.102	0.257	0.087	0.021*
Russia	0.000*	-	1.000	1.000
Sudan	0.004*	-	0.000*	-
Senegal	0.000*	-	0.000*	-
Sierra Leone	0.000*	-	0.000*	-
El Salvador	0.000*	-	1.000	1.000
Somalia	0.000*	-	1.000	1.000
Slovenia	1.000	1.000	0.000*	-
Chad	0.000*	-	1.000	1.000
Togo	0.000*	-	0.000*	-
Trinidad-Tobago	0.007*	-	0.000*	-
Turkey	0.061	0.029*	0.000*	-
Tanzania	0.000*	-	0.000*	-
Uganda	0.000*	-	0.000*	-
Ukraine	1.000	1.000	0.605	0.029*
Uruguay	1.000	1.000	0.000*	-
Venezuela	1.000	1.000	0.000*	-

Note: The values in Table are Mackinnon (1996) one sided p-values.

*Rejects the null hypothesis of unit root at 5% at significant level.

Table 4.15: The Results of ADF Tests

Country	Paris Club		London Club	
	Levels	First differences	Levels	First differences
Vietnam	0.000*	-	0.000*	-
Yemen	0.000*	-	0.000*	-
Yugoslavia	0.005*	-	0.005*	-
South Africa	1.000	1.000	0.000*	-
DR Congo	0.000*	-	1.000	1.000
Zambia	0.000*	-	0.000*	-

Note: The values in Table are Mackinnon (1996) one sided p-values.

*Rejects the null hypothesis of unit root at 5% at significant level.

Table 4.16: The Results of Granger Causality Tests

Country	k_i	H_0: PC does not cause LC		H_0: LC does not cause PC	
		W_i	p_i	W_i	p_i
Albania	4	3.850	0.014***	3.590	0.019***
Argentina	2	2.960	0.067*	2.000	0.152
Bolivia	3	2.920	0.052*	2.430	0.086*
Brazil	4	1.370	0.273	1.540	0.221
Chile	4	0.980	0.438	7.700	0.000***
Cote d'Ivoire	1	0.820	0.373	0.840	0.366
Cameroon	3	1.500	0.236	2.180	0.113
Congo	1	0.000	0.974	3.900	0.057*
Costa Rica	4	1.930	0.136	0.610	0.658
Dominican Republic	1	7.140	0.012**	0.350	0.560
Ecuador	1	0.160	0.695	0.010	0.914
Ethiopia	4	1.570	0.212	1.710	0.180
Gabon	1	0.430	0.516	7.120	0.012**
Guinea	1	1.200	0.281	0.990	0.326
Gambia	1	0.120	0.729	0.080	0.774
Equatorial Guinea	4	3.550	0.020**	6.470	0.001***
Guyana	3	6.990	0.001***	0.400	0.751
Honduras	1	0.200	0.661	5.750	0.022**
Jamaica	3	0.200	0.894	6.070	0.003***
Jordan	1	5.670	0.023**	5.480	0.025**

*Significant at a 10% level, **significant at a 5% level, and *** significant at a 1% level.

Table 4.16: The Results of Granger Causality Tests

Country	k_i	H_0: PC does not cause LC		H_0: LC does not cause PC	
		W_i	p_i	W_i	p_i
Kenya	4	2.810	0.047**	3.360	0.025**
Liberia	3	7.650	0.001***	3.540	0.027**
Morocco	4	3.800	0.015**	4.870	0.005***
Madagascar	4	0.330	0.853	1.810	0.158
Mexico	2	11.640	0.000***	16.040	0.000***
Macedonia	3	8.750	0.000***	8.710	0.000***
Mozambique	4	1.010	0.421	0.180	0.949
Mauritania	1	3.780	0.060*	0.240	0.626
Malawi	1	5.200	0.029**	1.090	0.304
Niger	1	13.460	0.001***	0.040	0.850
Nigeria	2	1.100	0.347	5.190	0.011**
Nicaragua	1	1.360	0.252	1.060	0.309
Pakistan	2	0.060	0.939	5.540	0.009***
Panama	1	0.060	0.809	0.100	0.755
Peru	1	0.500	0.485	0.670	0.420
Philippines	3	11.750	0.000***	0.650	0.588
Poland	1	11.470	0.002***	8.080	0.008***
Romania	3	10.850	0.000***	0.030	0.994
Sudan	3	14.850	0.000***	0.300	0.825
Senegal	4	2.110	0.109	3.230	0.029**

*Significant at a 10% level, **significant at a 5% level, and *** significant at a 1% level.

Table 4.16: The Results of Granger Causality Tests

Country	k_i	H_0: PC does not cause LC		H_0: LC does not cause PC	
		W_i	p_i	W_i	p_i
Sierra Leone	1	2.730	0.108	2.440	0.128
Togo	1	0.910	0.347	0.210	0.649
Trinidad-Tobago	1	0.030	0.869	17.500	0.000***
Tanzania	2	2.050	0.146	0.150	0.862
Uganda	1	3.190	0.083*	0.330	0.571
Yemen	4	24.200	0.000***	1.740	0.174
Yugoslavia	3	1.840	0.163	21.540	0.000***
Zambia	1	0.330	0.571	0.440	0.511

*Significant at a 10% level, **significant at a 5% level, and *** significant at a 1% level.

Bibliography

Admati, A. and Perry, M. (1987). Strategic Delay in Bargaining, *Review of Economic Studies* **54**(3): 345–364.

Aghion, P. and Bolton, P. (1990). *Public debt management: theory and history*, Cambridge University Press, chapter Government domestic debt and the risk of default: a political-economic model of the strategic role of debt, pp. 315–44.

Alesina, A. (1997). *Political cycles and the macroeconomy*, the MIT Press.

Alesina, A. and Drazen, A. (1991). Why are Stabilizations Delayed?, *American Economic Review* **81**(5): 1170–1188.

Alesina, A. and Perotti, R. (1995). The political economy of budget deficits, *IMF Staff Papers* **42**(1): 1–31.

Alesina, A. and Tabellini, G. (1990). A positive theory of fiscal deficits and government debt, *The Review of Economic Studies* **57**(3): 403–414.

Alfaro, L. and Kanczuk, F. (2005). Sovereign debt as a contingent claim: a quantitative approach, *Journal of International Economics* **65**(2): 297–314.

Amador, M. (2003). A political economy model of sovereign debt repayment, *Manuscript, Stanford University* .

Arulampalam, W. and Stewart, M. B. (2009). Simplified implementation of the heckman estimator of the dynamic probit model and a comparison with alternative estimators*, *Oxford bulletin of economics and statistics* **71**(5): 659–681.

Balkan, E. M. (1992). Political instability, country risk and probability of default, *Applied Economics* **24**(9): 999–1008.

Bardhan, P. (1993). Symposium on democracy and development, *The Journal of Economic Perspectives* **7**(3): 45–49.

Barro, R. J. (1979). On the determination of the public debt, *The Journal of Political Economy* pp. 940–971.

Beers, D. T. and Chambers, J. (2006). Default study: Sovereign defaults at 26-year low, to show little change in 2007, *Standard & Poor CreditWeek, September* **18**.

Bertschek, I. and Lechner, M. (1998). Convenient estimators for the panel probit model, *Journal of Econometrics* **87**(2): 329–371.

Bliss, C. and Nalebuff, B. (1984). Dragon-slaying and Ballroom Dancing: The Private Supply of a Public Good, *Journal of Public Economics* **25**: 1–12.

Block, S. A. and Vaaler, P. M. (2004). The price of democracy: sovereign risk ratings, bond spreads and political business cycles in developing countries, *Journal of International Money and Finance* **23**(6): 917–946.

Bordo, M. and Oosterlinck, K. (2005). Do political changes trigger debt default? and do defaults lead to political changes?, *Conference on the Political Economy of International Finance PEIF*.

Borensztein, E. and Panizza, U. (2009). The costs of sovereign default, *IMF Staff Papers* **56**(4): 683–741.

Brennan, G. and Buchanan, J. M. (1980). *The power to tax: Analytic foundations of a fiscal constitution*, Cambridge University Press.

Brewer, T. L. and Rivoli, P. (1990). Politics and perceived country creditworthiness in international banking, *Journal of Money, Credit and Banking* **22**(3): 357–369.

Brunetti, A. (1997). Political variables in cross-country growth analysis, *Journal of Economic Surveys* **11**(2): 163–190.

Buchanan, J. M. (1960). la scienza delle finanze: the italian tradition in fiscal theory, *Fiscal Theory and Political Economy* pp. 24–74.

Buchanan, J. M. and Wagner, R. E. (1977). *Democracy in Deficit: The Political Legacy of Lord Keynes*, Academic Press; New York.

Bulow, J. and Rogoff, K. (1989). Sovereign debt: Is to forgive to forget?, *The American Economic Review* pp. 43–50.

Butler, J. S. and Moffitt, R. (1982). A computationally efficient quadrature procedure for the one-factor multinomial probit model, *Econometrica: Journal of the Econometric Society* pp. 761–764.

Casella, A. and Eichengreen, B. (1996). Can Foreign Aid Accelerate Stabilisation, *Economic Journal* **106**(436): 605–619.

Chamberlain, G. (1984). *Handbook of Econometrics, Vol. II, Ch. 22*, North-Holland, Amsterdam, chapter Panel Data.

Cho, I. and Kreps, D. (1987). Signaling Games and Stable Equilibria, *Quarterly Journal of Economics* **102**(2): 179–222.

Citron, J.-T. and Nickelsburg, G. (1987). Country risk and political instability, *Journal of Development Economics* **25**(2): 385–392.

Cole, H. L., Dow, J. and English, W. B. (1995). Default, settlement, and signalling: lending resumption in a reputational model of sovereign debt, *International Economic Review* pp. 365–385.

Cole, H. L. and Kehoe, P. J. (1997). Reviving reputation models of international debt, *Federal Reserve Bank of Minneapolis Quarterly Review* **21**: 21–30.

Cramton, P. (1992). Strategic Delay in Bargaining with Two-Sided Uncertainty, *Review of Economic Studies* **59**(1): 205–225.

Cuadra, G. and Sapriza, H. (2008). Sovereign default, interest rates and political uncertainty in emerging markets, *Journal of International Economics* **76**(1): 78–88.

Curtis, K. A., Jupille, J. and Leblang, D. (2012). I save for icesave: self-interest and sovereign debt resettlement, *Unpublished manuscript, Univ. Colorado* .

Das, U., Papaioannou, M. and Trebesch, C. (2012). Sovereign debt restructurings 1950-2010: Literature survey, data, and stylized facts, *IMF working paper* .

Das, U. S., Papaioannou, M. G. and Trebesch, C. (2013). Restructuring sovereign debt: Lessons from recent history, *Financial Crises, Consequences, and Policy Responses, forthcoming* .

Dhillon, A. and Sjostrom, T. (2009). Leader reputation and default in sovereign debt, *Warwick economic Research Papers* .

Drazen, A. (2001). *Political Economy in Macroeconomics*, new ed edn, Princeton Univ Pr.

Drazen, A. and Grilli, V. (1993). The Benefit of Crises for Economic Reforms, *American Economic Review* **83**(3): 598–607.

Eaton, J. and Gersovitz, M. (1981). Debt with potential repudiation: Theoretical and empirical analysis, *The Review of Economic Studies* **48**(2): 289–309.

Foley-Fisher, N. (2012). Timing of sovereign defaults over electoral terms, *Board of Governors of the US Federal Reserve International Finance Discussion Papers* **1047**.

Granger, C. W. (1969). Investigating causal relations by econometric models and cross-spectral methods, *Econometrica* pp. 424–438.

Greene, W. H. (2003). *Econometric analysis*, Pearson Education India.

Guembel, A. and Sussman, O. (2009). Sovereign debt without default penalties, *The Review of Economic Studies* **76**(4): 1297–1320.

Hatchondo, J. C. and Martinez, L. (2009). Long-duration bonds and sovereign defaults, *Journal of International Economics* **79**(1): 117–125.

Heckman, J. (1981a). *Structural Analysis of Discrete Data with Econometric Applications*, Cambridge: MIT Press., chapter The Incidental Parameters Problem and the Problem of Initial Conditions in Estimating a Discrete Time-Discrete Data Stochastic Process, pp. 179–95.

Heckman, J. (1981b). *Studies in Labor Markets*, University of Chicago Press, chapter Heterogeneity and State Dependence, pp. 91–139.

Hsieh, C. (2000). Bargaining over reform, *European Economic Review* **44**(9): 1659–76.

Kar, M., Nazlıoğlu, Ş. and Ağır, H. (2011). Financial development and economic growth nexus in the mena countries: Bootstrap panel granger causality analysis, *Economic Modelling* **28**(1): 685–693.

Keynes, J. M. (1936). *The General Theory of Employment, Interest and Money*, London: Macmillan.

Kletzer, K. M. and Wright, B. D. (2000). Sovereign debt as intertemporal barter, *The American Economic Review* **90**(3): 621–639.

Kohlscheen, E. (2010). Sovereign risk: Constitutions rule, *Oxford Economic Papers* **62**(1): 62–85.

Konya, L. (2006). Exports and growth: Granger causality analysis on oecd countries with a panel data approach, *Economic Modelling* **23**(6): 978–992.

Kraay, A. and Nehru, V. (2006). When is external debt sustainable?, *The World Bank Economic Review* **20**(3): 341–365.

Lechner, M. and Breitung, J. (1996). *The Econometrics of Panel Data: Handbook of Theory and Applications, 2nd edition*, Kluwer, Amsterdam, chapter Some GMM Estimation Methods and Specification Tests for Nonlinear Models.

Manasse, P., Roubini, A. and Schimmelpfennig, N. (2003). Predicting sovereign debt crises, *IMF Working Papers* **221**.

Martinelli, C. and Escorza, R. (2007). When are stabilizations delayed? Alesina–Drazen revisited, *European Economic Review* **51**(5): 1223–1245.

McGillivray, F. and Smith, A. (2003). Who can be trusted? sovereign debt and the impact of leadership change, *Department of Politics New York University Working Paper* .

Moser, C. and Dreher, A. (2010). Do markets care about central bank governor changes? evidence from emerging markets, *Journal of Money, Credit and Banking* **42**(8): 1589–1612.

Neyman, J. and Scott, E. L. (1948). Consistent estimates based on partially consistent observations, *Econometrica: Journal of the Econometric Society* pp. 1–32.

Orme, C. D. (1997). The initial conditions problem and two-step estimation in discrete panel data models, *Unpublished paper, University of Manchester* .

Orme, C. D. (2001). Two-step inference in dynamic non-linear panel data models, *Unpublished paper, University of Manchester* .

Palac-McMiken, E. D. (1995). *Rescheduling, creditworthiness and market prices*, Avebury.

Panizza, U., Sturzenegger, F. and Zettelmeyer, J. (2009). The economics and law of sovereign debt and default, *Journal of Economic Literature* pp. 651–698.

Persson, T. and Tabellini, G. (2000). *Political economics*, MIT Press Cambridge, Mass.

Pukthuanthong-Le, K., Elayan, F. A. and Rose, L. C. (2007). Equity and debt market responses to sovereign credit ratings announcement, *Global finance journal* **18**(1): 47–83.

Rabe-Hesketh, S. and Skrondal, A. (2013). Avoiding biased versions of wooldridges simple solution to the initial conditions problem, *Economics Letters* .

Reinhart, C. M. and Rogoff, K. S. (2011). A decade of debt, **16827**.

Riley, J. G. (1980). Strong evolutionary equilibrium and the war of attrition, *Journal of Theoretical Biology* **82**(3): 383–400.

Roubini, N. and Manasse, P. (2005). 'rules of thumb' for sovereign debt crises, *IMF Working Papers* .

Rubinstein, A. (1982). Perfect Equilibrium in a Bargaining Model, *Econometrica* **50**(1): 97–109.

Sah, R. K. (1991). Fallibility in human organizations and political systems, *The Journal of Economic Perspectives* **5**(2): 67–88.

Saiegh, S. M. (2005). Do countries have a democratic advantage? political institutions, multilateral agencies, and sovereign borrowing, *Comparative Political Studies* **38**(4): 366–387.

Saiegh, S. M. (2009). Coalition governments and sovereign debt crises, *Economics & Politics* **21**(2): 232–254.

Schultz, K. A. and Weingast, B. R. (2003). The democratic advantage: institutional foundations of financial power in international competition, *International Organization* pp. 3–42.

Shapiro, C. and Stiglitz, J. E. (1984). Equilibrium unemployment as a worker discipline device, *The American Economic Review* **74**(3): 433–444.

Sibert, A. and Perraudin, W. (2000). Timing of Multilateral Lending, *Economic Journal* **110**: 192–211.

Spolaore, E. (2004). Adjustments in Different Government Systems, *Economics and Politics* **16**(2): 117–146.

Sturzenegger, F. and Zettelmeyer, J. (2006). *Debt defaults and lessons from a decade of crises*, The MIT press.

Tomz, M. (2007). *Reputation and international cooperation: Sovereign debt across three centuries*, Princeton University Press.

Tomz, M. and Wright, M. L. (2007). Do countries default in bad times?, *Journal of the European Economic Association* **5**(2-3): 352–360.

Tornell, A. (1998). Reform from Within, *NBER Working Paper* **6497**.

Trebesch, C. (2008). Delays in sovereign debt restructurings. should we really blame the creditors?

Trebesch, C. (2011). Sovereign debt restructurings 1950-2010: A new database, *Unpublished Paper, University of Munich* .

Van Rijckeghem, C. and Weder, B. (2009). Political institutions and debt crises, *Public Choice* **138**(3-4): 387–408.

Velasco, A. (2000). Debts and deficits with fragmented fiscal policymaking, *Journal of Public Economics* **76**(1): 105–125.

Wooldridge, J. M. (2005). Simple solutions to the initial conditions problem in dynamic, nonlinear panel data models with unobserved heterogeneity, *Journal of applied econometrics* **20**(1): 39–54.