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Sovereign Debt and Economic Policies in Global Markets: A Political Economy Approach

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Chapter 1

Introduction

Political economy was certainly one of the most active fields in economics in the last 30 years. Fiscal Policies, monetary policies and regulatory policies seemed to be very different in the reality from what the well founded theories of public finance suggested. Was this due to a lack of interest of policymakers and their consultants or were there systematic reasons why economic policy fell short of following the guidelines of economic theory? Political economy opted for the second type of answers and was indeed successful in delivering them. Assuming individual utility maximization of politicians led us to a lot of new insights. Theoretical models showed not only that rational individual welfare maximizing politicians will induce allocations that look different from the first best solutions of economic theory, but also identified the underlying reasons. A lot of the inefficiencies could be traced back to various forms of imperfections in the political process and a lot of the traditional insights on the optimal division of labor between public and private sectors were challenged. In short, political economy formalized the political constraints of real world economic policy and showed what allocations one can expect from economic policy in the reality.

From its very beginnings, the formal and informal literature of political economy was concerned with questions that arise in open economies like the high level of observed custom taxes or excessive (foreign) borrowing. Still, most models of political economy deal with closed economy models. Beyond any doubt, these models provided us with a lot of understanding about the political frictions economic policy has to face. However, it is also true that many economic policies can only be fully understood in an international context. Not only are some policy issues by their mere existence international phenomena - like sovereign debt - but also get a lot of economic policy interventions a more and more international dimension that increases with countries

integration into international financial, goods and factor markets. Certainly, tax or regulatory policies can be understood in closed economy models, but at the same time it is true that the degree of openness of an economy matters for the normative design or positive results of such policies.

Political economy in open economies is distinct from political economy in closed economies for a variety of reasons. First and foremost, goods, capital and other factors of production have the possibility to cross borders. This has to be taken into account by rational politicians as the mobility of factors and goods reduces the set of allocations that are feasible to him. Secondly, politicians do not necessarily take into account the effect of their policies on the citizens of other countries, although they might have an impact on the allocation there. The literature on international economics has been very well aware of this inter country external effect. We will present two models in this dissertation where we can show that domestic political frictions can attenuate this inter country external effect. Finally, foreigners in turn will have an impact on the domestic allocation as well. We show in one model that this gives rises a further dimension to the credibility and commitment problems of the chosen policy. In this context, we make the point that the engagement in domestic political competition might serve as a commitment device towards foreigners.

Therefore, in part I of this dissertation we want to present two models of non-welfare maximizing politicians that are explicitly set in open economies. In part II, we certainly stay in the field of political economy, but deal with redistributive conflicts on a more abstract level.

In CHAPTER 2, we give a selective review on the literature on international policy interdependence. Most literature reviews on policy interdependence tend to focus on one special policy area like monetary policy, tax policy or trade policy. We want to look at the interdependence from a political economy point of view, that is we want to stress the impact of non-cooperative policy making, reelection seeking politicians, partisan politics and policy credibility. Indeed, we can show that these issue are present in all the different strands of literature. Therefore it is worth looking at them simultaneously in a separate chapter.

CHAPTER 3 presents a model of sovereign debt. Sovereign Debt is per definitionem a topic of international economics as it describes government debt that is held by foreigners. As sovereign governments cannot be forced to repay their debts in any way comparable to private borrowers, economists asked which mechanisms can sustain repayment in equilibrium. Whereas the existing literature is only able to show that

sovereign debt is sustainable, if foreigners can credibly threat to exclude a defaulting economy from future borrowing or enforce trade sanctions, we show that there is another mechanism that can sustain sovereign debt in equilibrium, it is simply the interest of domestic bondholders to get repaid. Further, the existing literature frequently points out that the ultimate decision of a sovereign whether to repay or not is a political one. Nevertheless, there are only a few contributions so far that try to model this political decision explicitly. We take a new approach to the subject in a model in which the sovereign government is engaged in domestic political competition and derive its decision endogenously from its desire to get reelected. Furthermore, we allow for debt to be held by domestic and foreign residents simultaneously. Finally, we derive a Bayesian Nash equilibrium that can explain repayment and non-repayment as equilibrium phenomena depending on the realization of exogenous parameters. While this in itself is certainly a new feature, we can also show that it matters crucially to focus on a re-election seeking politician as he is a be to solve the time inconsistency problem of sovereign debt under appropriate conditions. Whereas a social planner of the domestic economy will never repay, given that no selective default and no punishment against him are possible, a reelection seeking politician will repay under appropriate circumstances. Put differently, we can show that the switch from a welfare maximizing politician to a re-election seeking politician implies not only a marginal change in the resulting allocation, but we might arrive in a completely different allocation. The engagement in domestic political competition serves as a commitment device towards foreigners, although foreigners obviously have no possibility to influence the domestic political process. In particular, we can show that sovereign debt is feasible in equilibrium, even if foreigners have no possibilities to punish a defaulting government as they can implicitly delegate this punishment mechanism to domestic voters. The model therefore identifies a new mechanism that can sustain sovereign debt in equilibrium: it is simply domestic creditor's interest to get repaid.

CHAPTER 4 deals with intellectual property rights - a topic that has received a heightened attention in recent years in political debates as well as in the academic literature on international trade. It is reasonably well understood how patent lengths influence economic activity in a closed economy. There are however no papers that take explicitly a political economy approach to an open economy. This is surprising as the protection of intellectual property rights turned out to be one of the most controversial subjects in the world trading system. On the one hand northern countries claim that there is insufficient protection of intellectual property rights in developing countries, developing countries point out to the high social and monetary cost of enforcing higher

intellectual property rights standards in their economies. Therefore, we develop a simple model with two countries (that can be taken as North and South) and allow for politicians that can be biased in favor of consumers or producers. In the context of this model, we explore under which conditions there is insufficient protection of intellectual property rights in a global economy and how the characteristics of politicians or the sizes of the countries will affect it. We can identify two frictions in policymaking: on the one hand politicians do not take into account the effect of their policies on the welfare of foreigners (inter country effect), on the other hand they can be biased towards certain domestic groups (political friction). We derive the welfare maximizing allocation in a closed and in an open economy and compare it to the Nash equilibrium that will result from the interaction of politicians. While it is a robust finding for the closed economy that a biased politician cannot do better than a welfare maximizing politician by the mere definition of the terms, we show that he can indeed increase global welfare, but does so at the expense of domestic consumers. Although the literature on international trade has been recognizing the impact of this inter country friction for a long time, we can show that the interaction of both frictions gives rise to an interesting result: they tend to offset each other. In contrast to the previous chapter, where we analyzed the incentives of a reelection seeking politician, in this chapter we look at a politician that is biased towards a lobbying group. Further, we can substantiate the claim, that non-cooperative policy making in intellectual property rights protection will always lead to an insufficient protection of intellectual property rights.

In CHAPTER 5 we turn our attention to questions of economic governance. One of the oldest concepts in the field of political economy is rent seeking. Wherever there is a return above the market return to be gained, one should expect rational economic agents to spend resources in order to obtain this rent. We briefly discuss the concept of rent seeking and compare it to other models of special interest group politics. After having discussed some effects of strategic delegation (which is based on joint work with Florian Englmaier), we turn to the costs of rent seeking. This discussion leads us straightforward to the last model.

Consequently, in the last CHAPTER 6 we take a new perspective on rent seeking contests. Whereas it is a general and quite robust result in the literature on rent seeking contests that the contest will be more wasteful, the more players are involved, we show that this result is only true as long as one views the contest in isolation. As soon as one looks at the contest as a subgame of a larger game in which contestants have the possibility to control the creation of the rent, this result is overturned: more anticipated competition leads to less rent seeking activities in the subgame perfect equilibrium.

The model provides a simple specification of a political process where voters elect a politician, a politician can set the size of a rent and voters finally decide whether to engage in rent seeking activities. We abstract from all institutional details of the political details and ask what characteristics of a population will make the emergence of rent seeking activities likely in an economy. We show that electoral accountability provides indeed incentives to reduce the amount of rent seeking activities undertaken in an economy. Finally, we overturn the common sense argument that more fragmented societies will experience less clean governance structures, and show that a high degree of fragmentation or asymmetry can indeed reduce the amount of rent seeking activities we observe in an economy.

Part I

Political Economy in Open Economies

Chapter 2

National Policies in International Markets

2.1 Policy Interdependence

There has been probably no other economic development in the last decades that attracted as much attention as the so called globalization. Although different authors refer to different phenomena and concepts when they use this term, there can be little doubt that markets currently enjoy an historically unprecedented level of openness.[1] Beyond any doubt, financial and good markets are more open today than they used to be ever before. The ratio of foreign trade to GDP has been rising continuously for almost all nations in the last decades. Financial cross-border transactions have been growing even faster. No market, however, operates without a political framework and political interventions. Still, political interventions are undertaken by national governments most of the time. So, despite all the integration, the rules under which markets operate nationally and internationally are still decided upon by national governments. Certainly, international and intergovernmental organizations grew in scope and importance as well in the last decades. But still, sovereign states decide about national economic policies or decide whether to accept internationally agreed upon norms. Some of the most important policy areas like fiscal policy are almost exclusively undertaken by national policymakers. Certainly, a lot of countries try to set norms that are bilaterally valid, in some areas sovereign countries even try to set norms that have a global impact like the world trading system, the world intellectual property rights organization and many more. But still, in order for them to become valid, they have

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[1] For a historical analysis and critical discussion of this issue see Baldwin and Martin (1999).

to get accepted and ratified by national governments or parliaments.

What does this imply for economic policymaking? First of all, it means that economic policy has to deal with markets that are open in many ways. A change on a domestic market can lead to a different allocation on a foreign market, that will influence again the domestic allocation. The normative design and positive outcome of economic policies look quite different in open and in closed economies.[2] Second, if we try to model the outcome of the domestic policy game, we have to take into account that there are more actors than national governments and national economic agents. There are circumstances - as those described in Chapter 3 - where national policymakers have to take into account the reactions of foreign investors or consumers as well. Thirdly, several governments might have to make similar decisions at the same time. If each government knows that its own optimal decision has an impact on the optimal decision of the other governments and vice versa, then we can describe this situation of mutual interdependence as a game. Indeed, Chapter 4 will present a model with this structure. Finally, not only domestic but also international institutions can have an impact on the allocation.

Since the first two models in this dissertation deal with political decisions in open economies, we want to give a brief overview on the political economy literature on economic policies in open economies. This literature is large as it covers an array of topics such different as monetary policy, fiscal policy, trade policy and regulatory policy. We do not want to go into the details of each policy literature, but rather focus on some recurrent topics in this literature, such as: When is international cooperation welfare improving? Can the engagement in political competition make policies more credible? Will voters always benefit from the cooperation of politicians or can this cooperation be to their disadvantage? How can international organizations help to enforce cooperative outcomes?

The rest of this introductory chapter is structured as follows. In section 2.2 we look upon countries the are interdependent by some market mechanisms while policies are still chosen nationally. We ask under which circumstances cooperation of welfare maximizing politicians is welfare improving and briefly discuss the limitations of this approach

Then, we look at issues of time consistency and credibility in open economies in 2.3.

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[2]Gordon and Hines (2002) for example observe: "The nature of optimal tax policy depends critically on whether the economy is open or closed: The importance of this distinction is evident immediately from the difference that economic openness makes for tax incidence."

We show how the engagement in international competition can serve as a commitment device as it can give additional credibility to chosen policies.

In section 2.4 we discuss some models of partisan policymakers and show that in the presence of partisan policymakers coordination can not only be unfruitful, but also counterproductive. If politicians have different objectives than their voters, international cooperation can be a means of collusion by present governments against future governments or present voters. It will turn out that international competition might put an additional incentive constraint on the politicians and these additional constraints can increase welfare.

Finally, in 2.5 and 2.6 we recognize that international policy cooperation takes place in an institutional setting. We discuss how domestic and international institutions can influence the strategic situation and the resulting allocation.

2.2   International Cooperation and Welfare Maximizing Politicians

Hamada (1976) was the first one to explore spillovers in monetary policy and monetary authorities that are aware of this spillover effect. That is, he looked at international monetary policy as a strategic situation. Although he did not take into account rational expectations and the involved issues of time consistency of the optimal monetary policy, he applied the tools of modern game theory in his study. Hamada looked at two countries that are hit by a supply shock simultaneously. The optimal response of each monetary authority to a negative supply shock is to increase the money supply, which stabilizes output, but increases inflation. This inflation in turn leads to a real appreciation of the exchange rate because of the higher domestic price level, which will have a negative effect on exports and therefore on the domestic output level. This implies that the optimal response of the monetary authority in the open economy is to accommodate the supply side shock less than in a closed economy.

Hamada then asks whether one can improve on this uncoordinated Nash equilibrium and he can show indeed that there is a whole set of domestic and foreign money supplies that lead for both countries to a higher welfare. A subset of this set fulfills the efficiency condition and can be interpreted as a contract curve. Although, one cannot determine without further assumptions, which point will be chosen, coopera-

tion can unambiguously lead to a Pareto-improvement. The economic reason for this improvement lies in the fact that both countries are assured that the other country expands money supply further than in the non-cooperative regime, which will offset the negative impact of the exchange rate on output.

Although the application of simple game theory predicts that one can gain in terms of welfare by moving from the noncooperative to the cooperative equilibrium, a vivid discussion followed Hamada's seminal contribution. Generically, the cooperative equilibrium has the property to be instable as each country has unilaterally an incentive to defect. If this strategic situation occurs frequently, one might interpret it as a repeated game. In this case reputational considerations or trigger strategies can sustain the cooperative outcome.[3] As a country is sovereign, there are no means to punish the defection readily. However, it might be that countries can commit themselves to a certain degree by joining international organizations.[4] This in turn can explain why international policy cooperation is not done on a bilateral or multilateral basis in most cases, but rather delegated to international institutions.[5]

A rich empirical literature has tried to quantify the gains of international cooperation, if all relevant actors agree on the true model of the world. The pioneering work by Sachs and Oudiz (1988) showed indeed that there are significantly positive gains from international cooperation, but that they are likely to be relatively small. However, one cannot be assured that policymakers know the correct model on the world and are able to agree on it. Frankel and Rockett (1988) explore this issue in a two country setting (EU and US). They restrict the uncertainty to one model parameter and show that, even if politicians agree on a cooperative policymaking and truly believe that this will lead to welfare gains for their country, this is only true in roughly half of all cases. In the other half of all possible cases this cooperation will lead to a welfare loss. Of course, if politicians do not even maximize welfare or face credibility problems, this can aggravate the problem further. We will discuss these issues in the following paragraphs. Still, taking policymakers as national welfare maximizers can provide insights, but one must take into account the methodological limitations of this approach or as Frey (1996) summarizes these criticisms:"[...] most studies [...] assume nations to be the relevant actors. Such a view is useful for some types of analyses, but it is inconsistent with the basic tenet of economics. Only individuals act in accordance

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[3]For a detailled discussion, see Canzoneri and Henderson(1992) pp. 81-134

[4]See Staiger (1995) for a detailed examination of this argument.

[5]This idea was originally developped by Buchanan and Faith(1987). Chari and Kehoe(provide a more formal discussion on what can be achieved by international coopertaion, depending on whether side payments are possible or not.

with their preferences and constraints. Nations do not have preferences nor do they respond to incentives in a way comparable to individuals."

2.3 Time Consistency and Credibility: International Competition as a Commitment Device

That welfare maximizing politicians can do better by cooperating should not come as a surprise in static games. But what happens, if politicians are not the only actors? What if they interact with a private sector that consists of rational economic agents as well? As Lucas (1976) famously demonstrated, if one takes the rationality paradigm seriously, one cannot model voters as passive agents with adaptive expectations, but must take into account that they form expectations rationally and in particular that they condition their expectations on politicians' behavior. This perspective leads to a new interpretation of economic policy as optimal economic policy has to satisfy an additional condition in order to be viable, it has to be time consistent. Most dynamic economic policies involve issues of time consistency. Once a private sector has formed expectations about the future inflation rate, monetary authorities have an incentive to create surprise inflation in order to boost output.[6] Another famous example from fiscal policy is capital taxation. Ex-ante politicians have incentives to promise low tax rates in order to stimulate investment. Once the capital is installed it has an elasticity of zero and should be taxed highly according to the principles of optimal taxation.

We want to discuss briefly the structure of the time consistency problem in open economies. We do so in a famous example of capital tax competition and policy credibility. If capital is mobile between sovereign states and each country tries to maximize its fiscal revenue, the Nash equilibrium in taxes between this governments implies an undertaxation of capital. The reason for this result is that each country has an incentive to cut its own tax rate and thereby to attract foreign capital. Depending on the costs of capital mobility, the Nash equilibrium can go as far as zero tax on the mobile factor.

On the other hand, there is a time inconsistency problem in capital taxation. Ex-ante politician's have an incentive to promise low taxes in order to induce consumers to

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[6] This idea was brought up by Kydland and Prsecott (1977) and furthr explored by Barro and Gordon (1983).

save or to attract foreign capital. Once the capital is in place, even a welfare maximizing government tends to overtax capital. The reason can be understood with the help of the Ramsey rule on optimal taxation. Installed capital has a low elasticity, therefore it should be taxed heavily. Rational consumers anticipate that the government has an incentive to overtax installed capital and will therefore accumulate less capital, this leads to an equilibrium where social welfare will be less than in an equilibrium in which the government has the possibility to commit itself to future tax rates.[7]

Will the credibility problem be worsened or attenuated in an open economy? Kehoe (1989) shows that openness of the capital market can improve welfare, if there is a credibility problem of the policymaker. The reason is that the engagement in an international competition for mobile capital can serve as a commitment device in itself not to overtax capital. This result stands in stark contrast to models of tax competition, which show that competition for mobile factors might be worse than a situation in which one could suppress this competition. In particular, Kehoe looks at a two country model with three periods. First, consumers have to decide on how much capital to accumulate, then governments announce their tax rates, finally consumers decide on where to invest. If capital is immobile, one arrives at the classical overtaxation result: once the capital is in place, there is an incentive to overtax it. This is rationally anticipated by consumers in the first period and leads to a distorted decision of consumers in that period. It is important to keep in mind that it is indeed rational forward looking behavior of consumers that leads to this distortion because they understand the incentives of governments to overtax capital.

If capital is mobile between economies, this forces governments in competition to attract capital by setting a low tax rate. This competition prevents governments from overtaxation. If one wants to make exact welfare comparisons, one has to specify the mobility costs, but Kehoe is able to show that there are reasonable cost functions for which the competition equilibrium results in a higher welfare. The important point is that there are two forces that pull taxes away from there optimal level. On the one hand, there is the effect of international competition which pulls down tax rates from their optimal level; on the other hand there is politician's credibility problem that tends to push taxes up relative to the optimal level. As these forces go into opposite directions, both frictions may offset each other - an idea that will play an important role in the models of the following two chapters.

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[7]There is an equally impressive literature on how this time inconsistency problem can be solved. Person and Tabellini (1994), for example, suggest strategic delegation to a wealthy politician.

Finally, one can ask what this implies for international cooperation. One sees that it is not sure whether international cooperation is desirable in this setting. If politicians can coordinate on the tax rates, they effectively can suppress the competition in the tax rates between them. This will eliminate the force that was working against the upward distortion of the taxes that is caused by the credibility problem. While models that look at policy cooperation in a purely static setting predict that cooperation can only be welfare improving (as one can always coordinate on the non-cooperative Nash equilibrium), this must no longer be true if we recognize that governments are not the only relevant actors, but economic decisions are also undertaken by consumers and in the interaction with them. Put differently, cooperation among governments implies that only a subcoalition of all actors forms a joint coalition. We know from coalition theory, that a subcoalition that tries to improve its welfare might well end up in a situation where it reduced welfare

2.4 Biased Politicians: Cooperation as a Means of Collusion

So far, we were considering politicians that tried to maximize social welfare of their own economy, but did not take into account the effects their policy choices have on foreigners. This gave rise to an inter-country friction. Political economy is also concerned with the positive outcomes of economic policy, if a politicians are not interested in maximizing social welfare, but have their own agenda, which can include reelection, rent appropriation in office or catering to special interest groups. If we look at politicians that maximize something different than social welfare, we add a political friction as well. A priori, we have no idea whether these frictions will amplify, attenuate or even eliminate each other. In the following chapters, we will present two models that show how the political and the inter-country friction can indeed attenuate each other. Still, in this paragraph, we want to have a look on the literature on international policymaking with non-welfare maximizing politicians.

Vaubel (1985) was the first one to make the point that policy cooperation might be undesirable if politicians have different objectives than their voters. Without making reference to a special model, he states that policy cooperation can be used as a means to collude against voters. In this case, international competition might be desirable as it can make partisan politics more expensive. Reconsider the example of monetary

authorities that have an incentive to create surprise inflation. If politicians are in an open economy, this will not only boost output, but also increase the price level which in turn will lead to an appreciation of the currency and finally reduce exports and thereby output. It is exactly this negative effect in the open economy that will make it more costly for monetary authorities to increase output by surprise inflation. If one allows politicians to cooperate, they can suppress this negative effect. If both monetary authorities expand money supply at the same time, they eliminate this negative effect of the exchange rate and create an even higher inflation. [8]

Cooperation might not only serve as a means to collude against voters, it can also be used as a means to collude against future governments. Alesina and Tabellini (1990) put forward the idea that political instability can lead to an overaccumulation of public debt. If the current government is unsure about whether it will get reelected, it has an incentive to overaccumulate debt. As it knows that the future government with different preferences on public spending, will spend the fiscal revenues on different types of public goods, the present government has an incentive to transfer future tax revenues into the present by the accumulation debt. This happens because the present government can set the use of the present public spending. Tabellini (1990) considers this idea in an open economy and comes up with a similar conclusion upon the desirability of policy cooperation: the noncooperative equilibrium might well imply a higher welfare than the cooperative one. As the expansion of public spending leads to an appreciation of the exchange rate and thereby to a decrease in exports, this will have a negative second order effect on output. If politician's can cooperate, they can accumulate debt and expand output at the same time. Therefore, they can eliminate this negative second order effect of the exchange rate appreciation.

Note the similarities between both arguments. Although politicians do not care about the exchange rate in itself, it will be influenced by their policy. The exchange rate again has an effect on the output variable, politicians originally tried to target. As both politician's had similar objectives, but objectives that were different from their voters' objectives, cooperation was used as a means to collude against them.

A necessary condition for the undesirability of international cooperation is that politicians have objectives that are sufficiently different from welfare maximization. Although Tabellini provides microfoundations for the politician's behavior, there remains some arbitrariness in the specification of the politician's objective functions. The

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[8]Lohmann(1994) makes a related argument for political business cycles.

objective functions are important as they are decisive on whether cooperation is desirable or undesirable. To make this argument in terms of the above mentioned model let us consider a politician that has preferences over public spending and domestic output. One can show in the framework of Tabellini's model that the negative effect of cooperation depends crucially on the weight politicians put on output and public spending. In particular, the negative effect of international cooperation decreases in the weight the politician puts on output (as opposed to the composition of public spending) and finally disappears if the politician only cares about output.

2.5 Enforcement and Institutions: The Role of International Organizations

Although we discussed in the previous sections that there might be circumstances under which international cooperation of economic policies can be desirable, we only mentioned the related issues of enforcement in passing. In most cooperative solutions players have an incentive to deviate from the cooperative outcome unilaterally. In other words, the cooperative outcome tends to be inherently unstable. Furthermore, we can observe that most policy coordination is not undertaken by bilateral or multilateral agreements, but rather takes place under the auspices of international organizations. Does the presence of international organizations alter the strategic situation between countries fundamentally? Can international organizations help to coordinate on cooperative outcomes that would not have been possible otherwise? The impact of international organizations seems to be considerable.

Indeed, there is a large literature that tries to identify how the voting mechanisms and financing structures of international organizations shape their policymaking. Frey (1996) for example observes that many international organizations like the United Nations have some few main contributors to their budget, but an equal voting when it comes to policy issues. Naturally, this gives small contributors to the budget a high incentive to vote for an increase in expenditures as they pay only a small fraction of the expenditure raise. We want to structure our brief discussion around two questions: Can international organizations help the to coordinate the economic policies of countries towards a favorable outcome and under which conditions are they able to do so? Does the presence of international organizations alter the structure of policymaking in member countries?

Staiger (1995) discusses the issue in the context of the World Trade Organization. In particular, he asks why there is a World Trade Organization at all and if it has any power in a world of sovereign sates. He is able to show that there is indeed a difference between multilateral trade negotiations and an institutionalized procedure as the World Trade Organization. Staiger looks at a world of imperfect information where it is costly to verify, if a state broke a previously negotiated agreement. In this case, there is a free rider problem as each individual country has an incentive not to carry out the investigations to check if this has happened. Further an individual country might come under pressure, if it acts against another, in particular, if a small country acts against a bigger one. Delegating this monitoring to a central authority can overcome this free rider problem under a proper institutional design.[9]

Certainly, this raises the question whether the presence and power of international organizations violates the national sovereignty. Certainly, if states sign a treaty that obliges them to follow certain rules, this limits the scope of national economic policy. Bagwell and Staiger (2004) show under which conditions there is a trade-off between national sovereignty and international efficiency. In an abstract setting, they are able to show that a careful institutional design can eliminate this tension in the area of trade policy, because of the overall win-win nature of trade liberalizations. Although Stagier does not make an explicit reference to other policy areas, one can see that in the case of monetary policy there is indeed a trade-off between national sovereignty and international efficiency. This discussion conjured up a rich literature on the European monetary integration. [10]Although most authors do not explicitly speak of a trade- off between economic efficiency and national sovereignty, they point out to political factors that shape the institutional development. [11]

So, if there is a literature that models how international institutions and agreements are shaped by national political objectives or constraints, one can indeed turn around and ask whether there is also a causality the other way, namely, if international institutions alter national policies as well. There is a rich, but rather descriptive literature

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[9]From a contract theoretical perspective, it is not clear at all that the central authority will have incentives to monitor compliance and enforce punishments, even if it has a comparative advantage to do so.

[10]There is in particular a rich literature that looks at the political determinants of the European monetary integration. Seminal contributions include Alesina and Grilli (1992) and Eichengreen and Frieden (1994).

[11]It might be a valid assumption in a purely macroeconomic analysis to identify political factors as an exogenous constraint or policy goal. If we take on a true political economy approach however, these "political factors" should no longer be taken as exogenous constraints or objectives.

in political science that explores these questions.[12] The political economy literature on that issue is rather descriptive. Dreher (2003, 2004) shows that International Monetary Fund lending influences fiscal and monetary policy of recipient countries, in another contribution he asks whether International Monetary Fund involvement in a country changes its political structure significantly (as measured by an index of economic freedom). Svensson (1999) and Drazen (1999) show in theoretical contributions that donations by international organizations or foreign donors can induce rent seeking behavior in recipient countries and decrease welfare. Casella and Eichengreen (1996) identify conditions under which foreign aid can delay necessary policy reforms even further. They apply a war of attrition model to support their claim.

To sum it up, there is not only evidence on policy interdependence between countries, there are also interdependencies between countries and international organizations. We briefly sketched that not only political structures and forces of the member countries can shape the policies of these international organizations, but also that the policy of the international organizations can have a substantial impact on the political and economic situation of the member countries.

2.6   Domestic Institutions and International Policy

Policymaking certainly takes place in an institutional environment and we there is considerable evidence that this institutional environment shapes the policy outcome. Recent contributions for example showed that presidential regimes tend to provide less public infrastructure than parliamentary systems.[13] If institutions already shape national policy, they should shape the structure of international policymaking as well.

Putnam (1988) presents a formal model of international negotiations. He identifies the basic institutional structure of international negotiations as a two stage game. In a first step appointees (which can be diplomats or politicians) have to reach an agreement. This agreement has to get ratified by a national political institution, for example a parliament. Considering the strategic situation, it is important to realize that the national institutions at the second stage can only agree or disagree with the result of the previous negotiations. Being aware of that, the negotiators on the first stage will only negotiate agreements where they can be sure to get ratified in the second

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[12]For a recent survey see Little (2001).
[13]See Person and Tabellini (1999).

stage. This defines a set with all Pareto-improvements to the status quo, which Putnam calls the "win-win" set. The exact characteristics of the win-win set will depend on the negotiators characteristics, the national political processes and the institutional details of the negotiations. The same is true for the chosen outcome of the negotiation process. Still Putnam is able to identify factors that shape the set of possible outcomes.

Knowing that the characteristics of appointees, national political processes and institutional details influence the outcome of the negotiations, national politicians will have an incentive to chose or set them to their own advantage. If the appointees type is of importance, this generically gives rise to a delegation problem as one might want to carry out negotiations by someone with preferences different from one's own (delegation to hawks). If characteristics of the national political process are important, one might change this in order to influence the set of acceptable outcomes. Political scientists refer to this concept as a rise in the step-back costs. One can pass laws before the negotiations process, in order to rule out unfavorable outcomes of the negotiation process.[14]. There are many ways how institutional details can become important. Indeed, there is a rich literature in political science that discusses the role of ultimatums, threats to incorporate other issues as well and threats never to negotiate among the same issue again.[15] This points out to the design of international organizations again. Most organizations have rather strict procedural rules how to negotiate. The World Trade Organization, for example, allows claims only to be filed by states. Putnam's considerations have shaped the understanding international organizations and negotiations.[16]

2.7   Conclusion and Outlook

In this chapter, we gave some perspectives on the interdependence of national policies in international markets and the strategic interaction this implies. We could show that the desirability of policy coordination crucially depends on the objectives of politicians. We did not come up with simple conclusions and recommendations as national policy-making in international markets has too deal with two frictions: on the one hand, there

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[14]Baldwin (1985) describes this for the case of U. S. trade policy.

[15]For a survey see Berridge (1995).

[16]Very recent contributions include Lorz and Willmann (2005). The authors interpet politics on a European level as a two stage game and analyze effects of strategic delegation. Contrary to common sense, they show that this strategic delegation effect will lead to an undrprovision of public goods on the European level. Similar ideas can also be found in Chari et al. (1997).

is an inter-country friction as politicians do not take into account the effect of their policies on other countries; on the other hand, there can be political frictions as politicians do not necessarily want to maximize social welfare. Both frictions can attenuate or amplify each other. In order to come up with a clear answer we have to consider the underlying economic model and the assumed objective function of politicians.

Finally, we recognized that policy cooperation takes place in an institutional setting. We stressed the presence of international organization in international policymaking and showed that it is not only domestic institutions that shape the policy outcome, but also the structure and presence of international institutions. In what follows, we present two political economy models from two different policy area: one model of sovereign debt and one of regulatory policy. Nevertheless, the interaction of political and inter-country frictions will be a recurrent topic in the following two chapters of this dissertation.

Chapter 3

Domestic Debt as a Commitment Device - A Probabilistic Voting Model of Sovereign Debt

3.1 Introduction

Sovereign debt differs from private debt in many respects. First of all, collateral is rather seldom given. Second, there are no direct means that can force a sovereign to repay. Third, there are no specified procedures what to do with a sovereign debtor that is unwilling or unable to repay. Not surprisingly, sovereign debt is very often characterized by a history of partial default, delays in repayment and rescheduling. These observations lead many researchers to the conclusion that the decision to repay of a Sovereign Debtor is ultimately a political one, since repayment depends on willingness rather than ability (as it is the case for a private debtor).[1]

Although, there seems to be a broad consensus, that the repayment decision is a political one, few approaches have been undertaken to model this political decision explicitly.[2] A large amount of the literature assumes – explicitly or implicitly – that the borrowing economy is ruled by a benevolent dictator that compares the gains and losses from repayment and default and takes the action that will generate the

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[1] See for example Rogoff (2001).

[2] For an alternative view see Hellwig (1989). Hellwig does not deny the importance of the willingness to repay, but points out that it might be different to distinguish actually between lack of willingness and lack of ability.

higher benefits for the domestic economy. This might be a valid working assumption and can be justified if the conditions of the Coase theorem are met. However it is doubtful that redistribution without transaction costs is technically and politically feasible. Furthermore, the political economy literature points out that it is not clear at all why a politician has an objective to maximize social benefit, rather a politician tries to get re-elected, maximize his private benefit from holding office or simply implement his own preferred policy. Summing up all these arguments, it seems indeed necessary to formulate a political process explicitly. In what follows, we will consider a politician that does not want to maximize social welfare but simply wants to get re-elected.

A large strand of literature takes it for granted that even if there are no direct mechanisms that can enforce repayment of a sovereign state, there are at least some indirect mechanisms foreign creditors can evoke in order to enforce repayment. Two very often quoted possibilities are the threat of a trade embargo or the exclusion from future financial markets. It is however not too difficult to see that both mechanisms have their own weaknesses.[3] In what follows, we will consider an extreme case, namely we will look at a world in which foreigners have no punishment possibilities at all against a defaulting sovereign state. Although the existing literature suggests that in this world a sovereign debtor will not be able to issue any bonds at all to foreigners, we will be able to show that even in this case foreigners will be willing to give money to a sovereign state under appropriate assumptions. If foreigners cannot punish a defaulting government, but domestic residents can, then it might still be the case that this threat alone is so strong that it will force a sovereign government to repay, provided the government cannot distinguish between a foreign and a domestic bondholder. This points to a neglected mechanism that sustains sovereign debt: the punishment power of domestic residents. This implies however that domestic residents have to gain a certain strength, otherwise it is not possible for their governments to sell bonds to international capital markets. The model will also derive conditions for this to be feasible at all.

The literature dealing with the political decision of repayment is very small so far. Drazen (1998) considers a median voter model where the median voter decides on how much of the debts will be repaid. In his model, a government can not only distinguish, whether a particular bond is held by a domestic or a foreign resident, it can also commit to repay domestic residents while it cannot commit to foreign residents. This assumption seems to be at least doubtful. Nevertheless Drazen is able to identify the factors that will favour repayment or partial default in this setting.

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[3]It is not clear why trade sanctions are a credible (in the sense of subgame-perfect) threat. Bulow and Rogoff (1989) provide an argument why the threat never to lend again might be to weak as well.

Harms (2002) shows in an overlapping generations Model that heterogeneous interests might play an important role for the decision of the sovereign whether to repay its debt or not.[4] In particular, Harms assumes that a government maximizes its support function. Whereas the young generation will always be in favour of repayment, since all punishments will hurt it, the old generation will always want an outright default. Depending on expectations, two subgame-perfect equilibria are possible, one with full international diversification and one with pure autarky. The model is remarkable as it suggests that not only heterogeneous interests might play an important role in this context, but also the way these interests are aggregated into a political decision.

In what follows, we will model explicitly the strategic situation between a reelection seeking government, domestic non-bondholders, domestic bondholders and foreign bondholders in a world with uncertainty.

3.2   The Model

We will consider the following strategic situation. First an incumbent government decides in period 0 on how much debt to issue in order to provide public goods. In period 1, this debt is sold to the market. Then the government decides on whether to repay the debt or not in period 2. In order to repay the debt, however, the government has to impose a lump-sum tax on all voters. Thereafter voters decide whether they want to re-elect the government or replace it by an opposition.

The domestic economy is populated by a population of mass one. Therefore the per capita debt d will equal the total amount of debt, a property that will keep the notation simple. Each resident derives utility from private income y and a publicly provided good g.

$$U\left(y,g\right) = y + v\left(g\right) \tag{3.1}$$

$v\left(g\right)$ satisfies the Inada conditions. This implies that all residents want at least one marginal unit of public good as long as the cost of providing it will not be infinitely high. The public good however has to be financed by debts, since there is no taxing in period 1. The paper abstracts from this possibility as it does not focus on the optimal

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[4]Harms considers the political risk foreign direct investment faces. However, it is not difficult to interpret his model as a model of international lending, if the borrowed money is used for investment.

tax splitting of a re-election seeking government, but on its incentives to honour issued debt. We will specify the market structure and the political process in the following paragraphs.

3.2.1   Market Structure

A fraction p of the debt is bought by domestic residents, where p is a random variable that can take on values between 0 and 1. p is distributed with a distribution function $f(p)$, which is common knowledge. This captures the fact that everybody has some beliefs about the fraction of the debt that will be held by domestic residents, whereas it is not possible to know the exact value at the time this debt is sold to the market. In Period 2 however the government (and the investors) will know the exact realization of p. It seems reasonable to assume that the government can get some information about the fraction of domestically held bonds by for example studying the current account. The point of the paper is not to claim that the government will get perfect information about the p, but that it is at least able to collect some information about the actual realization of p.

Note however that the government can learn only the aggregate value of p, it is not able to distinguish for an individual bond who holds it. This captures the fact that the sovereign debt is sold on an anonymous bond market. While it might not matter a lot from a pure macroeconomic perspective whether the debt is in the form of a credit or in the form of bonds, it matters a lot from a political economy point of view. Whereas it is more or less obvious who is the creditor of a credit, it is quite different for a debtor to know who holds her bonds. This is particularly true if the bonds are not issued on capital markets only, but also traded. In the context of sovereign debt, it is important to distinguish between a domestic creditor and a foreign creditor, since both have different possibilities to punish a government that is unwilling or unable to repay. In contrast to the literature, that often assumes that foreign residents can exclude a defaulting government from future capital markets or induce trade sanctions against the defaulting country, we will consider a world where foreigners have no possibility at all to credibly threat to punish a defaulting government. This might be a reasonable approximation of reality, if the country dealt with is big or important for strategic or other non-economic considerations. But even, if one deals with small countries the question is important, since conventional wisdom would assume that such a small country will not get access to credits if foreigners lack punishment possibilities.

So, even if foreigners have no punishment possibilities at all, domestic residents might have some opportunities to sanction a defaulting government, thereby enforcing repayment. If the government in charge is a democratic government, domestic residents could simply vote for a new government if they dislike the default decision of their government. Another way to enforce repayment could be to influence the political decision with various kinds of lobbying activities. We will consider a political process that allows for both interpretations. However, we will also assume that the government ex-ante is not able to estimate the relative strength of different interest groups with certainty.

Next, we will assume that the sovereign debt will be issued in the form of zero bonds, i. e. each unit of debt will earn 1 in the case of repayment, 0 in the case of default. Again, this assumption is made for analytical convenience. If there are sufficiently liquid and integrated capital markets, the government will be able to sell all of the issued bonds. However, the price q might be very low if investors anticipate that the repayment probability will be very low. In the extreme case, if the market does believe that the government will never repay, this price q can drop to 0.

Investors will be able to price this bond only if there is another financial instrument that allows shifting income from period 1 to period 2. The model assumes that there is a risk less alternative investment that costs 1 in period 1 and will be repaid with 1 in period 2. All investors are risk-neutral, rational and operate under the same information set. Risk-neutrality of the investors might look like a very strong assumption, since it is well known that one of the most important functions of financial markets is to allocate risks. In this setting, however, risk-neutrality is not crucial for the results, but simplifies our calculations considerably. The assumptions of rationality and the same information set of all agents imply arbitrage-free capital markets in this simple setting. Furthermore, it will turn out that all investors will be willing to pay the same price q for the government bonds, which therefore will be determined endogenously in period 1.

3.2.2   Political Structure - Probabilistic Voting

The domestic economy will be ruled by a government that has neither any policy preferences on its own nor any motivation to maximize social welfare, instead it simply wants to maximize its own re-election probability. In this election, however, the ruling

party will be challenged by an opposition that tries to get into power as well. This opposition has no own interests as well. Like the ruling government, it simply wants to gain power. Both parties will offer a policy platform that consists of an amount of debt that is issued in period 0 and the decision whether to repay the issued debt or not in period 2.

The voting behavior of an individual voter is uncertain from the point of view of the politicians. It is not possible to predict that a particular voter will vote for the party that offers her the platform that gives her a higher utility. The reason for that might be that a voter has a political bias for one or the other party. A voter who is biased towards party A will only vote for party B, if the policy platform party B offers gives her a utility that is high enough to compensate her for her ideological bias ϵ.

$$U\left(A\right) + \epsilon < U\left(B\right) \tag{3.2}$$

Another reason why a voter does not vote for the party that gives her the higher utility might simply be the fact that she makes mistakes, since she lacks the ability to calculate the exact utility a party platform offers her. If this bias term or mistake term is not known to the parties for an individual voter, but only in the aggregate of the population, the voting behavior in this economy can be described by a probabilistic voting model. Although there are different behavioral assumptions that can lead to this stochastic element in the voting decision, it is crucial that there exists no deterministic mapping from a policy platform to the voting decision of an individual voter. Put differently, a policy platform induces only probability for a certain voting decision.

Next, we assume that the mistake or bias term will not be the same for all voters. Since there are two groups of people in the economy, I will assume for simplicity that all bondholders have the same error or bias term. This does not mean literally that every individual in one group has the same error or bias term; it simply captures the fact that the groups as a whole might have different error or bias terms.

In particular, I will assume that a member of the group of bondholders will have an error term ϵ that is drawn from the following uniform distribution:

With

$$F\left(\epsilon_{bond}\right) = \epsilon + \frac{1}{2\alpha} \tag{3.3}$$

The error term non bondholders have, is drawn from the following uniform distri-

bution,

with

$$F\left(\epsilon_{non}\right) = \epsilon + \frac{1}{2} \tag{3.4}$$

This is for simplicity normalized to be of length 1.

Furthermore, it is assumed that the distribution of the error or bias term of bondholders is not known with certainty. This means α is a random variable that is drawn from a distribution $g(\alpha)$. As already mentioned, being well informed translates straightforward into having political power in a probabilistic voting model. Therefore, we can take the random α as a measure of political influence. It is important however to keep in mind that the relative strength of bondholders is not known with certainty, since α is drawn from the distribution $g(\alpha)$, where all realizations of α have to be positive.

If we assume retrospective voting behavior (i. e. voters make their voting decision conditional on the level of utility they currently enjoy) and both parties have no policy preferences on their own except of gaining power, they face the same maximization problem. This implies that they will offer the same platform in equilibrium. What matters is that the engagement in a political competition forces both parties to maximize the same objective function. In particular, if the individual bias terms are drawn from a uniform distribution with the borders $-b$ and b, parties will maximize the following function by choosing an amount of debt d and then eventually deciding whether to repay it or not.

$$S = \int_{y_{\min}}^{y_{\max}} \int_{b_{\min}}^{b_{\max}} \frac{1}{2b}\left(y + v\left(g\right)\right) f\left(b\right) h\left(y\right) db dy \tag{3.5}$$

This support function is simply a weighted sum of all utilities of domestic residents. The weights correspond to the error or bias terms of different groups. The smaller the support of the distribution of the individual error or bias term b, the more weight the government puts on the utility of this particular voter. In other words, being well informed, or being biased in an easily predictable way translates into political power. This is a very common property of probabilistic voting models and has a very intuitive interpretation: The more informed a voter is, the more easily she will recognize which policy gives her a higher utility. This makes her a quite attractive target for

redistributive measures of government. On the other hand a voter who is only badly informed has to be given relatively more transfers so that she realizes that it is indeed one particular party that gives her a higher utility, which makes her a less attractive target for redistributive measures.[5]

This objective function of the government however can not only be motivated by a probabilistic voting model. An alternative, although less micro founded, way of justifying this function, is simply to take it ad hoc as a support function. A support function captures the idea that a government somehow tries to maximize the utility of the domestic population in order to increase its own popularity. However if some groups have more possibilities to influence the government than others, the government will put more weight on their utility than on the utilities of other groups. The disadvantage of this specification is that it is not very specific about the channels different lobbying groups make their interests heard.

In this model, government can influence the utility of an individual voter in four different ways. It can provide public goods, sell bonds, tax, and repay bonds. Whereas all individuals will be influenced by taxing and providing public goods symmetrically, selling and repaying bonds will only influence the utility of bondholders.[6] Keeping in mind that bondholders have a political power of α, that is not known with certainty ex-ante, and that they are a fraction pd of the total population, we can rewrite the parties objective functions as follows:

$$S = \int\limits_{p_{\min}}^{p_{\max}} \int\limits_{\alpha_{\min}}^{\alpha_{\max}} \alpha pd U\left(y,g\right) g\left(\alpha\right) d\alpha + \left(1 - pd\right) U\left(y,g\right) f\left(p\right) dp \qquad (3.6)$$

The first term denotes the bondholders' utility, the second term the non-bondholders' utility. Note that the support of the bondholder group is ex-ante stochastic for two reasons. On the one hand, it is not clear how big the bondholder group will be; on the other hand it is also not clear how well informed they will be.

Next, consider that bondholders will have to pay the price q in period 1 for the bonds and they will earn 1 in the case of repayment and 0 in the case of default. As will become clearer later on, the price q of one unit of debt will depend on the total amount of debt issued. The utility of non-bondholders will not be influenced by the issuance and repayment of bonds. If x denotes a dummy variable that is 1 in the case

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[5]Another application of a probabilistic voting model is Dixit and Londregan (1998).

[6]This is due to the fact that we assumed all taxing to be done in a lump sum fashion.

of repayment and 0 in the case of default , we can rewrite the government's objective function as follows.[7]

$$
\begin{aligned}
S\left(d,x\right) \;=\; & \int_{p_{\min}}^{p_{\max}} \int_{\alpha_{\min}}^{\alpha_{\max}} \left[\alpha p d\left(-q\left(d\right)-dx+x\right)+v\left(q\left(d\right)d\right)g\left(\alpha\right)d\alpha +\right.\\
& \left. + \left(1-pd\right)\left(-dx+v\left(q\left(d\right)d\right)\right)\right]f\left(p\right)dp
\end{aligned}
\tag{3.7}
$$

This is the complete maximization problem of the government in period 0. It maximizes this function by a choice of d in period 0 and a choice of x in period 2.[8] Note that in order to solve the maximization problem, the government has to take into account that its choice of d will influence the price the market is willing to pay for the bonds. This price however will be influenced in turn by the expected repayment probability. The next paragraph will be more formal on that issue.

Again for analytical convenience, it is necessary to assume that the government cannot simply take away income from one group and give it to another group. Since utility is linear in income, this would lead to a solution in which the government would take away all income from the less well informed group of domestic inhabitants and give it to the other group. Also such an equilibrium would still imply the issuance of a certain amount of sovereign debt, it seems to be quite realistic to assume this away, since taking away all income might be technically infeasible or prohibited by constitutional rules.

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[7] The assumption that x has to be either 0 or one is not restrictive. Since the payoff function is linear in the repayment rate y, it is never optimal to choose a y between 0 and 1.

[8] This naturally raises the question of the timing of the elections. The model assumes that elections take place at the last stage of the game; this implies a retrospective voting behaviour. One could also assume that elections are held even before period 0; in this case one would have to assume that the government can make binding commitments to choose the announced policy variables. It is even possible to have elections at every stage of the game, since elections do not influence the game per se in a probabilistic voting context, but force parties to maximise a well defined objective function

3.3   Positive Analysis

Obviously this strategic situation involves uncertainty about the fraction of debt that is bought by domestic bondholders and about the information bondholders and non-bondholders have. Therefore the appropriate solution concept of this game will be a Bayesian equilibrium. A strategy of the government consists of an amount of debt d chosen in period 0 and the decision x to repay or not in period 2. It is important to keep in mind that the government knows the values of p and α, when it has to decide over x. By choosing an amount of debt d, the government has to take into account its believes about the distribution of the random p and the random α, but also about how the chosen amount of debt will influence the price investors are willing to pay for the issued debt and how it will influence the optimal strategy to repay or not.

A strategy of an investor consists of a price q she is willing to pay for the issued debt. Since all investors operate under the same information set and the government is not able to treat them differently, all investors will choose the same optimal strategy in equilibrium. This in particular implies that domestic residents will not be able to pay a different price than foreign investors. This is true although domestic residents can punish the defaulting government and foreigners can not. As the government cannot distinguish between domestic and foreign residents, it does not matter whether an individual investor is a domestic or a foreign resident. What matters is the aggregate composition of domestic and foreign bondholders, which is captured by the realization of the random p.

Therefore, the Bayesian equilibrium will consist of the following set of strategies.

$d = d\left(g\left(\alpha\right), f\left(p\right)\right)$ chosen in period 0 by the government

$q = q\left(g\left(\alpha\right), f\left(p\right)\right)$ chosen in period 1 by each investor

$x = x\left(\alpha, p, d\right)$ chosen in period 2 by the government

Note that x has to be chosen at a stage where all uncertainty has been resolved, therefore it is a function of the realized α and p, not of their distribution functions.

In order to determine the optimal strategies of all players, one has to solve the game by backward induction, which means one first has to determine the optimal strategy of the government in period 2. As already mentioned, at this stage of the game the government knows the realizations of α and p. Therefore it will repay, if and only if it gets a higher support from repaying than from defaulting. Defaulting will generate an additional support of zero, since in the case of default no taxation will take place

and no repayment either. Repaying, on the other hand, will generate an additional support of $\alpha pd(1 - d) - (1 - pd)d$ in the aggregate, since d is the whole amount of debt that has been issued (which also equals per capita debt) and pd is the fraction that is held by domestic residents. Note that in the case of repayment bondholders and non-bondholders have to be taxed by a lump-sum tax d. This implies that non-bondholders always want their government to default, since repaying only means a tax burden to them. On the other hand, as long as d is smaller than 1, which has to be the case in equilibrium, domestic bondholders always favour repayment, which leaves them with a net gain of $1 - d$. To be precise, the government will opt for repayment, if the following inequality holds.

$$\alpha pd\,(1 - d) - (1 - pd)\,d \geq 0 \tag{3.8}$$

The first term denotes the support a repaying government gets from bondholders for repaying, the second term captures the resistance of non-bondholders to repayment. The higher the realized α, the more likely repayment becomes. A high α captures the fact that bondholders are relatively well-informed about the political process (Probabilistic Voting) or that they managed to organize relatively well (Lobbying model). In particular, if α is smaller than or equal to one (which means bondholders are neither better informed than non-bondholders nor could they organize better), repayment will never occur in equilibrium. Put differently, for sovereign debt to be sustainable in the above specified setting, it is a necessary condition that domestic bondholders are (for whatever reasons) politically more influential than non-bondholders. In particular, by reformulating the above stated inequality, one can construct the following correspondence Γ, that will be referred to as the repayment correspondence.

$$\alpha \geq \frac{(1 - pd)\,d}{pd\,(1 - d)} = \frac{1 - pd}{p\,(1 - d)} \tag{3.9}$$

Or, stated in a more formal way:

$$\Gamma : \ (p, d) \rightarrow \alpha$$

$$\Gamma\,(p, d) = \left\{ p, d : \alpha \geq \frac{1 - pd}{p\,(1 - d)} \right\} \tag{3.10}$$

The repayment correspondence gives us all values of α for a given d and p, for which the government will decide to repay, since repayment generates a higher support than non-repayment. It is important to keep in mind that the repayment correspondence contains no stochastic elements, since at this stage of the game all uncertainty is resolved.

The repayment correspondence has the following properties.

$$\Gamma\left(p_1, d\right) \subset \Gamma\left(p_2, d\right) \qquad if \qquad p_1 < p_2$$

$$\Gamma\left(p, d_1\right) \subset \Gamma\left(p, d_2\right) \qquad if \qquad d_1 > d_2 \qquad \text{(3.11)}$$

The first property has a very intuitive interpretation. It simply says that the fraction of domestic bondholders and their political power are substitutes. The more voters of the domestic economy hold bonds, the less powerful they have to be in order to get repayment. Put differently, two things tend to favour repayment: either a large fraction of domestic voters has to hold bonds or they have to be powerful. Already at this stage, we have identified the two factors that will be crucial for repayment.

The second property of the repayment correspondence implies that in order to repay a higher debt d, there has to be a larger fraction of bondholders or they have to be more politically influential.

One can show that for each combination of p and d, there is exactly one value of α that will fulfil the above stated weak inequality with equality. In what follows, I will refer to that value of α as the critical α or α_{crit}. In other words, α_{crit} is a function of the following form:

$$\alpha_{crit} = \alpha_{crit}\left(p, d\right) = \frac{1 - pd}{p\left(1 - d\right)} \qquad \text{(3.12)}$$

Given p and d, for all $\alpha > \alpha_{crit}$, the government will repay, for all values below it will default.[9] Since α_{crit} defines the borders of the repayment correspondence, it follows straightforward from the properties of the repayment correspondence that α_{crit} is a function with the following properties.

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[9] For the critical alpha, the government is indifferent between both. Since this event will occur with probability 0, it is not necessary to specify a strategy than conditions on the occurrence of that event.

$$\frac{\partial \alpha_{crit}}{\partial p} = -\frac{1-d}{\left(p\left(1-d\right)\right)^2} < 0 \tag{3.13}$$

$$\frac{\partial \alpha_{crit}}{\partial d} = \frac{p-p^2}{\left(p\left(1-d\right)\right)^2} > 0 \tag{3.14}$$

Rationality of investors implies that they will anticipate that the government in period 2 will only repay, if repaying generates a higher support than defaulting. That is to say, they know that the optimal policy rule of the government is fully described by the repayment correspondence. Since the government will repay each bond either with one or with zero, the price a rational, risk-neutral investor is willing to pay will simply be the repayment probability. This repayment probability is already implicitly defined by the repayment correspondence, insofar as the repayment correspondence is nothing but a description of governments' optimal policy rule. If α is above α_{crit}, government will repay, otherwise default. Some reformulations lead to the following expression for q, which not only denotes the price paid, but also the repayment probability.

$$q = 1 - G\left(\alpha_{crit}\left(p,d\right)\right) =$$

$$= 1 - G\left(\int_{p_{\min}}^{p_{\max}} \frac{1-pd}{p\left(1-d\right)} f\left(p\right) dp\right) \tag{3.15}$$

This means that the optimal strategy for a risk-neutral and rational investor is simply to pay a price equal to the calculated default probability.[10] Note that this optimal strategy has to take into account the stochastic nature of α and p, since at this stage of the game, the realizations of α and p are not known.

Nevertheless, this equation can also be interpreted as a function $q(d)$, that shows that each amount of debt issued will lead to exactly one price q that will be paid by the market for one unit of government debt.[11] This implies that one can rule out multiple equilibria, as the governments decision in period 2 for given α and p can be predicted perfectly. This means every d induces exactly one repayment probability. Furthermore,

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[10] To be precise, q denotes the maximum price a rational and risk-neutral investor is willing to pay. If we assume however that there is sufficiently much competition between foreign investors, they will drive the price up to q.

[11] Obviously q is not only a correspondence, but also a function of d. Since α is a function of d, F(α) is also a function of d. Therefore q is a function of d.

this function $q(d)$ has the following properties.

$$\frac{\partial q}{\partial d} = -g\left(\alpha_{crit}\right) \int\limits_{p_{\min}}^{p_{\max}} \frac{\partial \alpha_{crit}}{\partial d} f\left(p\right) dp < 0 \qquad (3.16)$$

Again this has a very natural interpretation. The more debt a government issues, the less it will get for one unit of debt. This is due to the fact that more debt will lead to a higher burden of repayment. A higher burden of repayment in turn will lead to more domestic resistance of repayment, since the support of bondholders, $1-d$, for repayment decreases, but still stays positive, whereas the resistance d of non-bondholders increases. In order to understand this result, it is important to keep in mind that as long as one unit of debt is held by a foreigner, repayment is in essence redistribution from domestic residents to foreign residents. Of course, rational investors anticipate this difficulty, and adjust their repayment expectations appropriately. In very vague sense, one can compare the government's problem to the problem a monopolist faces: Producing more lowers the price, although for very different reasons.[12]

Having derived the price q of government bonds as a function of d, one can now rewrite the government's maximization problem in period 0 as maximizing its support function over d.

The optimal strategy of government and opposition is to choose an amount of per capita debt d that maximizes the following support function.:

$$S = -\int\limits_{p_{\min}}^{p_{\max}} \int\limits_{\alpha_{\min}}^{\alpha_{\max}} \alpha p d q\left(d\right) g\left(\alpha\right) f\left(p\right) d\alpha dp+$$

$$+\int\limits_{p_{\min}}^{p_{\max}} \int\limits_{\alpha_{\min}}^{\alpha_{\max}} [\alpha p d + (1-pd) v\left(q\left(d\right) d\right)] g\left(\alpha\right) f\left(p\right) d\alpha dp+$$

$$+\int\limits_{p_{\min}}^{p_{\max}} \int\limits_{\alpha_{crit}}^{\alpha_{\max}} [\alpha p d\left(1-d\right) - (1-pd)] g\left(\alpha\right) f\left(p\right) d\alpha dp \qquad (3.17)$$

The first term shows the disutility domestic bondholders experience when buying

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[12]The maximization problem of the government is much more complex, since issuing more debt also enables to provide more public goods, but also generates the opposite effect in creating further resistance to repayment.

the debt. The second term gives us the utility each voter in the economy experiences by the provision of public goods for which the debt has been issued. Note that this utility is enjoyed by everybody in the domestic economy, independent of whether she bought bonds or not. The last term is again the repayment correspondence that captures the fact that the government will only repay if repayment generates a higher support than default which generates a support of 0. Therefore the integral is only taken over values for which the term under the integral is bigger or equal than zero.

Unfortunately, one cannot solve this maximization problem analytically. The following two lemmas however establish the existence of an interior solution.

Lemma 1 *A government can issue debt at international capital markets, if and only if the the bondholder class is sufficiently influential, namely if:*

$$\alpha_{\max} > \int_{p_{\min}}^{p_{\max}} \frac{1}{p} f(p) \, dp$$

This implies that there is correspondence that maps $E(1/p)$ into $\alpha_{\max}$. For all $\alpha_{\max}$ inside the correspondence, it is feasible to sell debt to the market; therefore I will refer to that correspondence as the feasibility correspondence Ω. The feasibility correspondence is characterized by the following property.

$$\Omega : E\left(\frac{1}{p}\right) \to \alpha \tag{3.18}$$

Again, the borders can be described by a function $\alpha_{crit}^{\max}$. As will become clearer later on, the feasibility correspondences determines whether one will arrive at a Bayesian equilibrium with bond-emission or at a Bayesian equilibrium without bond emission.

(Proof can be found in appendix)

Lemma 1 is already in itself noteworthy, since it gives a necessary condition for sovereign debt to be feasible at all. It says that there has to be at least one realization of and therefore one state of the world α, in which bondholders are sufficiently powerful in order to sustain the smallest amount of debt possible. This implies that there has to be at least one α that is bigger than one (all values of p are between 0 and1).

We can also see that the fraction of domestic bondholders matters: the more domestic bondholders, the less influential they have to be. Obviously, this property could

already be seen in the repayment correspondence. This is due to the fact that in this Bayesian equilibrium the issues of repaying and buying bonds are no independent events, but depend on the same priors over $f(p)$ and $g(\alpha)$.

Lemma 2 *If government and opposition maximize their probability of winning the elections, they will choose a strictly positive amount of debt d, provided the necessary conditions for bond-emission as specified in lemma 1 are fulfilled.*

The proof of the lemma is rather involved and therefore delegated to the appendix. Nevertheless it tells us that a government will issue bonds, if it can. Or put differently lemma 2 gives us the last missing variable of the Bayesian equilibrium. Summing up everything leads to the following proposition:

Proposition 1 *If α and $E(p)$ are in the set described by the feasibility correspondence Ω, there is a unique Bayesian equilibrium that consists of a $d > 0$ (chosen in period 0), a price q ($0 < q < 1$, chosen in period1)and a decision x (chosen in period 2) whether to repay or not. Depending on the actual realizations of the random α and p, x can be either 0 or 1.*

If α and $E(p)$ are not element of the set that is defined by the feasibility correspondence Ω, then there is a continuum of Bayesian Equilibria with the following properties, $d \geq 0$, $q = 0$ and $x = 0$. In this case the government will never repay and therefore is not able to sell any debt to the market.

This proposition follows straightforward from lemma 1 and lemma 2. Once an optimal amount of debt is chosen by the government, this will induce one price q, rational investors are willing to pay. After that α and p are realized and the government follows its optimal decision rule in choosing x as specified by the repayment correspondence.

This result is remarkable for some reasons. First of all, it shows that even if foreigners have no possibilities to punish a defaulting government, they might under the above specified circumstances (lemma 1) be willing to lend money to this government. They are willing to do that, since they know that the governments aim is to please its voters and that the government can please its voters by repaying. This is only true

however, if there are enough voters that hold bonds and therefore have a vital interest in repayment or if they are sufficiently powerful in the political process. It is however important to keep in mind that this result depends on the assumption that the government is not able to treat foreigners and domestic residents differently. Therefore this paper has identified a new mechanism that might sustain sovereign debt even in the absence of all punishment possibilities of foreigners: it is simply the fact that domestic residents might have an interest in getting repaid.

In order to understand the result, it is important to realize that repayment has redistributive effects within domestic economy and between the domestic and the foreign economy. If debt is repaid, each debt holder gains $1 - d$, whereas each non-bondholder has to pay d for that. The fact that some voters in the domestic economy gain from repayment is essentially the mechanism that is needed in order to guarantee the repayment of the sovereign debt. Nevertheless repayment has also redistributive effects between the domestic economy and the foreign economy. Each foreign bondholder gains 1, if the debt is repaid. Since the whole indebtedness to foreigners amounts to $(1 - pd) d$, repayment is a transfer of $(1 - pd) d$ from the domestic economy as a whole to foreigners.

3.4   Normative Implications

Now, once a positive result has been established, it is interesting to look at its normative properties. Having looked at an opportunistic policy-maker who simply tries to maximize his re-election probability, it seems natural to compare this setting to a benevolent dictator who tries to maximize a Benthamite Welfare function.[13] Since a Benthamite Social Welfare Function simply adds up all individual utilities, each individual is given the same weight.

$$SWF_B = \int\limits_{y_{\min}}^{y_{\max}} y h(y)\, dy \tag{3.19}$$

In what follows, it is important to keep in mind that a sovereign government cannot commit to do anything by the mere fact that it is sovereign. Therefore, it is

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[13]Although the term benevolent dictator allows for different interpretations, in what follows I will use it in exactly that way. The benevolent dictator tries to maximise social welfare under the same exogenous constraints like the opportunistic politician.

straightforward to derive the following lemma.

Lemma 3 *If the domestic government is a benevolent dictator, the induced game has a continuum of Bayesian Nash Equilibria with $d = d$, $x = 0$, $q = 0$. All of these equilibria imply that the issued bonds will not be bought and repaid, in other words, the sovereign is not able to raise money at capital markets. In other words regardless of α and $E(p)$, the game will always yield the no emission equilibrium as specified by proposition, as the feasibility correspondence is always empty.*

Proof: The benevolent dictator will repay, if the following is true:

$$pd(1-d) - (1-pd)d = d(p-1) > 0 \qquad (3.20)$$

This is obviously never true.QED.

Since repayment is not only redistribution within the domestic economy, but also a redistribution of income from domestic residents to foreign residents, a social planner who tries to maximize a social welfare function will never do that. Note that the burden of repayment is completely left to the domestic residents while at least some of gains from repayment will go abroad. This is due to the fact that repayment is a zero-sum game. Since rational investors anticipate that a benevolent dictator will never repay, they will never be willing to give any money to him. If all bonds were held by domestic residents, the social planner would be indifferent between repaying or not repaying, since utility is linear in private income.

It is straightforward to see that ex-ante a bondholder and a non-bondholder will enjoy the same utility. The (ex-ante) utility of a bondholder can be written as:

$$U_b = y - q + v(qd) + q*1 + (1-q)*0 - qd = y + v(qd) - dq = U_{nb} \qquad (3.21)$$

This result does not come as a surprise, since the bond price q is the outcome of a Bayesian equilibrium, in which investors had rational expectations about the government's decision. This also justifies the assumption that nature chooses whether a domestic resident becomes a bondholder or not, since one doe at least not make any

systematic mistake by doing the one or the other thing. Note that in an economy where no bonds are issued, the total social welfare will be simply.

$$SWF_B = \int_{y_{\min}}^{y_{\max}} yh(y)\, dy \tag{3.22}$$

Compared to:

$$SWF_B = \int_{y_{\min}}^{y_{\max}} (y - v(qd) - d) h(y)\, dy \tag{3.23}$$

In the bond-issuing economy.

Proposition 2 follows straightforward.

Proposition 2 *Ex ante, a country ruled by an opportunistic politician (Probabilistic Voting) enjoys a higher welfare (measured by a Benthamite Social welfare function) than a country that is ruled by a benevolent dictator that tries to maximize this social welfare function.*

Proof: The bond-issuing economy, will do better if:

$$v(qd) - d > 0 \tag{3.24}$$

If the bonds are issued by a support maximizing government, it will never choose a d that reverses the above inequality, since in this case it could do strictly better by choosing $d = 0$.

Lemma 2 however showed that there are some values of d for which

$$v(qd) - \frac{h}{c} qd > 0 \tag{3.25}$$

where h could be any finite constant.

This also implies that there are some values for which.

$$v\left(qd\right) - d > 0 \qquad (3.26)$$

QED.

This result might come as a surprise since one should expect that a benevolent dictator that has the objective of maximizing social welfare will generate a higher social welfare than an opportunistic politician that tries to maximize his re-election probability. The result depends essentially on the commitment issue. Although, the opportunistic politician cannot commit to repay either, rational investors understand that there might be states of the world where the politician will find it in his own interest to repay. The previous section identified these states of the world. If there are a lot of domestic bondholders and their influence or quality of information is better than that of the non-bondholders, the politician will maximize his re-election probability by repaying. Having understood this mechanism, the proposition follows quite straightforward. Since at least the first marginal unit of the public good provides an infinite marginal utility, all domestic residents will desire at least some public good. As the public good can only be financed by issuing bonds, only the opportunistic politician will be able to provide this public good.

Of course, the welfare result stems from the fact that no taxing in period one is possible. The result that an opportunistic politician can issue bonds, whereas the benevolent dictator can not, is not due to that assumption. Or put differently, the result that an opportunistic politician has a richer choice set seems to be quite robust in a world where no commitment is possible.

The welfare analysis has only looked at the domestic economy; everything might be challenged if one considered also the welfare of foreign investors. From a positive point of view, this does not matter at all, as a politician has no incentive to please foreigners who are not voters. Putting it in a broader context, this points out to the fact that the incentives of a politician in an open economy might be different from a politician in a closed economy, as the former will not take into account the spillovers he puts on other countries. This suggests that there might be welfare gains to be achieved through international coordination. Indeed, one considers if a specified procedure, the Sovereign Debt Bankruptcy Court, might lead to a Pareto Improvement for a variety of reasons.[14] Of course framework discussed above is too simple to provide an answer to these questions.

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[14] See for for example Rogoff (1999) or Krueger (2001).

3.5 Conclusion

The aim and starting point of this paper was to show that sovereign debt can be sustainable even if foreigners have no possibilities to punish a defaulting government at all. It is sufficient to have sufficiently many domestic bondholders and/ or them to be sufficiently powerful in the political process. Two different versions of being politically powerful were considered. First voters differed in the quality of information they had about the political process. Second they differed in their lobbying power. The derived model allows for both interpretations. The model also has the feature that investors are willing to give money to a sovereign who cannot commit to repay and moreover where default can indeed happen in equilibrium. The reason why both, repayment and default, can happen in equilibrium was that at the beginning of the game there is some uncertainty about the fraction of domestic bondholders and their abilities to influence the governments' decisions. Once this uncertainty is resolved the government makes its decision based on the actual realizations of the random variables.

Another aim of the model was to take heterogeneous interests in the borrowing country seriously. Since it might not be appropriate to take the borrowing country as a single entity with unified interests, it was necessary to model the divergent interests explicitly. Obviously, bondholders favour repayment, while non-bondholders tend to oppose it. It became clear that the repayment of sovereign debt has not only distributive consequences between the borrowing country and abroad, but also within the domestic country between bondholders and non-bondholders. Ultimately, this redistributive mechanism within the borrowing country sustained repayment. However, it was necessary to be more specific about the way individual preferences ere aggregated into a policy decision; a probabilistic voting model was chosen which was flexible enough to allow for different interpretations as well.

Two things are remarkable about the model discussed above. First, it is to my best knowledge the first model which explicitly derives the political decision of repayment or default. Second it showed that modelling this decision was indeed more than an intellectual exercise. Once the political process was specified, it became clear, that there is a new mechanism that might sustain sovereign debt: the political influence of domestic voters.

In a broader context, the model fits into the political economy literature in international economics. The domestic decision maker can put external effects on foreign investors which he does not take into account, as she only feels responsible towards

her domestic citizens. Surprisingly, the model came up with the result that in this context, an opportunistic politician might do better than a benevolent dictator for the domestic economy. Although the opportunistic politician does not take into account the external effects of her decision on foreign investors either, he can issue debt on the market. The reason for the result was that as long it is believed that domestic bondholders are possibly sufficiently strong to enforce repayment, he can raise money on international capital markets.

This again implies two things. First, it might be quite favorable for a government to issue bonds in a way that does not allow discriminating between domestic and foreign investors. If bonds were only issued to foreign investors in the above setting, they would never be bought, since the sovereign lacks any device to commit to repay. Second in order to raise any money from foreign investors, it is necessary to have a sufficiently big and politically influential fraction of domestic residents that hold the government bonds. If the government debt is held in the form of bonds, it might not be too unrealistic to assume that foreigners have no punishment possibilities; since in order to implement any action against a defaulting country, they have to overcome their coordination problem, since a single foreign investor does indeed not have significant punishment possibilities.[15] This might be different for domestic investors as the election of a new government does not involve the overcoming of a commitment / free-rider problem. Taken this together the paper suggests a correlation between the fraction of domestically held debt and the fraction of debt that is held in the form of bonds.

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[15]This could also shed some light on the so-called home bias in International Finance. The home bias denotes the phenomenon that a too large portfolio share is held in domestic bonds. The paper suggests that full risk-diversification might not be an equilibrium since it is indeed necessary to have a high fraction of domestically held bonds. Otherwise the incentives of a government to expropriate might be too large for the diversification equilibrium to be sustainable.

3.6 Appendix

Proof of Lemma 1:

Debt will be repaid, if:

$$\alpha \geq \frac{(1-pd)d}{pd(1-d)} = \frac{1-pd}{p(1-d)}$$

if d is infinitely small, this becomes:

$$\alpha \geq \frac{1}{p}$$

Government can only raise money if there is at least one state of the world α, in which the bondholders can enforce repayment, i. e. at least

$$\alpha_{\max} \geq \frac{1}{p}$$

Ex-ante, when p is not known, this condition is:

$$\alpha_{\max} \geq \int_{p_{\min}}^{p_{\max}} \frac{1}{p} f(p)\, dp = E\left(\frac{1}{p}\right)$$

QED.

Proof of Lemma 2:

In what follows, we will show that there exists always an interior solution to the parties maximization problem. The idea of the proof is to show that the support for choosing the extreme values $d = 0$ or $d \geq 1$ is always zero (Step 1). Next we will show that there is at least one value d, with $0 < d < 1$, for which S is strictly positive.

STEP 1:

For d=0 and d=1, S will be zero

a) $d = 0$

$$S = -\int_{p_{\min}}^{p_{\max}} \int_{\alpha_{\min}}^{\alpha_{\max}} \alpha p d q\left(d\right) f\left(\alpha\right) f\left(p\right) d\alpha dp +$$

$$+ \int_{p_{min}}^{p_{max}} \int_{\alpha_{min}}^{\alpha_{max}} [\alpha pd + (1 - pd) v (q (d) d)]g (\alpha) f (p) \, d\alpha dp +$$

$$+ \int_{p_{min}}^{p_{max}} \int_{\alpha_{crit}}^{\alpha_{max}} [\alpha pd (1 - d) - (1 - pd)]dg (\alpha) f (p) \, d\alpha dp =$$

$$= 0 + 0 + 0$$

note that $q(d)$ can be at most 1

b) $d = 1$ or $d > 1$

$$S = - \int_{p_{min}}^{p_{max}} \int_{\alpha_{min}}^{\alpha_{max}} \alpha pdq (d) g (\alpha) f (p) \, d\alpha dp +$$

$$+ \int_{p_{min}}^{p_{max}} \int_{\alpha_{min}}^{\alpha_{max}} \alpha pd + (1 - pd) v (q (d) d) g (\alpha) f (p) \, d\alpha dp +$$

$$+ \int_{p_{min}}^{p_{max}} \int_{\alpha_{crit}}^{\alpha_{max}} \alpha pd (1 - d) - (1 - pd) g (\alpha) f (p) \, d\alpha dp =$$

$$= 0 + 0 + 0$$

This has to be the case, since $q (1) = 0$.

The government will repay, if:

$$\alpha pd (1 - d) - (1 - pd) d > 0$$

This can never be the case, if $d \geq 1$. Therefore the price will drop to 0.

STEP 2:

For d close to 0 : $q (d) d > 0$

$$q (d) d = d \left[1 - G \left(\int_{p_{min}}^{p_{max}} \frac{1 - pd}{p (1 - d)} f (p) \, dp \right) \right]$$

From Lemma 1 we know, that for debt to be feasible at all, it has to be true that:

$$\alpha_{\max} \geq \int_{p_{\min}}^{p_{\max}} \frac{1}{p} f(p) \, dp$$

So, if debt is feasible, it has to be true that:

$$\alpha_{crit}(d = 0 + \epsilon) = \int_{p_{\min}}^{p_{\max}} \frac{1}{p} f(p) \, dp < \alpha_{\max} \implies F(\alpha_{crit}) < 1 \implies q(d = 0 + \epsilon) > 0$$

This implies that $dq(d) > 0$.

STEP 3:

If $\alpha < \alpha_{crit}$, the government will default thereby generating a total support of:

This will happen with a probability $G(\alpha_{crit})$.

If $\alpha > \alpha_{crit}$, the government will repay thereby generating the following support:

$$S(d) = - \int_{p_{\min}}^{p_{\max}} \int_{\alpha_{\min}}^{\alpha_{\max}} \alpha p \, dq(d) \, f(\alpha) \, f(p) \, d\alpha dp +$$

$$+ \int_{p_{\min}}^{p_{\max}} \int_{\alpha_{\min}}^{\alpha_{\max}} \alpha p d + (1 - pd) \, v(q(d) \, d) \, g(\alpha) \, f(p) \, d\alpha dp +$$

$$+ \int_{p_{\min}}^{p_{\max}} \int_{\alpha_{crit}}^{\alpha_{\max}} \alpha p d(1 - d) - (1 - pd) \, d g(\alpha) \, f(p) \, d\alpha dp$$

Note that the first and the second term will always be grater or equal to 0, whereas the third term will be negative or equal to 0.

Let's define the following:

$$\int_{p_{\min}}^{p_{\max}} \int_{\alpha_{\min}}^{\alpha_{\max}} \alpha p d + (1 - pd) \, g(\alpha) \, f(p) \, d\alpha d(p) = c$$

Combining both equations yields the following expression:

$$
G\left(\alpha_{crit}\right)\left(c * v\left(qd\right) - \int_{p_{\min}}^{p_{\max}} \int_{\alpha_{\min}}^{\alpha_{\max}} \alpha p dq\left(d\right) g\left(\alpha\right) f\left(p\right) d\alpha dp\right) +
$$

$$
+ \left(1 - G\left(\alpha_{crit}\right)\right) \left(\begin{array}{c} c * v\left(qd\right) + \int_{p_{\min}}^{p_{\max}} \int_{\alpha_{\min}}^{\alpha_{\max}} \left[\alpha p d\left(1 - d\right) - \left(1 - p d\right) d\right] g\left(\alpha\right) f\left(p\right) d\alpha dp - \\ - \int_{p_{\min}}^{p_{\max}} \int_{\alpha_{\min}}^{\alpha_{\max}} \alpha p dq\left(d\right) g\left(\alpha\right) f\left(p\right) d\alpha dp \end{array}\right) >
$$

$$
> c * v\left(qd\right) - q\left(d\right) d * h
$$

Denoting:

$$
\int_{p_{\min}}^{p_{\max}} \int_{\alpha_{\min}}^{\alpha_{\max}} \alpha p dq\left(d\right) g\left(\alpha\right) f\left(p\right) d\alpha dp =
$$

$$
= q\left(d\right) d \int_{p_{\min}}^{p_{\max}} \int_{\alpha_{\min}}^{\alpha_{\max}} \alpha p g\left(\alpha\right) f\left(p\right) d\alpha dp = q\left(d\right) d\left[E\left(\alpha\right) E\left(p\right) + Cov\left(\alpha, p\right)\right] =
$$

$$
= q\left(d\right) d * h
$$

where h denotes a finite constant, as long as $E\left(\alpha\right)$ and $Cov\left(\alpha, p\right)$ is not infinity, which seems very reasonable to assume.

STEP 4 (Concavity Argument):

$$
v\left(qd\right) - \frac{h}{c} qd > 0
$$

for d close enough to zero.

Step 2 showed that qd is greater than 0 for small values of d. It is however also true that there are at least small values of qd, $g(qd) > hqd$. This follows straightforward from the assumed Inada Conditions.

Therefore, if the conditions of lemma 1 are met, there are always values of d with the property that $S(d) > 0$. This however implies that there will be always an interior solution with $0 < d < 1$, if assumption 2 is fulfilled.

QED.

Note that this lemma only establishes that there is at least one interior maximum, there could be more than one. In this case the political competition forces both parties to choose the absolute maximum. See Coughlin (1984) for details.

Chapter 4

The Political Economy of Intellectual Property Rights in Open Economies

4.1 Introduction

Intellectual property rights have always been on the agenda of the economic profession. On the one hand, a perfectly competitive market cannot provide sufficient incentives to create new knowledge as knowledge can be copied easily without the inventor being able to cover his research costs. On the other hand, economists were convinced that the protection of property rights has a substantial and positive impact on economic growth.[1] Different countries, however, have chosen different regimes of protection of intellectual property rights. Recently, a debate emerged whether it is necessary to harmonize the standards of protection of intellectual property rights internationally and to what extent. Obviously, different countries have different interests in how much to protect intellectual property.[2] It was not until very recently, that economists asked about the welfare effects of different regimes of intellectual property rights protection. Deardorff (1992) considers the welfare effects of a one size fits all property rights regime,

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[1] See Saint-Paul(2003) for a theoretical examination of this issue.
[2] For a recent survey see Maskus (1998).

whereas Grossman and Lai (2005) look at the allocation that will result in the inter-
action of national governments that try to maximize their respective national welfare
over an infinite time horizon.

While Deardorff asks for the welfare effects of a given policy and Grossman and Lai
assume ad hoc that a national politician wants to maximize national welfare, the aim
of this paper is to look at the property rights regime that will emerge in the interaction
of politicians that do not necessarily want to maximize national welfare, but favor some
groups over others. We derive the resulting allocation and show that politicians that
are biased in favor of some interest groups might actually increase welfare globally, but
do so at the expense of other domestic groups. In particular, we are able to show that a
politician who favors producers' interests over consumers' interests can increase world
welfare as compared to a politician that wants to maximize national welfare as a whole.
In doing so the biased national policymaker decreases national welfare as measured as
the sum of producers' and consumers' welfare.

In a closed economy a non-welfare maximizing politician can never do better than
a social planner by the mere definition of the terms. In contrast to that, this paper
shows that he might be able to increase global welfare in an open economy. This result
bears some similarity to the previous paper where we showed that a reelection seek-
ing politician can solve the time inconsistency problem of sovereign debt and thereby
increase domestic welfare as a whole ex-ante. Here, a biased politician increases only
world welfare as a whole, but does so at the expense of diminishing domestic welfare.
We will discuss the implication of this strategic effect later on.

4.2   The Issue and Related Literature

Recently, intellectual property rights made it on the agenda of international trade ne-
gotiations as well as of the academic literature on international trade. Although there
have been treaties that dealt with intellectual property rights since the end of 19th
century, it attained a heightened interest in the last years. Intellectual property be-
came an increasingly important part of national production and international trade.[3]
Developed economies, however, expressed concerns that the protection of intellectual
property rights is insufficient in developing countries. If producers see their products

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[3]A detailed examination can be found in Eaton and Kortum (1996).

copied in developing countries, they will not only see their profits decrease, but might also refrain from further research and development activities. At the same time developing countries mentioned high social costs of enforcing developed economies property rights standard in their markets. This is particularly true when it comes to medicines. After ongoing discussions an intermediate agreement was reached with the TRIPS treaty in 1994. Although it was signed with unanimity, it came under critique right from its very beginning. Some developing countries and non-governmental organizations denounced it as an instrument of neo-imperialistic policies that will come at a high cost (both in monetary and social terms) to poorer countries. Granting patents for medicines against diseases such as HIV, malaria or cholera - so the argument goes - will make these medicines unaffordable for the large majority of people in developing countries and cause a widespread and despicable suffering there, whereas the additional profits of the pharmaceutical industry will be negligible compared to the rest of their total revenue.[4] Still, lobbyists of the pharmaceutical industry claim that these arguments are highly exaggerated and deliberately misleading. Due to price discrimination in different markets prices will not rise by a large amount, but the protection is needed to give security to pharmaceutical producers. Further, the demand structure for medicines is different in third world countries compared to developed countries. The demand for medicines against malaria is too small in developed countries to guarantee a sufficiently high investment in this market segment. Diwan and Rodrik (1989) substantiate this claim in a model. The widespread disagreement over the protection of intellectual property rights suggests that different countries and different groups within countries have divergent interests and that their politicians face very different incentives when they negotiate over intellectual property rights. This paper analyses what kind of agreements one can expect from biased politicians with well defined objective functions.

Although there is a rich literature that deals with the incentive effects patents have on the innovative activity in a closed economy, there is only a small literature that looks at the issue in open economies. Closed economy models of patents consider a social planner that wants to maximize domestic welfare over an infinite horizon. By granting a certain patent length, he will induce innovative activity. This, of course, comes at the prize of less consumer surplus, as by granting a patent the social planner suppresses competition on a potentially competitive market. In general, the politician's trade-off will have an interior solution that will imply a finite length of patent protection.[5]

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[4]See Chaudhuri (2004) for a detailed examination of this argument.

[5]An exception is Gilbert and Shapiro (1990).

Things might be more complicated in an open economy. The first paper to address this question is Deardorff (1994). Deardorff considers a world that is partitioned into a North that can engage in research and development activities and a South that cannot. Taking as a reference point a situation in which only the developed North has protection of property rights, he asks about the welfare effects of extending the North's property rights regime to the South. Deardorff is able to show that the welfare effects are ambiguous as they depend on the relative size of the South. Although he considers the welfare effects of different patent policies, he does not specify objective functions of governments. The analysis is only concerned with welfare and policies are rather described as exogenous shocks to an economic system.

Grossman and Lee (2005) go one step further and specify a dynamic general equilibrium model with two countries which can be taken again for North and South. Both countries are ruled by politicians that want to maximize national welfare over an infinite horizon. They do so by choosing a certain strength of patent protection that includes the time of protection as well as strength of it. Finally they derive a Nash equilibrium in patent protection, that has the following properties:

- In general, patent protection is too low in a world economy that consists of heterogeneous countries.

- The size of the inefficiency depends on the relative size of both countries.

- Global harmonization is neither a necessary nor a sufficient condition for global efficiency.

Despite the analytical complexity of the model the welfare properties of the cooperative and non-cooperative equilibria depend to a large degree on the inter-country external effect: a national policymaker does not take into account that an additional time unit of patent length will increase the probability of innovation not only for his home country, but will also generate benefits for the other country as well.

4.3   The Model in a Closed Economy

In this paper, we look at a world economy that consists of two separate and sovereign countries that are ruled by politicians with well defined objective functions. We relax, however, the assumption that politicians want to maximize national welfare, as we want to allow for the possibility, that national policymakers might value producers' profits

more or less than consumer surplus. If one looks at a closed economy, a politician that is biased towards one group of society will always induce an allocation that is inferior to the allocation a social planner would choose. Things might be different in an open economy, however, as we deal with two sources of inefficiency: On the one hand, there is an inter-country friction, as politicians do not take into account the effect of their policies on other countries, but on the other hand, there is an intra-country friction as well, as politicians try to cater to certain groups. We identify conditions under which these frictions amplify each other and under which conditions they attenuate each other. As it will turn out in the end, a biased national politician might increase global welfare, but does so at the expense of his own consumers.

In this respect, this chapter is closely related to the previous one, where we could show that an opportunistic domestic politician might indeed do better than a social planner who tries to maximize national welfare. The reason there was not this double coincidence of external effects, but rather the fact that the opportunistic politician by the mere virtue of being opportunistic could commit better to certain future policies.

To introduce the basic conflict between static and dynamic efficiency, we first look at a closed economy in autarky. In order to simplify the analysis and to derive explicit solutions, we do not discount future welfare, but assume a finite time horizon instead. Once we are confident that our maximization problem has an interior solution, this is not a severe restriction as it does not influence the quality of our derived properties.

We look at a partial market and allow for any demand structure. We assume that the protection of intellectual property rights gives the inventor an exclusive right to the innovation for a time t, such that he will be able to earn monopoly profits m.[6] During the time of protection, consumers will only reap a small consumer surplus from the innovation that we denote by c_S. After the protection expires, competition will drive down profits to zero and consumers will get a large consumer surplus c_L. We do, however, abstract from substitution effects between a new market and existing ones - something that can be taken into account in theories of optimal patent lengths, but would only blur our main points. Further, we assume that the producers have to bear a cost of their research activities $C(p(t))$.

With these assumptions, social welfare is given by:

$$W = p(t)(t(m + c_S) + (T - t)c_L) - C(p(t)) \tag{4.1}$$

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[6]This is indeed how patents work. In this paper however, we use the term intellectual property rigths as the term patents rather refers to industrial goods.

Depending on the actual length of protection t, welfare will be the probability $p(t)$ that an innovation occurs (which is of course a function of the time of patent protection) times the sum of consumer surplus and monopoly profits given a certain time of protection.

Aggregate welfare is a function of the chosen protection length t, which we take as choice variable of the policymaker. This implies that the politician maximizes the following objective function:

$$W = p(t)(t(\alpha m + c_S) + (T - t)c_L) - \alpha C(p(t)) \qquad (4.2)$$

Note that this objective function differs from the social welfare function only with respect to the parameter α. This parameter allows us to consider different types of politicians. If α equals one, the politician can be taken as a social planner who maximizes social welfare. If α is bigger than one, the politician is biased in favor of producers' interests, that is, he values monopoly profits more than consumer surplus. If α lies between zero and one, the politician favors consumers' interests over producers' interests. In the extreme case of $\alpha = 0$, he does not care about producers at all.[7] This simple parametrization has its microfoundation in models that allow for lobbying.[8] As we are interested in the effect of a given bias and not in the process of lobbying per se, we do not provide an explicit derivation of this parameter.

Finally, we have to specify the producer side. We assume that producers' profit function is given by:

$$\Pi(p) = pmt - \frac{1}{2}bp^2 \qquad (4.3)$$

Producers' revenue consists of the product of period monopoly profit m, the duration of the protection t and the probability that an invention actually occurs. In order to obtain the total profit one has to subtract the costs of research activities which are quadratic in the innovative activity p. We take a short term approach and assume that the entrepreneur can choose a probability p directly. This, admittedly simplistic, specification still allows us to capture the basic relationship between innovative activity and the strength of the patent regime. Innovative activity as captured in the parameter p also causes a convex cost, which we take to be quadratic in order to derive explicit

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[7] Indeed, $\alpha = 0$ can be taken as a consumer's utility function.

[8] See for example the seminal paper of Grossman and Helpman (1994).

solutions. Later on we will argue that this particular specification does not influence our results substantially. b denotes a cost parameter that we assume to be sufficiently big to guarantee an interior solution, i. e. $p < 1$.[9]

The entrepreneur maximizes his profit function by the choice of p. In equilibrium, firms will choose an optimal amount of innovative activity p, that is a function of t.

$$p = \frac{mt}{b} \tag{4.4}$$

Taking firms behavior into account, the politician faces the following maximization problem:

$$W = \frac{mt}{b} \left(t\alpha m + tc_S + (T - t)\, c_L \right) - \frac{1}{2} b \left(\frac{mt}{b} \right)^2 =$$

$$= \frac{mt}{b} \left(t\alpha m + tc_S + (T - t)\, c_L \right) - \frac{mt}{b} \left(\frac{mt}{2} \right) =$$

$$= \frac{mt}{b} \left(t\frac{\alpha m}{2} + tc_S + (T - t)\, c_L \right) \tag{4.5}$$

Maximizing over the political choice variable t leads to the following first order condition:

$$\frac{\partial W}{\partial t} = \frac{m}{b} \left(t\frac{\alpha m}{2} + tc_S + (T - t)\, c_L \right) + \frac{mt}{b} \left(\frac{\alpha m}{2} + c_S - c_L \right) = 0 \tag{4.6}$$

The first term captures the marginal benefit of a marginal increase of the invention probability, the second the marginal cost which includes the reduced consumer surplus. Looking at the second order condition provides some interesting insights as well:

$$\frac{\partial^2 W}{\partial t^2} = \frac{m}{b} (-2c_L + 2c_S + \alpha m) < 0 \tag{4.7}$$

Reformulating leads to:

$$condition\ 1 : c_L - c_S - \frac{\alpha m}{2} > 0 \tag{4.8}$$

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[9] We do not go into details, whether this profit function applies to one firm or the whole sector. For our purposes, it is sufficient to have a positive relationship between protection time t and innovative activity p.

We will make frequent references to this condition in what follows. The interpretation is straightforward and intuitive. If this condition is fulfilled, the policymaker values a large consumer surplus more than the sum of monopoly profits and the (small) consumer surplus in the monopoly case. In this case, he faces a trade-off: On the one hand he would like to keep the patent lengths as short as possible, on the other hand he has to take into account the incentive affect that a longer patent duration has on producers. Otherwise, the policymaker will always want to choose a patent duration that is as long as possible which means in terms of the model $t = T$. In other words, this condition is a necessary condition for an interior solution and later for the existence of non-trivial strategic interaction.

The first order condition

$$\frac{m}{b}\left(t\frac{\alpha m}{2} + tc_S + (T - t)\,c_L\right) + \frac{mt}{b}\left(\frac{\alpha m}{2} + c_S - c_L\right) = 0 \qquad (4.9)$$

can be rewritten as:

$$2t\left(c_L - c_S - \frac{\alpha m}{2}\right) = Tc_L \qquad (4.10)$$

which leads straightforward to proposition 1.

Proposition 1 *If condition 1 is fulfilled (politician values consumer surplus sufficiently strong), the politician will choose a patent length of:*

$$\mathbf{t}_N = \min\left[\frac{Tc_L}{2\left(c_L - c_S - \frac{\alpha m}{2}\right)}, T\right]$$

The comparative statics are straightforward: $\frac{\partial t_N}{\partial \alpha} > 0$. The more emphasis the politician puts on producers' interests, the longer the patent length he will choose. As $\alpha = 1$ describes a social planner, domestic welfare will be maximized by $\mathbf{t}_N = \frac{Tc_L}{2\left(c_L - c_S - \frac{m}{2}\right)}$. As it is globally true that $\frac{\partial^2 W}{\partial^2 t} < 0$ for all α, that fulfill condition 1, we can conclude that preferences are single peaked. This implies in particular in this context that for each politician and consumer there is exactly one t that maximizes his welfare and the further the actually chosen t is away from his preferred t, the less utility he will enjoy.[10]

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[10]Obviously, a consumer as an economic agent has an alpha of zero.

4.4   The Model in an Open Economy

As a next step, we will consider a world that consists of two countries which we will denote North and South respectively. For simplicity, we assume that only the North can create new products that can be protected by intellectual property rights [11] Further, we will make the assumption that markets can be separated and no arbitrage exists between the two markets. This is a necessary condition for different lengths of protection to be effective, otherwise monopoly prices in the market that is protected for a longer time will be driven down to the competitive level. We will distinguish two cases. First, we will derive the protection lengths in the North and the South, t_N and t_S, a social world planner would choose. Having obtained this normative benchmark, we will compare it to the Nash equilibrium that will result out of the interaction between politicians in the North and the South. We further assume that the innovative sector in the North can be described as in chapter 2.

4.4.1   World Social Planner

As a benchmark case we will look at the first best allocation a social planner would choose, if he wanted to maximize global welfare. We capture the different size of the southern market by a variable q, with $q > 0$. The social planner wants to maximize the sum of northern and southern welfare by choosing a patent length t_N and t_S respectively. Taking into account that northern producers maximize the following profit function:

$$\Pi\left(p\right) = pm\left(t_N + qt_S\right) - \frac{1}{2}bp^2 \tag{4.11}$$

which is maximized by:

$$p = \frac{m\left(t_N + t_S q\right)}{b} \tag{4.12}$$

the social planner's optimization problem can be stated as:

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[11]This might be a reasonably well description of reality. Grossman and Helpman (1991), for example, reports that approximately 95% of all research activity is carried out in only 15 countries.

$$W = \frac{(t_n + qt_S)\, m}{b} \left[(t_N + qt_S)\, \frac{m}{2} + t_N c_S + qt_S c_S + (T - t_N)\, c_L + (T - t_S)\, qc_L \right]$$
(4.13)

The first term in brackets captures the net profit (revenue minus costs) of the monopolist, the second two terms refer to the reduced (small) consumer surplus during the time the protection is in place in the North and the South. Finally, the large consumer surpluses consumers will get once the patent has expired enter the objective function as well. Maximizing this objective function over the two choice variables t_N and t_S leads us straightforward to two identical first order conditions that can be written as:[12]

$$t_N^* + qt_S^* = \frac{T(1+q)\, c_L}{2\left(c_L - c_S - \frac{m}{2}\right)}$$
(4.14)

where the asterisks denote the optimal values.

Proposition 2 **All combinations of t_N and t_S that fulfill $t_N^* + qt_S^* = \frac{T(1+q)c_L}{2\left(c_L - c_S - \frac{m}{2}\right)}$, maximize world welfare.**

This means, that world welfare is maximized by a set of combinations of t_N and t_S .Note that we did not take into account distributional considerations between North and South. The longer t_N, the higher the welfare southern consumers enjoy. In what follows, we will compare this optimal[13] benchmark allocation to the Nash equilibria, that result from national maximization problems in the non-cooperative solution.

4.4.2   Non-Cooperative Solution

In contrast to the previous section, we now want to study the effect a biased politician in the North has on the chosen level of intellectual property rights protection. Therefore the northern politician maximizes:

$$W_N = p(t_N, t_S)\left((t_N + qt_S)\, \frac{m}{2} + t_N c_S + (T - t_N)\, c_L \right)$$
(4.15)

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[12]Actually, both patent lengths are political choice variables. Maximization of the profit function will lead to two linearly dependent equations. An intuition for this result will be given below.

[13]Optimal refers to the maximisation problem of world welfare.

This bears some similarity with the politicians objective function in the closed economy, but differs in the inclusion of $qt_S \frac{m}{2}$, the additional profit the monopoly producer gets in the South, if his innovation is protected there. Note also, that the probability of an innovation depends now on the northern and the southern level of intellectual property rights protection.

As there are no new products developed in the South that will be protected by intellectual property rights, monopoly profits accrue only in the North and do not enter the southern politician's objective function that consequently contains only small and large consumer surplus:

$$W_S = p\left(t_N, t_S\right)\left(t_S q c_S + \left(T - t_S\right) q c_L\right) \tag{4.16}$$

Note also, that all consumer surpluses are multiplied by a factor q, as the South differs in size by a factor q. Firms in turn maximize:

$$\Pi\left(p\right) = pm\left(t_N + qt_S\right) - \frac{1}{2}bp^2 \tag{4.17}$$

which yields as a unique maximum:

$$p = \frac{m\left(t_N + qt_S\right)}{b} \tag{4.18}$$

Taking firms' behavior as given, the northern policymaker maximizes:

$$W_N = \frac{m\left(t_N + t_S q\right)}{b}\left(\left(t_N + qt_S\right)\frac{m}{2} + t_N c_S + \left(T - t_N\right)c_L\right) \tag{4.19}$$

whereas the southern politician maximizes the following objective function:

$$W_S = \frac{m\left(t_N + t_S q\right)}{b}\left(t_S q c_S + \left(T - t_S\right)q c_L\right) \tag{4.20}$$

Since t_N and t_S can only take on non-negative values, we maximize over a restricted domain (non-negativity constraint). Therefore the first order conditions for the politicians' maximization problems will be given by the following inequalities:

$$t_N\left(-2c_L + 2c_S + \alpha m\right) + t_S q\left(-c_L + c_S + \alpha m\right) + T c_L \leq 0$$

$$t_N \geq 0 \tag{4.21}$$

for the North and:

$$t_N \left(-c_L + c_S\right) + t_S \left(-c_L + c_S\right) 2q + qT c_L \leq 0$$

$$t_S \geq 0 \tag{4.22}$$

for the South.

Keeping in mind that both values have to be greater or equal to zero, we rewrite the first order conditions as:

$$\begin{bmatrix} 2c_L - 2c_S - \alpha m & q\left(c_L - c_S - \alpha m\right) \\ c_L - c_S & 2q\left(c_L - c_S\right) \end{bmatrix} \begin{pmatrix} t_N \\ t_S \end{pmatrix} \leq \begin{pmatrix} T c_L \\ qT c_L \end{pmatrix} \tag{4.23}$$

These first order conditions lead to the following kinked reaction functions:[14]

$$t_N = \max\left[\frac{T c_L}{\left(-2c_L + 2c_S + \alpha m\right)} - \frac{q\left(-c_L + c_S + \alpha m\right)}{\left(-2c_L + 2c_S + \alpha m\right)} t_S; 0\right] \tag{4.24}$$

$$t_S = \max\left[\frac{qT c_L}{\left(-c_L + c_S\right) 2q} - \frac{\left(-c_L + c_S\right)}{\left(-c_L + c_S\right) 2q} t_N, 0\right] \tag{4.25}$$

As long as t_N and t_S lie in the interior of the domain, the comparative statics are as expected:

$\frac{\partial t_S}{\partial t_N} < 0$

$\frac{\partial t_N}{\partial t_S} < 0$

This implies that t_N and t_S are strategic substitutes. This is due to the fact that there is a positive externality in the protection of intellectual property rights between both countries. If one country extends its property rights protection standard, this will induce more innovation which obviously has a positive effect on consumers in other countries. We will discuss this issue further when we compare the politics of intellectual property rights to trade policy in paragraph 5.

As the reaction functions are kinked and only piecewise linear, we cannot be sure that there is always an equilibrium and neither that this equilibrium is always unique or even interior. Before we proceed, we will clarify this issue in proposition 3. The

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[14]The Kuhn-Tucker conditions tell us that $t_N \geq 0$, if the first order condition is fulfilled with equality. $t_N = 0$ otherwise.

proofs for proposition 3 are not very insightful in itself and therefore delegated to the appendix.

Proposition 3 *There is always one and only one equilibrium.*

Still, there is the question whether the equilibrium will consist of t_N and t_S from the interior of their respective domains or whether one or both of the values lie on the border of the domain. Depending on the exogenous parameters q and α, there are indeed three different equilibria possible. One in which both countries guarantee protection (which we will call the interior equilibrium) and two corner equilibria in which one country decides not to protect intellectual property at all. In order to separate these equilibria, we define two cut-off levels for the variable q. Let us define:

$$q_N^{crit}\left(\alpha\right) = \frac{2(c_L - c_S)}{c_L - c_S - \alpha m} \tag{4.26}$$

and

$$q_S^{crit}\left(\alpha\right) = \frac{c_L - c_S}{2c_L - 2c_S - \alpha m} \tag{4.27}$$

Note that $q_N^{crit}\left(\alpha\right) > q_S^{crit}\left(\alpha\right)$ for all possible parameter constellations.

Proposition 4 *Depending on the exogenous parameters α and q, there can be three different equilibria. If $q_S^{crit}\left(\alpha\right) \leq q \leq q_N^{crit}\left(\alpha\right)$, there will be an interior equilibrium. If $q \geq q_N^{crit}\left(\alpha\right)$, there will be an equilibrium with $t_N = 0$ and $t_S > 0$. If $q \leq q_S^{crit}\left(\alpha\right)$, there is an equilibrium with $t_N > 0$ and $t_S = 0$*

As one can see, it depends crucially on the size of the South and on the northern politician's bias which type of equilibrium will be achieved. It turns out that the South is more likely to grant protection, the bigger it is. If it is relatively small ($q \leq q_S^{crit}$), it will opt for no protection. Then there is an intermediate range of values of q for which both countries will protect intellectual property rights. And finally, for a very big South, only the South will protect intellectual property rights in equilibrium. This is indeed in line with what economic intuition predicts. If the South is big, a marginal increase in its intellectual property rights' protection will have significant effects on the innovative activity. If the South is small, a marginal increase in the protection

will cause each individual consumer the same loss in consumer surplus, but give only little incentive effects to northern producers. Indeed, if the South is sufficiently big as compared to the North, then the North will stop to grant patent protection as it knows that its effects are relatively insignificant.[15] Put differently, there is a classical free rider problem.

Since we have defined the critical cutoff levels q^{crit} as functions of α, we can do some insightful comparative statics with respect to this parameter as well. In particular, we can derive that

$$\frac{\partial q_N^{crit}(\alpha)}{\partial \alpha} = \frac{2\alpha(c_L - c_S)}{(c_L - c_S - \alpha m)^2} > 0 \tag{4.28}$$

and

$$\frac{\partial q_S^{crit}(\alpha)}{\partial \alpha} = \frac{\alpha(c_L - c_S)}{(2c_L - 2c_S - \alpha m)^2} > 0 \tag{4.29}$$

The more biased the northern politician is in favor of producers' interests, the bigger the range of q for which one arrives at the equilibrium with no protection in the South and the smaller the range of q for which one arrives at an equilibrium with protection only in the South. As the rational southern politician anticipates that a very biased northern counterpart has intrinsically high incentives to grant high protection, his own incentives to do so are deceased in equilibrium. Put differently, the size of the South and the bias of the politician are forces that pull in opposite directions. A large South will make it more likely for its politician to grant protection; a high bias of the Northern politician less likely.

In what follows we will first concentrate on the interior Nash equilibrium, that is described by the following system of equations:

$$\begin{bmatrix} 2c_L - 2c_S - \alpha m & q\left(c_L - c_S - \alpha m\right) \\ c_L - c_S & 2q\left(c_L - c_S\right) \end{bmatrix} \begin{pmatrix} t_N \\ t_S \end{pmatrix} = \begin{pmatrix} Tc_L \\ qTc_L \end{pmatrix} \tag{4.30}$$

If condition 1 is fulfilled, the determinant of the coefficient matrix will be greater than zero and the system will have a unique solution. Now we are in a position to

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[15]One can ask if this is a realistic possibility. However, even in terms of the model, it is not. The South has to be "much" bigger than the North in order for this equilibrium to appear.

characterize the equilibrium rigorously We do so in the following proposition.

Proposition 5 *If $q_S^{crit} < q < q_N^{crit}$, there is an interior solution and the equilibrium values of t_N and t_S are given by:* $t_N^{neq} = \frac{Tc_L[(2-q)(c_L-c_S)+\alpha qm]}{(c_L-c_S)(3c_L-3c_S-\alpha m)}$ *and* $t_S^{neq} = \frac{Tc_L[(2q-1)(c_L-c_S)-\alpha qm]}{q(c_L-c_S)(3c_L-3c_S-\alpha m)}$.

The equilibrium comparative statics are as expected:

$$\frac{\partial t_N}{\partial \alpha} > 0 \tag{4.31}$$

$$\frac{\partial t_S}{\partial \alpha} < 0 \tag{4.32}$$

The more weight the northern politician puts on the welfare of producers, the longer the chosen protection length. The southern politician, however, will anticipate this bias and accommodate in the equilibrium with a lower protection length. Again, this is due to the fact, that protection levels are strategic substitutes at the interior of their respective domains:

$$\frac{\partial t_N}{\partial q} < 0 \tag{4.33}$$

$$\frac{\partial t_S}{\partial q} > 0 \tag{4.34}$$

The bigger the South, the more protection of intellectual property rights it will grant. The bigger the southern market, the bigger the incentive effect on northern producers, if the south decides to grant a marginally longer protection length.

If we plug $t_S = 0$ into the reaction function of the North and $t_N = 0$ in the reaction function of the South, we can characterize the corner equilibria in the following proposition.

Proposition 6 *If $q > q_N^{crit}$, there is a corner equilibrium with $t_N = 0$ and* $t_S = \frac{Tc_L}{2(c_L-c_S)}$.

Proposition 7 *If* $q < q_S^{crit}$*, there is a corner equilibrium with* $t_N = \frac{Tc_L}{2\left(c_L - c_S - \frac{\alpha m}{2}\right)} >$
0 *and* $t_S = 0$.

As it is determined by the exogenous parameters at which equilibrium we will arrive, we cannot make meaningful welfare comparisons between the corner equilibria and the interior equilibrium.

4.4.3   Comparison between the Global Welfare Maximizing Allocation and the Interior Nash-Equilibrium

If we compare the optimal allocation that we derived in section A to the Nash equilibrium, we have to keep in mind, that we have to weight North and South according to their respective market sizes. This implies in particular that we have to compare the welfare maximizing set of t_N^* and t_S^*

$$t_N^* + qt_S^* = \frac{Tc_L\,(1+q)}{(2c_L - 2c_S - m)} \tag{4.35}$$

to the Nash equilibrium values t_N^{neq} and t_S^{neq}. Note also that we have to weight the southern protection length with a factor q as the southern market is q times as large as the North.

$$
\begin{aligned}
t_N^{neq} + qt_S^{neq} &= \frac{Tc_L\,[(2-q)\,(c_L - c_S) + \alpha qm]}{(c_L - c_S)\,(3c_L - 3c_S - \alpha m)} + q\frac{Tc_L\,[(2q-1)\,(c_L - c_S) - \alpha qm]}{q\,(c_L - c_S)\,(3c_L - 3c_S - \alpha m)} = \\
&= \frac{Tc_L\,(1+q)}{(3c_L - 3c_S - \alpha m)} \tag{4.36}
\end{aligned}
$$

Therefore, the Nash equilibrium will provide insufficient protection, if

$$t_N^* + qt_S^* = \frac{Tc_L\,(1+q)}{(2c_L - 2c_S - m)} > \frac{Tc_L\,(1+q)}{(3c_L - 3c_S - \alpha m)} = t_N^{neq} + qt_S^{neq}$$

$$(3c_L - 3c_S - m) > (2c_L - 2c_S - \alpha m)$$

$$c_L - c_S - m + \alpha m > 0. \tag{4.37}$$

which has to be true for any partial market.

We state the result in the following proposition.

Proposition 8   *The interior Nash equilibrium provides always less than optimal protection of intellectual property rights.*

Knowing that the non-cooperative equilibrium provides insufficient protection of intellectual property rights we can ask next how the bias of the politician will affect the equilibrium values of property rights protection. While it is a very robust result for closed economy models that the welfare is decreasing in the bias of the politician, we can show that this is not the case in this open economy model.

Proposition 9 *As the Nash equilibrium implies always insufficient protection of intellectual property rights, a biased politician in the North can improve world welfare.*

Proof: Taking the derivative of $(t_N^{neq} + q t_S^{neq})$ yields:

$$\frac{\partial \left(t_N + q t_S\right)}{\partial \alpha} = \frac{m \left(1 + q\right) T c_L}{\left(3 c_L - 3 c_S - \alpha m\right)^2} > 0 \tag{4.38}$$

The result might be puzzling at first glance, but has a very straightforward interpretation. It is indeed true for a closed economy that overall welfare is non-increasing in the politician's bias towards one group. In this open economy model, however, we have to deal with two frictions. On the one hand, there is the politician's bias, on the other hand, there is the positive externality between both countries which leads to insufficient patent protection in the Nash equilibrium. If the politician is biased towards producers, he is intrinsically motivated to compensate this external effect as giving more income to producers (distributive goal) and strengthening the patent protection (efficiency goal) is achieved by the use of the same policy instrument and, moreover, by the use in the same direction.

4.5   Trade Policy and Policy of Intellectual Property Rights

Before we finally conclude, we want to make some remarks on the relationship between policies that deal with customs and policies that deal with intellectual property rights.[16] Whereas customs used to be the dominant subject in negotiations between sovereign states and international organizations, their impact decreased significantly. This is certainly due to the fact that one saw a large scale elimination of trade barriers in the last fifty years. Recently, however, intellectual property rights became a controversial subject of international negotiations, that led even to the creation of the World Intellectual Property Organization - a suborganization within the United Nations/World Trade Organization system of trade facilitating negotiations. Given the increasing importance of the subject, it seems worthwhile to consider similarities and differences between both policies and especially the incentives of policymakers that are in charge of carrying out the respective negotiations. Obviously, political interventions and political constraints play an important role in international economics. It was indeed the area of trade policy where political economy emerged as a field, since the observed structure of customs was indeed very different from the free trade equilibria proposed by economists.

A very striking and obvious difference between both policies is their different time structure. Trade policy can be described reasonably well in a static framework. What is relevant for current trade is the current custom structure. One can assume that the future customs regime has indeed a negligible impact on the current volume of trade. This is not true for intellectual property rights. The expected future protection of intellectual property rights will influence the level and structure of research activity of entrepreneurs at present times. In short, the policies of intellectual property rights can only be understood in a dynamic framework. Consequently, the paper proposed a simple version of it. Once we deal with dynamic policies and dynamic political constraints, time consistency becomes a problem. By its very nature granting intellectual property rights involves issues of time inconsistency, as even in a closed economy a policymaker has incentives to suspend the protection and thereby increase the domestic welfare as a whole once the innovation is made. Whereas this problem can be solved in the domestic case by delegation to independent courts, the problem might be more severe

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[16]Fora general discussion on the importance of intellectual property rights and international trade see Maskus (1995) and Keller (2004).

in an international world of sovereign states. On the one hand a policymaker from a low innovation country might have even lower incentives to enforce the protection of a property right when the profits accrue to stakeholders in foreign countries (in particular if it involves a net transfer from a poor to a rich country, which is often the case). On the other hand there is no international court that has the necessary authority to force sovereign states to enforce previously agreed property rights standards.

Aside from the issues involved with the time consistency the chosen policy and the problem of monitoring states enforcement activities, governments incentives depend for both types of policy on the size of the country as well. These differences are quite striking and we will argue in terms of the model.

It is a very robust result in trade theory that a sufficiently small country as a whole can never gain by introducing a custom, whereas there is a positive optimal custom for a country if the country is sufficiently big. By introducing a custom, the government reduces indeed domestic consumer welfare (negative effect), but it also decreases demand on world markets and thereby the price of the respective good, which improves the countries terms of trade (positive effect). If the country has a non-negligible size, the second effect dominates the first one. This might explain among other factors why we do not observe free trade world wide, but rather a Nash equilibrium with positive customs.

The incentives are different with intellectual property rights. A large country has always an incentive to grant a certain degree of intellectual property rights protection, as its market size will have an impact on the research activity of the innovators. On the other hand, a small country has strong incentives to act as a free rider. By granting intellectual property rights protection in an open economy, the policymaker of the small country gives little additional incentives to further innovation, but imposes a significant cost on his citizens.

In other words, the Nash equilibrium in customs would converge to the free trade (and therefore welfare maximizing) equilibrium, if the size of each individual country becomes infinitely small. The Nash equilibrium in property rights protection would move further away from the welfare maximizing allocation as the number of countries becomes infinitely small. These considerations are true for politicians that want to maximize national welfare.

If we compare what happens in the case of non-welfare maximizing politicians, the results are strikingly different as well. Let's first have a look at the case of trade policy. A politician that acts in favor of domestic producers will always want a custom

structure that is higher than the country's optimal custom. Increasing the custom will benefit domestic producers and hurt domestic consumers, whereas the loss for the consumers will be bigger than the gain for the producers. The effect on the rest of the world is ambiguous. Things are quite different if we consider a policymaker that is in favor of the producers who need protection of their property rights. Again he will cause welfare losses to domestic consumers and gains for domestic producers, but he will exert an unambiguously positive external effect on foreigners, whether they are producers or consumers. Foreign producers will benefit from the increased protection, foreign consumers from the higher likelihood of new innovations.

Nevertheless one should also bear in mind that not only market size matters. Certainly there are countries with small markets, but large industries that need intellectual property rights protection. In a truly dynamic setting one should also consider that the amount of research undertaken in a country depends on the protection of property rights. The implementation of intellectual property rights standards then might work as a signal for regime change in itself.[17]

4.6 Conclusion

We explored the degree of intellectual property rights protection that will be chosen by politicians that do not maximize social welfare but cater to certain interest groups. We compared the allocations in open and closed economies to the welfare maximizing allocations and derived some interesting results. While we showed that it is a robust finding that a Nash equilibrium in protection standards does provide less than optimal protection, we also showed that a politician that favors producers interests over consumers interests will increase world welfare as a whole, but does so at the expense of his own consumers. Whereas in a closed economy a biased politician is welfare reducing, this does not have to be true in an open economy.

As in the previous paper, we could show that the strategic interaction between states can shape their policies and alter them in non-trivial ways. While a biased politician will always reduce welfare in a closed economy, he can increase world welfare in an open economy. The result is caused by the double coincidence of two frictions. On the one hand, there is a positive externality in patent protection that is not fully

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[17]Branstetter et al. (2005) report exactly this finding in a cross-country study. Lai (1998) discusses similar issues.

exploited between two sovereign states in a non-cooperative equilibrium. On the other hand the politician gives different weights to different groups' welfare. We could show in a very simple and robust setting that the two frictions will attenuate each other: Put differently, adding the political friction increases efficiency as a whole.

4.7 Appendix

Proof of proposition 2:

Maximizing the world welfare function over t_N and t_S yields:

$$\frac{\partial W}{\partial t_N} = \frac{m}{b}\left[(t_N + qt_S)\frac{m}{2} + t_N c_S + qt_S c_S + (T - t_N)c_L + (T - t_S)qc_L\right] + \frac{m(t_N + t_S q)}{b}\left[\frac{m}{2} + c_S - c_L\right] =$$

$$= -2t_N\left(c_L - c_S - \frac{m}{2}\right) - 2qt_S\left(c_L - c_S - \frac{m}{2}\right) + (1 + q)Tc_L$$

$$\frac{\partial W}{\partial t_S} = \frac{qm}{b}\left[(t_N + qt_S)\frac{m}{2} + t_N c_S + qt_S c_S + (T - t_N)c_L + (T - t_S)qc_L\right] + \frac{m(t_N + t_S q)}{b}q\left[\frac{m}{2} + c_S - c_L\right] =$$

$$= q(-2t_N\left(c_L - c_S - \frac{m}{2}\right) - 2qt_S\left(c_L - c_S - \frac{m}{2}\right) + (1 + q)Tc_L) =$$

$$= -2t_N\left(c_L - c_S - \frac{m}{2}\right) - 2qt_S\left(c_L - c_S - \frac{m}{2}\right) + (1 + q)Tc_L$$

which is the same as above.

Proof of proposition 3a and 3b:

In order to proof this proposition, we proceed in three steps. First, we assume the existence of an interior equilibrium, taking the results from proposition 4 as given. Then we ask under which parameter constellations this equilibrium will emerge and derive cutoff levels for the parameters. In a next step, we show that there is a unique correspondence between the ranges of the parameters and the equilibrium that will emerge, i.e. we show that there is always a unique equilibrium.

We know from proposition 4, that t_N^{neq} and t_N^{neq} in the interior equilibrium are given by:

$$t_N^{neq} = \frac{Tc_L((2 - q)(c_L - c_S) + \alpha qm)}{(c_L - c_S)(3c_L - 3c_S - \alpha m)}$$

$$t_N^{neq} = \frac{Tc_L[(2q - 1)(c_L - c_S) - \alpha qm]}{q(c_L - c_S)(3c_L - 3c_S - \alpha m)}$$

$t_N^{neq} = 0$ implies that $(2 - q)(c_L - c_S) + \alpha q m < 0$.

Let us define a correspondence $\Gamma_N(\alpha)$, such that for all $q \in \Gamma_N(\alpha)$, $\Gamma_N(\alpha) = \left\{ q \leq \frac{2(c_L - c_S)}{c_L - c_S - \alpha m} \right\}$.

If $q \in \Gamma_N(\alpha)$, then there exists one Nash equilibrium with $t_N^{neq} = 0$, otherwise $t_N^{neq} > 0$,

Let us now define a correspondence $\Gamma_S(\alpha)$ such that $\Gamma_S(\alpha) = \left\{ q \geq \frac{c_L - c_S}{2c_L - 2c_S - \alpha m} \right\}$, if $q \in \Gamma_N(\alpha)$, then there exists a Nash equilibrium with $t_S^{neq} = 0$, otherwise $t_S^{neq} > 0$

Now, we can conclude, if q is neither covered by the correspondence $\Gamma_N(\alpha)$ nor by the correspondence $\Gamma_S(\alpha)$, then it has to be true that t_N and t_S have to be greater than zero.

Finally, the correspondences have critical border values for which fulfill the weak inequality with equality. Let us define these critical q as q_N^{crit} and q_S^{crit}.

$q_N^{crit} = \frac{2(c_L - c_S)}{c_L - c_S - \alpha m}$

$q_S^{crit} = \frac{c_L - c_S}{2c_L - 2c_S - \alpha m}$.

We can see that

$q_N^{crit} = \frac{2(c_L - c_S)}{c_L - c_S - \alpha m} > \frac{c_L - c_S}{2c_L - 2c_S - \alpha m} = q_S^{crit}$

as

$4c_L - 4c_S - 2\alpha m > c_L - c_S - \alpha m$

$3c_L - 3c_S - \alpha m > 0$

for all values.

Since $q_N^{crit} > q_S^{crit}$ for all values, it can never happen that more than one equilibrium will emerge under any parameter constellation.

QED.

Proof of proposition 4:

Applying Cramer's rule to the equation system delivers:

$$t_N = \frac{Tc_L(2q(c_L-c_S))-qTc_Lq(c_L-c_S-\alpha m)}{(2c_L-2c_S-\alpha m)(2q(c_L-c_S))-(c_L-c_S)(q(c_L-c_S-\alpha m))} =$$

$$= \frac{Tc_L((2(c_L-c_S))-q(c_L-c_S-\alpha m))}{(2c_L-2c_S-\alpha m)(2(c_L-c_S))-(c_L-c_S)((c_L-c_S))} =$$

$$= \frac{Tc_L((2-q)(c_L-c_S)+\alpha qm)}{(c_L-c_S)(3c_L-3c_S-\alpha m)}$$

$$t_S = \frac{(2c_L-2c_S-\alpha m)(qTc_L)-(c_L-c_S)(Tc_L)}{(2c_L-2c_S-\alpha m)(2q(c_L-c_S))-(c_L-c_S)(q(c_L-c_S-\alpha m))} =$$

$$= \frac{Tc_L[(2q-1)(c_L-c_S)-\alpha qm]}{q[(2c_L-2c_S-\alpha m)(2(c_L-c_S))-(c_L-c_S)((c_L-c_S))]}$$

Part II

Models of Inefficient Economic Policies

Chapter 5

Rent Seeking, Lobbying and Special Interest Group Politics

In the final section of this dissertation we will turn our attention away from inefficiencies that arise in open economies and look at issues of efficient governance on a more abstract level. Political economy arose as a subject when economists tried to identify frictions in the political process that cause economic policies to go away from optimal outcomes. One reason why this could happen was politicians' taste for re-election with uninformed voters, another reason was the influence special interest groups exert. There are many different ways how special interest groups can influence policy outcomes. In chapter 4, we already assumed an objective function of a politician that made him biased in favor of one group of domestic residents.

In what follows, we want to present two conceptually different possibilities how special interest groups can exert influence, namely rent seeking and lobbying. Then we want to stress the difference between the two approaches with a focus on rent seeking. Further, we want to discuss a new approach undertaken by Brandauer and Englmaier (2004). At the end of this chapter we want to have clarity on what models of rent seeking can explain and what they cannot explain. In the final chapter of this dissertation, we present a model that looks on rent seeking as a means of redistribution in a voting model.

5.1   Lobbying

As already mentioned, one way for special interest groups to influence political decision making is lobbying.[1] Whereas rent seeking is wasteful, because the channel how to buy influence is wasteful, the actual process of lobbying in itself is not wasteful. One can distinguish two main lines of the lobbying literature: the first one is lobbying by the provision of information, the second one is lobbying by donations of money. The first type of models involve some uncertainty about the true state of the world. The special interest group, however, has better information than the policymaker about the true state of the world, as it is more familiar with a particular policy issue. In this setting of asymmetric information, the special interest group can use its informational advantage in order to influence the chosen policy to its advantage. Typically, these models predict that this informational advantage of the lobbying group will increase the equilibrium welfare of the lobby, but at the expense of a decrease in overall welfare relative to the first best equilibrium under perfect information. If we compare the situation of asymmetric information with lobbying to one, where lobbying is not possible, we can see that lobbying increases welfare in general, but still does not reach the first best solution.[2] It is in our context important to stress that the channel of influence, namely the provision of information, does not cause any inefficiencies. The inefficiencies arise when the politician decides to choose a policy, even if the politician tries to maximize social welfare.

If we consider models where lobbyists try to influence policymakers by donations of money (sometimes called campaign contribution models), similar considerations apply. These models assume a politician that wants to maximize social welfare, but at the same time wants to attract donations. This gives lobby groups the possibility to offer the politician campaign contributions contingent on the chosen policy. The equilibrium allocation is jointly efficient for the politician and the interest group and has the nice property that the politicians behavior can be described as maximizing a weighted sum of national welfare and special interest group's welfare.[3] Again, it is important to stress that the mode of influence seeking in itself is not inefficient. The interest groups give a transfer to the politician who can use the money for his purposes. The inefficiency arises

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[1] A good review of the literature on lobbying can be found in Grossman and Helpman (2001).

[2] Austen-Smith (1993,1995) developed two classical contributions on that issue. Recent surveys can be found in Grossman and Helpman (2001) and Austen-Smith (2004).

[3] This is by the way the microfoundation of the politician's objective function we used in Chapter 4. The politicians objective function that we derived in Chapter 3 as the outcome of a probabilistic voting behavior can be motivated with this lobbying function as well.

once the politician chooses the policy. This model implicitly assumes that politicians are no pure welfare maximizers, but also have a taste for campaign contributions.[4]

5.2   Rent Seeking and Contest Success Functions

The term rent seeking was coined by Tullock (1967) and further developed by Krueger (1974). Buchanan used the term rent seeking to describe all unproductive activities that are undertaken in order to earn a return that lies above the market return. If entrepreneurs develop new products and thereby can earn a return that lies above the market return, society as a whole will gain by that activity. If entrepreneurs, however, collude and wastefully spend resources in order to obtain regulations that restrict competition on a potentially competitive market, then society as a whole will certainly lose. It is exactly this kind of activity that is called rent seeking. Afterwards some authors used the term rent seeking in order to describe the efforts undertaken to get a monopoly position, others used the term to describe an even broader range of activities in which the political process is used in order to restrict economic efficiency.[5] These activities can include (but are not limited to) lobbying for customs, restricting access on markets, lobbying for overly strict quality regulation that discriminate against other producers or fostering agricultural subsidies. When we talk about the costs of these inefficient regulations, we must not only talk about the immediate efficiency loss, that is caused by them, but - as it was Tullock's original insight - we also have to take into account the expenditures undertaken by lobbyists in order to get their favorable regulation. If there is an outright bribe for a regulator, this is a pure redistribution of income and not waste. If one takes into account that lobbyists could do something productive instead of trying to influence lawmakers or regulators, then we have to take all these efforts and expenditures as waste. Tullock also suspected that the efforts in order to get the favorable regulation could get as big as the rent to be gained. This is to say all of the rent is wasted in the competition for it. The important difference to lobbying models is that the activity of rent seeking in itself is unproductive. Regardless of the political decision the expenditures that are made are already regarded as waste. If the policy that is finally chosen is inefficient, the costs of this policy have to be added

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[4]Politicians' taste for campaign contributions were endogenized by Grossman and Helpman (1996). We discuss this model in chapter 6.2..Austen-Smith (1987) derived similar conclusions in a probabilistic voting model.

[5]See Drazen (2000) p. 335 for a discussion of this issue. For the sake of clarity, Bhagwati (1982) proposed the term Directly Unproductive Activities.

to ones of the contest. In other words rent seeking is socially costly for two reasons: on the one hand it implies an inefficient competition, on the other hand the competitors want to gain something that decreases society's welfare as a whole.[6]

5.3   Game Theoretic Models of Rent Seeking

Tullock(1980) was the first one who provided a simple and tractable model of rent seeking with solid game theoretic foundations. In particular, he assumed that each participating group could spend an amount of m_i in the contest. The probability p that this group will succeed is given by the so called contest success function, that he assumed to be of a simple logit form:

$$p_i = \frac{f_i\left(m_i\right)}{\sum\limits_{j=1}^{n} f_j\left(m_j\right)} \tag{5.1}$$

Although Tullock did not provide an explicit microfoundation for this contest success function, Skaperdas (1996) showed that this and only this contest success function could be derived from first principles. One can obtain insightful solutions, if one assumes the following simple form of the contest success function:

$$p_i = \frac{m_i}{\sum\limits_{j=1}^{n} m_j} \tag{5.2}$$

If all N players value the rent equally, there is a symmetric equilibrium, in which each player spends:

$$m = \frac{N-1}{N^2} R \tag{5.3}$$

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[6]A more subtle point is that more competition among rent seekers never improves welfare, as it is indeed this competition that is unproductive. Competition among lobbyists can improve welfare under certain circumstances. If the political decision is one-dimensional and the lobbies are on opposite sides of the welfare maximizing policy, these efforts will offset each other in equilibrium. Put differently, the addition of a second lobby can improve welfare. Note that this is due to the assumption that the direct transfer of money from the lobbyist to the politician is not wasteful.

Further lobbying models assume that a binding agreement can be signed between the politician and the lobbying group, whereas rent seeking models assume the opposite, namely that no explicit contract on the rent can be written.

and total waste D will be given by:

$$D = \sum m = N * \frac{N-1}{N} R = \frac{N-1}{N} R \tag{5.4}$$

Since $\frac{\partial D}{\partial N} > 0$, the more competition there is (as measured by an increase in N), the more waste will be produced.

As the expenditures for the contest are generally regarded as waste, the public choice scholars were especially interested in how different characteristics of the players and the technologies will affect the equilibrium amount of waste. One could show that more participants caused more waste in general. On the other hand risk aversion decreases the amount of resources spend in the contest.[7] Related to that, one could find that in the presence of risk aversion wealth effects influence the willingness to spend resources in the contest: the smaller the expenditures in comparison to the total wealth, the higher the willingness to spend resources in the contest. [8]

Nevertheless there are still some open and unexplored questions in the theory of rent seeking. The first one concerns the consequences of inter-group heterogeneity. If rent seeking is undertaken by groups and groups consist of individuals that value the rent differently, who will be decisive and will he opt to carry out the contest himself or will he prefer to delegate to strategically to someone else? This question is explored by Brandauer and Englmaier (2004) and we will sketch the main results briefly in the following paragraph.[9] Furthermore, we have so far no theoretical model that looks at the rent seeking contest as a subgame of a bigger game or to speak more concretely we have no model that looks at rent seeking as part of a political process where economic agents can vote and engage in rent seeking activities. We propose a theoretical framework to shed some light on this issue in the last chapter of this dissertation.

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[7]See Hilman and Katz(1984).

[8]Baye at al.(1993) provided further insights on a more general level when they looked at rent seeking contests as a special form of all pay auctions.

[9]This paper is part of thie dissertation of Florian Englmaier.

5.4   A Model of Delegation in Contests

In a paper with the same title we recognize that contests often take place between different groups. It seems quite natural that different group members value the rent differently according to their preferences. If farmers lobby for agricultural subsidies, the value of the subsidy may be different to different farmers depending on the actual structure of their farms. If import competing industries lobby for protection from foreign imports, similar considerations apply.

We assume that the heterogeneity within a group i can be captured in a single parameter α_{ij}, such that individual j 's utility function can be written as:

$$u_{ij} = \frac{m_i}{m_i + m_{-i}}\alpha_{ij}R - m_i \tag{5.5}$$

This intra group heterogeneity gives rise to two conflicts. On the one hand group members might wish to spend different amounts of resources in the contest. On the other hand, group members will have to choose one appointee who will carry out the rent seeking activities. As the appointee will act according to his own preferences once he is in office, this gives rise to a delegation problem.

As the conflict of interest takes place in a one-dimensional policy space (the amount of spending), we can show that the individual with the median valuation of the rent will be decisive. The interesting question is whether he will want to participate in the contest on his own or wishes to delegate someone with different preferences into the contest.

Although, one can never do better in a non-strategic decision problem by delegating a decision to someone with preferences different to one's own, this might be different in a strategic environment as the choice of a delegate can be regarded as a commitment to a high or low level of spending. In order to explore the effects of strategic delegation, we look at three different situations.

First, we look at a situation of one-sided delegation, that is only one group has the ability to delegate while the other group is stuck with an appointee. We can show that the delegation decision depends solely on the medians type and the type of the opponent from the other group. If the median faces someone that values the rent higher than he does, he will decide to send an appointee into the contest who values the rent less than he does. If he faces somebody who values the rent less than he does, he will

delegate to someone who is even more radical than he is. If he faces someone who values the rent as he does, he will decide to act on himself.

Second, if we look at a situation of sequential delegation, the first moving median will decide to delegate to someone who values the rent higher than he does. The second moving median will accompany by delegating to someone who values the rent less than he does. This result does not depend on whether the first or the second moving median is more radical and has a straightforward interpretation: Sending someone radical in the contest can preempt the opponent, as it serves as a commitment device to spend a lot. As the opponent is also concerned with the generated waste, he will decrease his expenditures by sending someone less radical into the contest.

Third, we look at a situation of simultaneous delegation. It turns out that the more radical median will delegate to the most radical type available, whereas the other median will delegate to someone less radical. This effect of extreme polarization is independent of the initial differences in the median's valuation. Put differently, we arrive again at a generically asymmetric equilibrium.

Finally, we can show that the equilibria in games of delegated rent seeking imply generically less waste. Roughly speaking, this is due to the fact that delegation tends to reinforce initial differences, which in turn tends to decrease the amount of resources spent in the contest. Therefore, we can conclude that delegation is desirable from a social planner's point of view.

5.5 Some Empirical Evidence on the Costs of Rent Seeking

There is a rich literature that tries to measure the costs of rent seeking activities.[10] Although these studies find in general that the costs of rent seeking are significant, the estimated costs vary significantly from some percentage of GDP up to half of the GDP depending on the definition of rent seeking. The seminal paper by Krueger (1974) looked at rent seeking India and Turkey and estimated that 7 percent of the Turkish GDP are wasted in rent seeking activities. For India she looked at the effects of regulations in the trade sector and came up with the surprisingly high number of 15 percent of GDP as wasted in rent seeking contests. The highest number was obtained

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[10]For a recent survey see Mueller(2003). Mueller does not restrict himself to a particular definition of rent seeking, but allows for a broad interpretation of the terms.

by Laband and Sophecleus (1988) for the US where they estimated 50 percent of the GDP as wasted into rent seeking. The high figure is certainly true to their very broad definition of rent seeking. They include for example all advertising expenditures rent seeking activities. A recent and prominent contribution by Goldberg and Maggi (1999) estimated for the US that politicians behavior in trade policy can be described as if they are willing to exchange one dollar in campaign contributions for 50 dollars in national welfare.[11] This is considerably smaller, but still evidence of the presence of rent seeking activities.[12]

So, if there is so much evidence of the presence of welfare reducing rent seeking, it is natural to ask, why is it not eliminated in democracies?[13] If politicians and bureaucrats can get exchanged, why do voters not get rid of politicians that tolerate rent seeking contest or even foster their emergence? We turn to that issue in the next paper where we combine the contest success function model of rent seeking that abstracts from all institutional details with an equally institution free model of voting. We will show that even in this institution free world we can show that rent seeking activities will emerge as an equilibrium outcome of the interaction between voters and politicians.

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[11] They do not estimate a contest model of rent seeking, but a model of lobbying that was proposed by Grossman and Helpman(1994) and is based on a menue auction, not a contest success function.

[12] One should not take these numbers too literally, as it is a matter of definition what activities are unproductive. An activity can only be qualified as unproductive, if one can be sure that the same means can be used for something productive. As Tollison(1996) puts it: "To argue that one can be wealthier without locks and lawyers implies that there are fesaible reforms in behavior that will reduce such costs. ...The lock and the lawyer are only wasteful to the extent that these ressources can be feasibly reallocated to more productive ueses." (p. 514)

[13] Austen-Smith(1991) raised the same question in the context of trade policy. If individuals are rational enough to make a "correct" consumption choice, why are they not able to stop inefficient trade policies.

Chapter 6

Rent Seeking and Electoral Accountability

6.1 Introduction

Rent seeking received a lot of attention by economists. Following Tullock's seminal contribution (1980) a rich literature emerged that tried to characterize equilibria in rent seeking contests and identified how different characteristics of the players will affect the equilibrium amount of resources spent in the rent seeking contest. No attention, however, was paid to politicians' incentives to create rents different groups of society compete for. In general, there has to be someone, for example a politician, who decides whether to give certain rents or suppress their creation. In many cases a politician has various possibilities to influence the size of the rent. Nevertheless, rent seeking parts of society as well as non-rent seeking parts have the possibility to vote and in particular they have the possibility to vote rent creating politicians out of office. This paper studies the interaction of politicians' incentives to create rents and voters' incentives to vote for rent creating politicians and to engage in rent seeking contests. In other words, the aim of this paper is to study the endogenous emergence of rents in democracies.[1]

The previous section presented already ample evidence that there are a lot of rent seeking activities going on in democracies. At the same time, however, there is the claim that electoral accountability leads to cleaner forms of government. While the public discussion is rather focussed on corruption, rent seeking activities should be taken into account as well. Whereas corruption is defined as illegal and therefore has

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[1]Throughout the paper we use the terms democracy and electoral accountability synonymously.

to take place in an environment of imperfect observability, rent seeking activities are not illegal and can be observed to a large degree. Still, there is no doubt that systems of governance should be designed as to avoid the emergence of rent seeking activities. Therefore this paper asks under which conditions democratic governance can eliminate wasteful rent seeking activities.

This paper looks at a institution free world. We take a policy space in which the median voter is decisive, so that we do not have to specify special voting procedures. Furthermore, we describe the rent seeking activities with a simple contest success function and do not go institutional details. This abstraction allows us to see clearly what characteristics of the population will lead to the emergence of rent seeking contests. Certainly, this clarity comes at the price of a lack of institutional details. This implies in particular that we cannot say anything about which institutional characteristics will make the emergence of rent seeking contests likely. However, we show that electoral accountability provides indeed the right incentives for politicians not to create rent seeking contests in their economies. At the same time, the paper also shows that there are circumstances under which these incentives are not strong enough and even in democracies under perfect observability politicians will be able to get into office that are inclined to give away rents in contests. This can happen as rent seeking contests can be used as a means of redistributive policy (although a very inefficient one). If there are large asymmetries in the cost sharing of the rents which can be created, this will unambiguously increase politicians' incentives to create rent seeking contests. Although all voters are perfectly aware of the fact that rent seeking contests are a particular inefficient instrument of redistributive policy, they can be an equilibrium outcome of the interaction between voters and politicians. Further we show that more vested interests in society decrease voters incentives to vote for rent creating politicians. This seems surprising since rent seeking models that do not account for the endogeneity of the rent creating process predict the opposite. The more players are involved in a rent seeking contest, the more resources will be spent in the contest, i. e. the larger the produced waste. We show that the anticipation of this waste will reduce voters incentives to vote for rent creating politicians ex-ante. While we certainly do not want to claim these classical results are wrong, we provide some caveats for their applicability. Once we consider the possibility that voters control the creation of rents indirectly through the voting mechanism, their incentives are altered in a non-trivial way. This result might explain why democracies seem to enjoy cleaner forms of governance.

In Section 6.2 we will relate this chapter to the existing literature; then we will present the model and the time structure in 6.3 and 6.4.. In the following section 6.5

we consider two asymmetric groups that engage in the rent seeking contest and briefly discuss issues of time consistent behavior. Finally in 6.6, we look at A groups but restrict the dimension of heterogeneity to one. Then we do some insightful comparative statics on the number of groups. We conclude in section 6.7.

6.2   Related literature

As already mentioned in Chapter 5, there is a rich empirical literature that shows that rent seeking activities are indeed more than a theoretical possibility, but cause a significant welfare loss to economies. From a theoretical point of view, there are few papers that look at the emergence of rent creating behavior in the political process. It is certainly true that politicians can create rents and give them away in contests. Still, if rent seeking activities are clearly inefficient, one should ask why voters do not make use of the voting mechanism to suppress the rent creating behavior of politicians. One of the first papers that deals with this issue is the seminal paper by Peltzman (1976). Peltzman looks at a regulated industry where a politician can set a price. Naturally consumers want the price to be as low as possible, whereas producers want the price to be as close to the monopoly price as possible. Although Peltzman does not formulate an explicit model of voting, he assumes that the politicians' behavior can be captured in an objective function that approximates his taste for reelection and campaign contributions. Peltzman then shows that the politician will choose a price between the competitive market price and the monopoly price. The politician faces a trade-off: on the one hand he wants to attract as much campaign contributions as possible (by setting a high price), on the other hand he wants to get as much consumer's votes as possible (by setting a low price). His optimal choice is an interior solution that sets the price somewhere between the monopoly price and the competitive price.

Baye et al.(1993) go one step further and calculate the maximum revenue a government can obtain in the rent creating process, but they still do not consider that a government is chosen by voters, and that voters have the possibility to control the rent creating process on this stage already. Finally, Hilman and Ursprung (2000) ask under which conditions rent seeking activities will lead to the economic decline of a nation.

There is also a large literature that deals with lobbying as a part of the political process. This is in particular true, once one wants to look at the interaction of lobbying and voting. Grossman and Helpman (1996) formalize this in a model with a re-election

seeking politician, informed voters, impressionable voters and lobbies. The politicians'
only desire is to get re-elected, informed voters know the policy that maximizes social
welfare, whereas impressionable voters do not. They can however be persuaded by
non-informative, but costly campaign adds. In order to pay for these adds, politicians
need campaign contributions by lobbies that can offer contributions contingent on
certain policies being enacted. In equilibrium, a policy will be chosen that does not
maximize social welfare, but the joint welfare of politician and interest group and the
politician will collect a positive amount of campaign contributions. This paper follows
Grossman and Helpman by specifying a voting procedure as well, but describes the
socially wasteful activity as rent seeking, not as lobbying.

6.3   The Model

Let us consider the following three stage game. In period one voters elect a politician
and voters can observe how efficient the politician is in collecting resources that are
spent in the rent seeking contests and how much he is willing to do so. Then the
politician sets the size of the rent by maximizing his objective function. Finally different
parts of societies decide, if they want to participate in the rent seeking contest and what
amount of resources they want to spent in the contest. Let us now first describe the
politician's behavior, then we turn to the rent seeking groups.

We assume that the politician's objectives can be described by the following objec-
tive function

$$\Pi\left(R\right) = \gamma \sum_j m_j\left(R\right) - \frac{1}{2a}R^2 \tag{6.1}$$

The first term captures the sum of all resources m, that are spent in the rent seeking
contest by the contestants. We allow for the possibility that the politician is not able
to appropriate all of them, but only a fraction γ, with $0 < \gamma \leq 1$. Of course, the
absolute amount of resources spent in the contest will depend on the chosen size of
the rent R.[2] The rent however does not only generates revenue, it also causes some

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[2]From a theoretical point of view, one may ask why we do not allow for the politician to choose
the optimal mechanism to extract revenues from the economy. It is easy to see that the efficient
mechanism would be an English auction in this case. However, this critique applies to all of the rent
seeking literature. It is probably more difficult or even illegal to give rents away in auctions. Still,
Ekelund and Tollison(1981) interpret mercantilism exactly like that. Another discussion of efficient

convex costs, which we assume to be quadratic. This captures the distortion created by the rent, which includes the immediate efficiency loss as well as the induced rent seeking behavior of other members of the same society. Politicians differ with respect to the importance they attach to the allocative costs of the rent and we assume that this parameter is observable by voters. Therefore a politician's type will be given by a and consequently voting takes place over a. A politician with a high a does not care a lot about the distortions created by the rent and is inclined to create rather high rents. If a approaches 0, the politician will put an infinitely high weight on the costs of the rent and refrain from the creation of rents.

Turning to the rent seekers we assume that society consists of groups that participate in the rent seeking contest and one group that contains all individuals that do not participate in the rent seeking contest in any form. We do not discuss why some individuals are able to form groups while others are not.[3] Furthermore, we assume in the first part of the paper that groups are able to overcome the free-rider problem within the group, that means the group can collect the amount of resources spent in the contest in the form of equal contributions by all members. In what follows, we will first look at a good that is a private good for the group as a whole, then we will look at a rent that can be considered as a group specific public good. In the case of the rent as a private good, each group member's utility function will be given by:

$$u_i = \frac{1}{n_i}(p_i\left(m_{-i}, m_i\right)\alpha_i R - m_i - \beta_i R - \frac{1}{2}R^2) \tag{6.2}$$

An individual group member's utility is given by the probability $p_i\left(m_{-i}, m_i\right)$ that his own group wins the rent which is of course a function of his own group's contributions and the other group's contributions. i denotes the group specific characteristics. We allow for the possibility that different groups value the rent differently and capture this heterogeneity in the group specific parameter α_i. We have to subtract from this expected revenue the resources the group spends in the contest m_i. Furthermore, the rent creates some distributive costs that are linear and capture the opportunity costs of the rent. Groups differ in the degree they participate in the costs by a group-specific parameter β_i. Note that $\sum \beta_i \geq 1$ is a sufficient condition for rent seeking to be inefficient for the economy as a whole. Of course, groups also face the allocative costs of the rent, that we captured in the last quadratic term. As the above utility function

transfers in poliuical economy can be found in Rodrik(1995), who discusses this issue at the example of trade policy.

[3]Olson(1965) is the classic reference on this issue.

describes individual and not group utility, the term in brackets is divided by the number of group members n_i.

Next, we have to be more specific about the contest success function $p_i(m_i, m_{-i})$. We assume a logit function in which the contributions of the groups enter linearly:

$$p_i(m_i, m_{-i}) = \frac{m_i}{\sum m_j} \tag{6.3}$$

Therefore, the individual utility function becomes:

$$u_i = \frac{1}{n_i}(\frac{m_i}{\sum m_j}\alpha_i R - m_i - \beta_i R - \frac{1}{2}R^2) \tag{6.4}$$

If an individual does not belong to a group that participates in the rent seeking contest, his utility will be given by:

$$u_i = \frac{1}{n_i}(-\beta_i R - \frac{1}{2}R^2) \tag{6.5}$$

Obviously, this individual will not participate in the gains of the contest, but only in the costs and it is easy to see that this individual will never want any rent seeking contests to emerge. Note also that, $\frac{\partial u_i}{\partial R} = 0$ for one and only one R and $\frac{\partial^2 u_i}{\partial R^2} < 0$ for all R. Therefore preferences are single-peaked. This implies in particular, that in any voting process over R or any variable $x = x^{-1}(R)$ with $\frac{\partial x}{\partial R} > 0$ or $\frac{\partial x}{\partial R} < 0$ for all R, the median agent will be decisive.[4]

Before we proceed to the analysis, we introduce the individual objective function for the case of the rent as a public good as well. It will be given by:

$$u_i = p_i(m_{-i}, m_i)\alpha_i R - \frac{1}{n_i}(m_i - \beta_i R - \frac{1}{2}R^2) \tag{6.6}$$

The only difference in this objective function and the objective function in the private goods case lies in the expected gains of the rent: they do not have to be divided by the number of group members, but can be enjoyed by all group members simultaneously.

In what follows, we look at the following three stage game. In period 1, voters will have the possibility to elect a politician. Since we assume perfect observability throughout the model, the election is essentially a choice of the politicians type a. In other words, voters are fully aware of the type of politician they elect.

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[4]The propensity to create rent seeking contests fulfills the conditions made on x.

In period 2, the politician influences the size of the rent different fractions in society compete for. He does so by maximizing his objective function over R.

Finally, in period 3, different fractions of society compete for the rent that can be gained in an ordinary Tullock style rent seeking contest by choosing an amount of m.

6.4 Two Asymmetric Rent Seeking Groups

6.4.1 The Rent as a Private Good

As it is in particular interesting to analyze how different characteristics or different numbers of groups influence the equilibrium amount of rent seeking in an economy, we want to study both effects in isolation to show their effects in a more pronounced way. First of all, we want to consider the case of asymmetric groups. In order to keep the analysis as simple as possible, we restrict ourselves to two groups, that we denote 1 and 2 respectively. This means society is partitioned in a way such that among all groups only two will participate in the rent seeking contest. We do not restrict the number of all individual players that can form a group. This will be of some importance once we are in a position to analyze the voting process. Further we assume that all groups are sufficiently well organized, such that the group is able to collect the optimal amount of rent seeking resources from its members, i. e. the group is able to solve the free rider problem perfectly. In what follows, we will first look at a rent that is a private good, i.e. group members have to share the rent among themselves. Then we will consider the case where the rent is a group specific public good. In the case of a private good the individual utility function is:

$$u_i = \frac{1}{n_i}(p\left(m_i, m_{-i}\right)\alpha_i R - m_i - \beta_i R - \frac{1}{2}R^2) \tag{6.7}$$

if he is member of a group that participates in the contest, and

$$u_i = \frac{1}{n_i}(-\beta_i R - \frac{1}{2}R^2) \tag{6.8}$$

otherwise. In order to determine the subgame perfect equilibrium of the game, we proceed by backward induction. Note that on the third stage of the game both groups

only decide about how much to invest in the rent seeking contest. As the size of the rent is already set, the cost are also given. Therefore the group's reduced maximization problem is given by:

$$u_1 = \frac{m_1}{m_1 + m_2}\alpha_1 R - m_1 \qquad (6.9)$$

for group 1. And

$$u_2 = \frac{m_2}{m_1 + m_2}\alpha_2 R - m_2 \qquad (6.10)$$

If both groups, one and two, maximize their objective functions, this yields the following first order conditions.

$$\frac{m_2}{(m_1 + m_2)^2}\alpha_1 R - 1 = 0 \qquad (6.11)$$

for group 1. And

$$\frac{m_1}{(m_1 + m_2)^2}\alpha_2 R - 1 = 0 \qquad (6.12)$$

for group 2. These two equations implicitly define two reaction functions.Solving this system of two equations, gives us the following equilibrium values of m_1 and m_2.

$$m_1 = \frac{\alpha_1\alpha_2}{(\alpha_1 + \alpha_2)^2}\alpha_1 R \qquad (6.13)$$

for group 1. And similarly for group 2:

$$m_2 = \frac{\alpha_1\alpha_2}{(\alpha_1 + \alpha_2)^2}\alpha_2 R \qquad (6.14)$$

Note that the optimal amount of resources spent in the contest is independent of the cost share. This is due to the fact that fighting for the rent does not influence the size of the rent. Further, the group's expenditures are proportional to the valuation. Note also that the amount of resources the group as a whole spends is independent of the number of its members. As the good is a private - and therefore rival - good, m is chosen in a way that maximizes the whole groups' expected profit of the contest. Since there are no distribution costs within the group, there is exactly one m, that

maximizes the group's expected profit independent of the number of its members. This result obviously depends on the assumption that the group is able to solve its free rider problem. Since we assume perfect information on all stages of the game, the politician who is to move on stage two of the game can perfectly predict the amount of rent seeking expenditures that are induced by a certain size of the rent. This allows him to calculate his expected revenues:

$$\gamma \left(m_1 \left(R \right) + m_2 \left(R \right) \right) \tag{6.15}$$

Taking into account that the rent will also create some distortions his maximization problem can be stated as:

$$\Pi(R) = \gamma(m_1(R) + m_2(R)) - \frac{1}{2a}R^2 = \gamma \frac{\alpha_1 \alpha_2}{(\alpha_1 + \alpha_2)} R - \frac{1}{2a}R^2 \tag{6.16}$$

which has as a unique solution:

$$R^* \left(a \mid \alpha_1, \alpha_1, \gamma \right) = \frac{\alpha_1 \alpha_2}{\alpha_1 + \alpha_2} \gamma a \tag{6.17}$$

This function maps the politician's type into the rent size, taking the characteristics of the rent seeking groups as given. One can see what determines the politicians taste for creating rent seeking contests. On the one hand it depends on his own characteristics: The more able he is in extracting bribes from the rent seeking groups and the less he values distortions created by the rent, the higher he will set the rent. On the other hand the rent seekers characteristics will also influence the size of the rent. Two factors determine the size: first it is the absolute valuation of both players, but at the same time it is also the relative valuation. Roughly speaking, the politician can extract more rents from two groups that value the rent by the same amount than from two very asymmetric players. This in turn will deliver a unique relationship between the elected politicians type and the rent seekers' payoff , which can be expressed as a function $u_i(a \mid \alpha_i, \beta_i, \alpha_j, \beta_j)$. In other words, we have a unique relationship between the politicians type and the individual payoff in equilibrium, given one's own characteristic and the characteristics of one's opponent.

$$u_1(a \mid \alpha_1, \beta_1, \alpha_2, \beta_2, \gamma) = \frac{1}{n_1}(p \left(m_1, m_2 \right) \alpha_1 R - m_1 - \beta_1 R - \frac{1}{2}R^2 =$$

$$= \frac{1}{n_1}(R[\frac{m_1}{m_1 + m_2}\alpha_1 - \beta_1 - \frac{\alpha_1^2\alpha_2}{(\alpha_1 + \alpha_2)^2}] - \frac{1}{2}R^2) =$$

$$= \frac{1}{n_1}(\frac{\alpha_1\alpha_2\gamma a}{\alpha_1 + \alpha_2}[\frac{m_1}{m_1 + m_2}\alpha_1 - \beta_1 - \frac{\alpha_1^2\alpha_2}{(\alpha_1 + \alpha_2)^2}] - \frac{1}{2}[\frac{\alpha_1\alpha_2\gamma a}{\alpha_1 + \alpha_2}]^2) \qquad (6.18)$$

As one can easily see, the utility function of an individual whose group participates in the rent seeking contest is quadratic in the politicians type a. Therefore it is maximized by:

$$a_1^* = \arg\max\{\frac{1}{n_1}(\frac{\alpha_1\alpha_2\gamma a}{\alpha_1 + \alpha_2}[\frac{m_1}{m_1 + m_2}\alpha_1 - \beta_1 - \frac{\alpha_1^2\alpha_2}{(\alpha_1 + \alpha_2)^2}] - \frac{1}{2}[\frac{\alpha_1\alpha_2\gamma a}{\alpha_1 + \alpha_2}]^2)\}$$

$$= \frac{1}{\alpha_1\alpha_2\gamma}\left[\alpha_1^2 - \beta_1(\alpha_1 + \alpha_2) - \frac{\alpha_1^2\alpha_2}{\alpha_1 + \alpha_2}\right] \qquad (6.19)$$

and respectively for the members of group 2

$$a_2^* = \arg\max\left(\frac{1}{n_2}(\frac{\alpha_1\alpha_2\gamma a}{\alpha_1 + \alpha_2}[\frac{m_2}{m_1 + m_2}\alpha_1 - \beta_2 - \frac{\alpha_1\alpha_2^2}{(\alpha_1 + \alpha_2)^2}] - \frac{1}{2}[\frac{\alpha_1\alpha_2\gamma a}{\alpha_1 + \alpha_2}]^2)\right) =$$

$$= \frac{1}{\alpha_1\alpha_2\gamma}\left[\alpha_2^2 - \beta_2(\alpha_1 + \alpha_2) - \frac{\alpha_1\alpha_2^2}{\alpha_1 + \alpha_2}\right] \qquad (6.20)$$

Next we have to specify the optimal voting decision, for negative maximands of the above equation. We do so in the following lemma.

Lemma 1 *Individual preferences are single peaked with respect to a, therefore the agents optimal voting decision is given by:*

$$\mathbf{a}_1^* = \max\left[\frac{1}{\alpha_1\alpha_2\gamma}\left[\alpha_1^2 - \beta_1(\alpha_1 + \alpha_2) - \frac{\alpha_1^2\alpha_2}{\alpha_1 + \alpha_2}\right]; 0\right] \text{ and}$$

$$\mathbf{a}_2^* = \max\left[\frac{1}{\alpha_1\alpha_2\gamma}\left[\alpha_2^2 - \beta_2(\alpha_1 + \alpha_2) - \frac{\alpha_1\alpha_2^2}{\alpha_1 + \alpha_2}\right]; 0\right]$$

As u_i is quadratic and therefore single-peaked with respect to a, the median voter will be decisive.

A proof can be found in the appendix. Naturally, groups that do not participate will never vote for a politician that will create rents, i. their preferred choice of a is $a^* = 0$.

If groups participate in the rent seeking contest, it is easy to see that the individually optimal choice of a has the following properties:

$$\frac{\partial a_1^*}{\partial \alpha_1} > 0 \text{ for } \alpha_2 > \tfrac{1}{2}$$

The higher ones own valuation of the rent, the more inclined one is to vote for a politician that is corrupt and will indeed create rents. A sufficient condition for this result is $\alpha_2 > \tfrac{1}{2}$.

$$\frac{\partial a_1^*}{\partial \alpha_2} < 0$$

If one faces an opponent group however, that values the rent highly, one's incentives to vote for politicians' with a high propensity to create contests decrease as one knows that the opponent is willing to fight hard for the contested rent.

$$\frac{\partial a_1^*}{\partial \beta_1} < 0.$$

The higher the share of the costs created by the rent that one has to bear, the smaller the size of the rent one wants to be created

$$\frac{\partial a_1^*}{\partial \gamma} < 0.$$

The more efficient politicians are in collecting the resources that are spent in the contest, the higher voter's incentives to vote for a politician that takes care of the costs of the rent seeking activities. If a politician is efficient in appropriating rent seeking resources, this makes the contest relatively cheap for him and he wants to create comparatively bigger rents. Rational voters anticipate that in their voting decision. Note also that γ does not influence the decision whether one wants rent seeking contests or not, but it influences merely their size.

The same properties hold vice versa for a_2^* as well. It is easy to see that players that will not participate in the rent seeking contest will have an optimal a of zero as they cannot participate in the contest, but have to bear some of its costs.

Lemma 2 *A subgame perfect equilibrium will consist of a voting decision* $a_i\left(\alpha_1, \alpha_2, \beta_1, \beta_2, \gamma\right)$ *of each member of society, a rent* $R\left(a, \alpha_1, \alpha_2\right)$ *and resources spent in rent seeking* $m_1\left(R, \alpha_1, \alpha_2\right)$ *and* $m_2\left(R, \alpha_1, \alpha_2\right)$.

Note that this is not a full characterization of the equilibrium, as it only defines the optimal decision rules depending on the games fundamentals, i. e. the characteristics of the players. In order to specify which politician will get elected we have to be more explicit about the majorities in society. We will distinguish two cases. As preferences are quadratic with respect to a the median agent of the population will be decisive.

In order to determine what type of politician will get elected, one has to determine the median voters group. If the median voter belongs to the group that does not gain from rent seeking, voting will indeed bring a politician into office who will not create rent seeking contests. Otherwise, the median voter decides over the degree of corruption. Let us now for notational reasons and without loss of generality assume, that the median voter lies in group 2. Therefore we can summarize our findings in the following proposition:

Proposition 1 *Proposition 2 ´The median voter will elect a politician of type* a, *such that* $\mathbf{a}_{med}^* = \max\left[\left(\frac{1}{\alpha_1 \alpha_{med}\gamma}\boldsymbol{\alpha}_{med}^2 - \boldsymbol{\beta}_{med}\left(\alpha_1 + \alpha_{med}\right) - \frac{\alpha_1 \alpha_{med}^2}{\alpha_1 + \alpha_{med}}\right), \mathbf{0}\right]$. *This implies an equilibrium rent size* $R = \max\begin{bmatrix} \frac{1}{\alpha_1 + \alpha_2}\left(\frac{1}{\alpha_1 \alpha_{med}\gamma}\alpha_{med}^2 - \\ \beta_{med}\left(\alpha_1 + \alpha_{med}\right) - \frac{\alpha_1 \alpha_{med}^2}{\alpha_1 + \alpha_{med}}\right); 0 \end{bmatrix}$ *and an equilibrium amount of waste (total amount of expenditures)* $D = m_1 + m_2 = \max\begin{bmatrix} \frac{\alpha_1 \alpha_2}{(\alpha_1 + \alpha_2)^2}\left(\frac{1}{\alpha_1 \alpha_{med}\gamma}\alpha_{med}^2 - \\ \beta_{med}\left(\alpha_1 + \alpha_{med}\right) - \frac{\alpha_1 \alpha_{med}^2}{\alpha_1 + \alpha_{med}}\right); \ 0 \end{bmatrix}$.

In particular, this implies the following: If the non-rent seeking groups have a majority in society, simple majority voting will not bring a rent creating politician into office. As these groups will only participate in the costs of, but not in the gains from the rent seeking contest, they will never vote for the emergence of a rent seeking contest. If the median lies in one of the two groups that might benefit from the emergence of rent seeking contests, he might choose a positive a. Note that this does not imply that he will do so necessarily. His optimal decision depends on his own and his opponents

characteristics. The comparative statics are the same as above, for all points where the
optimal decision of the median voter is differentiable.

Next, we want to see, if there are conditions, under which no group will vote for
a politician that is known to create rents. If we can identify such conditions, this
will allow us to make an even stronger statement about the emergence of rent seeking
contests in the economy, since our results will no longer depend on the applicability of
the median voter theorem.

Neither members of group 1 nor members of group two will gain from voting for a
rent creating politician, if their utility function is maximized by a negative a_i^* , i.e.:

$$\frac{1}{\alpha_1\alpha_2\gamma}\left[\alpha_1^2 - \beta_1(\alpha_1+\alpha_2) - \frac{\alpha_1\alpha_2^2}{\alpha_1+\alpha_2}\right] \le 0 \tag{6.21}$$

for group 1. And

$$\frac{1}{\alpha_1\alpha_2\gamma}\left[\alpha_2^2 - \beta_2(\alpha_1+\alpha_2) - \frac{\alpha_1^2\alpha_2}{\alpha_1+\alpha_2}\right] \le 0 \tag{6.22}$$

for group 2.A Remark on Time InconsistencyIt is worth mentioning that there might
be situations in which a group ex ante will be against all rent seeking contests, i.e.
$p(m_i, m_{-i})\alpha_i R(a) - m_i - \beta_i R(a) - R(a)^2$is maximized by $a = 0$. But ex-post it will
be willing to participate in the contest. This is true for all α_i, that fulfill the following
inequalities at the same time.

$$\alpha_i^2 - \beta_i(\alpha_i+\alpha_{-i}) - \frac{\alpha_i\alpha_{-i}^2}{\alpha_i+\alpha_i} \le 0 \tag{6.23}$$

(ex-ante against the contest)

$$\alpha_i \ge 0 \tag{6.24}$$

(ex-post willing to participate)

Once there is a rent creating politician in office, the group will nevertheless partici-
pate in the rent seeking contest. Since the group can no longer avoid the creation of the
rent and the costs associated with it, the best it can do is to participate in the context
and thereby trying to capture some of the gains from the rent. This shows the possi-
bility that groups which are ex-ante against the creation of any rents might be driven
(i.e. after the election of a rent creating politician) into rent seeking contests. As we

assumed majority voting, rent seeking contests will only emerge, if already ex-ante a majority of voters wants that to happen. Still, even in this case the majority of agents willing to participate in the rent seeking contest might further increase. This underlies again the crucial role of electoral accountability in trying to prevent rent seeking activities in an economy. The above mentioned problem might even be more severe, if the political process is better described in other forms, where also minorities have the possibility to bring their favored politician into power. Under these circumstances, a minority of the society might force larger parts into rent seeking behavior.

6.4.2 The Rent as a Group Specific Public Good

Next we want to analyze what happens, if the rent is not a private, but a group specific public good, that can be consumed by all group member without rivalry in consumption. As already mentioned, the individual utility function will take on the following form:

$$u_i = p\left(m_i, m_{-i}\right)\alpha_i R - \frac{1}{N_i}(m_i - \beta_i R - \frac{1}{2}R^2) =$$

$$= \frac{m_i}{m_i + m_{-i}}\alpha_i R - \frac{1}{N_i}(m_i - \beta_i R - \frac{1}{2}R^2) \tag{6.25}$$

for both groups. Again we can solve the game by backward induction. At the final stage group 1 maximizes:

$$u_1 = \frac{m_1}{m_1 + m_2}\alpha_1 R - \frac{1}{N_1}m_1 \tag{6.26}$$

Similarly:

$$u_2 = \frac{m_1}{m_1 + m_2}\alpha_2 R - \frac{1}{N_2}m_2 \tag{6.27}$$

This yields the following optimal expenditures spent in the contest:

$$m_1 = \frac{\alpha_1\alpha_2 N_1 N_2}{(\alpha_1 N_1 + \alpha_2 N_2)^2}\alpha_1 N_1 R \tag{6.28}$$

$$m_2 = \frac{\alpha_1\alpha_2 N_1 N_2}{(\alpha_1 N_1 + \alpha_2 N_2)^2}\alpha_2 N_2 R \tag{6.29}$$

In contrast to the previous case of rents with private good nature, group size matters in the case of rents as group specific public goods. It influences the optimal expenditures in the same way as the group specific valuation does.On stage two the politician again maximizes:

$$\Pi(R) = \gamma(m_1(R) + m_2(R)) - \frac{1}{2a}R^2 = \gamma\frac{\alpha_1\alpha_2 N_1 N_2}{(\alpha_1 N_1 + \alpha_2 N_2)}R - \frac{1}{2a}R^2 \tag{6.30}$$

which is maximized by:

$$R^* = \frac{\alpha_1\alpha_2 N_1 N_2}{\alpha_1 N_1 + \alpha_2 N_2}\gamma a \tag{6.31}$$

Turning to the first stage of the game and plugging R into the individual utility function, voters of group 1 have to choose an a_1^*, that maximizes the following function:

$$u_1\left(a \mid \alpha_1, \beta_1, \alpha_2, \beta_2, \gamma\right) = \frac{\alpha_1 N_1 \alpha_2 N_2 \gamma a}{N_1 \alpha_1 + N_2 \alpha_2}\left[\frac{m_1}{m_1 + m_2}\alpha_1 N_1 - \beta_1 - \frac{\alpha_1^2 N_1^2 \alpha_2 N_2}{(\alpha_1 + N_2\alpha_2)^2}\right] - \frac{1}{2}\left[\frac{\alpha_1 N_1 \alpha_2 N_2 \gamma a}{N_1 \alpha_1 + N_2\alpha_2}\right]^2 \tag{6.32}$$

which is maximized by:

$$a_1^* = \arg\max\left\{\frac{\alpha_1 N_1 \alpha_2 N_2 \gamma a}{N_1\alpha_1 + N_2\alpha_2}\left[\frac{m_1}{m_1 + m_2}\alpha_1 N_1 - \beta_1 - \frac{\alpha_1^2 N_1^2 \alpha_2 N_2}{(\alpha_1 + N_2\alpha_2)^2}\right] - \frac{1}{2}\left[\frac{\alpha_1 N_1 \alpha_2 N_2 \gamma a}{N_1\alpha_1 + N_2\alpha_2}\right]^2\right\}$$

$$= \frac{1}{N_1 N_2\alpha_1\alpha_2\gamma}\left[\alpha_1^2 N_1^2 - \beta_1(\alpha_1 N_1 + \alpha_2 N_2) - \frac{\alpha_1^2 N_1^2 \alpha_2 N_2}{\alpha_1 N_{1+}\alpha_2 N_2}\right] \tag{6.33}$$

Let us now again assume that the median lies in group 2, then we can summarize our findings in the following proposition.

Proposition 3 If the rent is a public good, the median voter will be decisive again. His optimal choice will be:

$$\mathbf{a} = \max\left[\left(\frac{1}{N_1 N_2\alpha_1\alpha_2\gamma}(\boldsymbol{\alpha}_2^2\mathbf{N}_2^2 - \boldsymbol{\beta}_2\left(\alpha_1 N_1 + \alpha_2 N_2\right) - \frac{\alpha_1\alpha_2 N_1 N_2}{\alpha_1 N_1 + N_2\alpha_2}\right), \mathbf{0}\right]$$

It is noteworthy, that the question whether the rent has the character of a public or a private good does not affect whether there will be rent seeking contests or not on

stage three. It only influences the absolute size of the rent. Note however, that the public good character can increase or decrease the equilibrium size of the rent.

6.5   n Symmetric Groups

6.5.1   The Rent as a Private Good

In order to keep the analysis tractable, we restrict the groups' asymmetry to one form, namely differences in the cost participation β_i. But we assume that $n_i = n$ and normalize $\alpha_i = 1$ for all groups. Furthermore, we denote the total number of groups with A. Therefore we still can consider non-heterogeneous groups, but avoid the problems of multiple equilibria that can arise with $A > 2$ players and heterogenous valuations of the rent or unequal group sizes. Again, we will first have a look at a rent that is a private good:

$$u_i = \frac{1}{n_i}[\frac{m_i}{\sum m_i}R - m_i - \beta_i R - \frac{1}{2}R^2] \tag{6.34}$$

We will consider the same setting with three periods: in a first period, each group is allowed to vote for a politician with a known and observable type parameter a. Once in office, the politician endogenously determines the size of the rent. Afterwards, all A groups engage in a rent seeking contest, where each group decides how many resources to spend in the contest. Again we solve the game by backward induction. The optimal amount of resources spent in the rent seeking contest is given by:

$$m_1^* = \frac{A-1}{A^2}R \tag{6.35}$$

and a total amount of rent seeking expenditures of:

$$D = \sum_{i=1}^{A} m_i = \frac{A-1}{A}R \tag{6.36}$$

Although players are heterogenous in their cost sharing of the rent, they will spend the same amount of resources in the rent seeking contest. This is due to the fact that the size of the rent is already fixed at this stage of the game. Nevertheless, at the

first stage of the game, which can be interpreted as a voting over the size of the rent, heterogeneity of the agents will matter crucially.

In stage two, the elected politician maximizes the amount of resources he can extract from the rent seeking parties, but will also take into account the distortions created by the rent as before, i. e. he maximizes:

$$\Pi = \sum_{j}^{n} \gamma m_j(R) - \frac{1}{2a}R^2 = \gamma \frac{A-1}{A}R - \frac{1}{2a}R^2 \tag{6.37}$$

which has as a unique solution:

$$R = \gamma \frac{A-1}{A}a \tag{6.38}$$

This gives us a direct relation between the politicians type and the rent he will create once he is in office. It is easy to see that:

$$\frac{\partial R}{\partial A} > 0 \tag{6.39}$$

This means the more fragmented society is, the higher he will set the rent. The result corresponds to what economic intuition predicts: Consider a rent of a given size. The distortion costs will not be influenced by the number of groups that will eventually compete for the rent (This is not true for the distributive costs, which are not paid by the politician). As competition for the rent gets more fierce as the number of rent seekers increases this will indeed lead to more resources spent in the contest and therefore vice versa more rent extraction of the rent setting politician. As in the previous case, the product of rent extracting capability and distortion valuation determines the absolute size of the rent. Further:

$$\frac{\partial R}{\partial \gamma} > 0 \tag{6.40}$$

Again, we have the property that rent seeking contests are relatively cheap for efficient politicians.

In the first stage of the game, voters will have to decide about their preferred type of politician. Therefore each group, respectively each group member, maximizes:

$$u_i(a, \beta_i, \beta_{-i}, A, N) = \frac{m_i}{\sum m_i} R - m_i - \beta_i R - \frac{1}{2} R^2 =$$

$$= \frac{1}{A} \alpha \gamma \frac{A-1}{A} - \left(\frac{A-1}{A^2} - \beta_i \right) \alpha \gamma \frac{A-1}{A} - \alpha^2 \gamma^2 \frac{(A-1)^2}{A^2} \qquad (6.41)$$

as preferences are quadratic with respect to a, the median agent will be decisive again. His utility function will be maximized by:

$$a^*_{med} = \frac{A}{(A-1)} \frac{1}{\gamma} \left(\frac{1}{A^2} - \beta_i \right) \qquad (6.42)$$

This implies the following proposition:

Proposition 4 *If all groups participate equally in the costs of the rent, no group will favor the emergence of rent seeking contests in the economy.*

Proof: If all groups participate equally, $\beta_i = \frac{1}{A}$ for all i. Then the optimal a^* will be zero for all groups.

The equilibrium level of rent seeking activities and therefore the equilibrium size of the rent will be determined by the median voters β_i. As one can see, rent seeking contests will only emerge in an economy as the result of interaction between voters and politicians, if there is some asymmetry in the costs. Roughly speaking, only if the median group participates to a lesser extent in the costs of the rent seeking contest than the average citizen, one can expect rents as the outcome of an interaction between voters and politicians.

Proposition 5 *If $\beta^{med} < \frac{1}{A^2}$, the median voter will gain from the emergence of rent seeking contests in equilibrium. The equilibrium can be characterized by a degree of corruption $a^*_{med} = \frac{A}{(A-1)} \frac{1}{\gamma} \left(\frac{1}{A^2} - \beta_{med} \right)$, a rent size $R = \left(\frac{1}{A^2} - \beta_{med} \right)$ and an equilibrium amount of waste, i.e. resources spent in rent seeking $D = \frac{A-1}{A} \left(\frac{1}{A^2} - \beta_{med} \right)$.*

The proofs can be found in the appendix. It is interesting to look at the comparative statics of this result. Taking the derivative of a^*_{med}, we see that

$$\frac{\partial a^*_{med}}{\partial A} = \frac{1}{\gamma}\left(-\frac{2A-1}{(A^2-A)} - \beta_{med}\frac{2A}{(A-1)^3}\right) < 0 \qquad (6.43)$$

The more competition the decisive median voter expects in the rent seeking contest, the less he will be inclined to vote for politicians that are known to create rents. As the expected gains from rent seeking decrease in the number of competitors, whereas the costs stay the same, rent seeking contests become a less and less attractive means of redistribution, as the number of potential competitors increases.

If we look at the equilibrium amount of rent created by the politician, we can see that it also decreases in A, i.e. $\frac{\partial R}{\partial A} < 0$. Although a given politician will always prefer more competitors to less in the rent seeking contest, the equilibrium size of the rent will be smaller, the more competitors there are. The reason is closely related to the one above. As voters know their expected payoff from the rent seeking contest will decrease in the number of competitive groups, they have incentives to vote for less rent creating politicians. In other words, this result is due to the fact that voters rationally anticipate that more competition will lead to more waste.

Finally, one can see that $\frac{\partial D}{\partial A} < 0$, i.e. the total amount of waste created in the rent seeking contest will also decrease in the number of different groups. This is again due to the fact that rational voters try to limit the amount of rent and waste as they know the wasteful effects of fiercer competition in the last stage of the game.

Proposition 4 deserves some attention as it seems to run contrary to the common sense argument that more fractionalized societies seem to have less clean forms of governance. Further it seems to be at odds with the traditional conclusion that rent seeking turns out to be more wasteful, the more groups are involved. Once one allows for the possibility that rent seekers can influence the size of the rent by voting for politicians that are more or less inclined to create these rents, the traditional conclusion is overturned: if people anticipate rationally that more competition will induce more waste, their incentives to increase the amount of rents they compete for will decrease in equilibrium. Put differently, the result does not overturn the classical result, but shows, that once one looks at the equilibrium of a larger game, the lower expected profit of more competition for each competitor will reduce the size of the rent ex-ante. The anticipation of wasteful competition will reduce the size of the rent in the subgame-perfect equilibrium.

6.5.2 The Rent as a Group Specific Public Good

Let us finally analyze the case of n groups and a rent that has the character of a group specific public good. We will restrict ourselves to the case of A symmetric groups, i. e. groups of equal member sizes.[5] Each agents utility function is again given by:

$$u_i = \frac{m_i}{\sum m_i} R - \frac{1}{N_i}(\beta_i R - \frac{1}{2}R^2 - m_i) \tag{6.44}$$

Or, as we assumed symmetry, let $N_i = N$ for all i.

$$u_i = \frac{m_i}{\sum m_i} R - \frac{1}{N}(\beta_i R - \frac{1}{2}R^2 - m_i) \tag{6.45}$$

Solving by backward induction, we get as solution for the last subgame:

$$m_i^* = \frac{A-1}{A^2} NR \tag{6.46}$$

for all i groups. In contrast to the case of private goods, the group size matters again, which is simply due to the fact that the rent has a value of N times R.

The maximization problem of the politician yields:

$$R = \gamma \frac{A-1}{A} Na \tag{6.47}$$

which is N times bigger as in the previous case as well.

Finally let us look at the individually optimal voting decision, which is:

$$a_i^* = \frac{AN}{(A-1)} \frac{1}{\gamma} \left(\frac{1}{A^2} - \beta_i \right) \tag{6.48}$$

Let us summarize these findings in the following proposition:

Proposition 6 *If $\beta^{med} < \frac{1}{A^2}$, the median voter will gain from the emergence of rent seeking contests in equilibrium. The equilibrium can be characterized by a degree of corruption $a = \frac{AN}{(A-1)} \frac{1}{\gamma} \left(\frac{1}{A^2} - \beta^{med} \right)$, a rent size $R = N \left(\frac{1}{A^2} - \beta_1 \right)$*

[5]Again we make this assumption in order to avoid issues of multiple equilibria.

and an equilibrium amount of waste, i.e. resources spent in rent seeking
$D = \frac{A-1}{A} N \left(\frac{1}{A^2} - \beta^{med} \right).$

Again the median voter is decisive. And we see the familiar result that the public good character of the rent influences the size of the rent, but not the principal decision whether there will be rent seeking contests in the economy or not.

From a normative point it is interesting to ask whether a partition of society in many small groups or a partition in only a few groups will generate more waste. If one looks at the rent seeking contest in isolation, one would predict that more competitors will generate more waste, therefore it is preferable to have less competitors, whereas the present framework showed that this does not have to be the case. In order to answer this question, let us define the whole size of the population with P, such that $P = N * A$. We can now redefine the equilibrium amount of waste D as:

$$D = \frac{A-1}{A} N \left(\frac{1}{A^2} - \beta^{med} \right) = . \frac{A-1}{A} \frac{P}{A} \left(\frac{1}{A^2} - \beta^{med} \right) =$$

$$= P \left(\frac{A-1}{A^4} - \frac{\beta^{med} (A-1)}{A^3} \right) \tag{6.49}$$

If the group size changes the cost share of each individual group might change as well, let us define

$$\beta^{med} = cA^\epsilon \tag{6.50}$$

with $0 < c < 1$ and $\epsilon < 0$.

If $\epsilon = -1$, cost decreases inversely proportional to group size. Now we can rewrite the above equation as:

$$D = P \left(\frac{A-1}{A^4} - \frac{cA^\epsilon (A-1)}{A^3} \right) = \frac{P}{A^4} \left((A-1) \left(1 - cA^{\epsilon+1} \right) \right) \tag{6.51}$$

Taking the derivative with respect to A yields:

$$\frac{\partial D}{\partial A} = \frac{c \left(A^\epsilon + A^{\epsilon+1} - A^{\epsilon+2} \right) - A}{A^5} < 0 \tag{6.52}$$

for all $\epsilon < 0$ and $A \geq 2$.

Now, we can derive proposition 6 .

Proposition 7 *If the costs a group has to bear decrease in the number of groups, a larger number of groups will reduce the equilibrium amount of waste. In particular, if the costs decrease inversely proportional, a larger number of groups will reduce the equilibrium amount of waste.*

Inversely proportional decreasing costs implies, that $\sum \beta_i$ stays constant for a any number of groups. Again we can see, that anticipated fiercer competition (larger number of groups), will reduce the incentives to create rent seeking contests ex-ante. Nevertheless this result is far from being obvious, as the total value of the rent to all agents together does not change by the partition in different groups.

6.6   Conclusion

It was Stigler's (1974) brilliant insight to recognize that regulations do not fall from heaven, but are created by politicians that pursue their own objectives. The idea of this paper was to go one step further since politicians and bureaucrats do not fall from heaven either. Politicians at least have to get elected in democracies. The aim of this paper was to identify circumstances under which rent seeking contests will be the equilibrium outcome of an interaction between voters and politicians. In other words, this paper tried to look at rent seeking contests, in which the size of the rent contestants compete for is an endogenous choice variable. We abstracted from all institutions and restricted the policy space, such that median voter is decisive in the voting procedure. Furthermore, we described the rent seeking process with a contest success function. Nevertheless our approach gave us interesting results: The paper identified two sources that will make it likely for rent creating politicians to get into office. If the there are large asymmetries in the benefits and costs of the rents that can be gained, this will tend to favor the emergence of rent creating politicians. The more the median voter values the rent and the smaller the degree to which he participates in the costs, the higher the equilibrium size of the rent. It is not only the high valuation of the rent itself that will make a group spend a lot in the rent seeking contest, but also the knowledge of the strategic advantage it will have in the rent seeking contest by being the higher valuing group. Interestingly, we were able to show that a large number of

groups makes the emergence of rent seeking contests less likely, something that might be surprising at first glance, but nevertheless has a plausible interpretation: the more contestants in the competition for the rent, the smaller the individual expected profit of the individual rent seeking group. As the costs created by the rent-seeking contest stay the same, this obviously makes rent seeking less attractive and thereby diminishes the incentives of all groups to elect rent creating politicians into office.

6.7 Appendix

Solution of Subgame 3

$$u_i = \tfrac{1}{N_i}\left(p\left(m_i, m_{-i}\right)\alpha_i R - m_i - \beta_i R - \tfrac{1}{2}R^2\right)$$

is the same as:

$$u_i = p\left(m_i, m_{-i}\right)\alpha_i R - m_i - \beta_i R - \tfrac{1}{2}R^2 = \tfrac{m_1}{m_1 m_2}\alpha_1 R - m_1 - \beta_1 R - \tfrac{1}{2}R^2$$

subgame 3

$$\tfrac{m_2}{(m_1+m_2)^2}\alpha_1 R - 1 = 0$$

and

$$\tfrac{m_1}{(m_1+m_2)^2}\alpha_2 R - 1 = 0$$

$$m_1 = \tfrac{\alpha_1 \alpha_2}{(\alpha_1+\alpha_2)}\alpha_1 R$$

$$m_2 = \tfrac{\alpha_1 \alpha_2}{(\alpha_1+\alpha_2)}\alpha_2 R$$

2.a Maximizing over a

Proof of lemma 1:

Preferences as a function of a are:

$$u_1(a \mid \alpha_1, \beta_1, \alpha_2, \beta_2) = \tfrac{1}{n_1}\left(\tfrac{\alpha_1 \alpha_2 \gamma a}{\alpha_1+\alpha_2}\left[\tfrac{m_1}{m_1+m_2}\alpha_1 - \beta_1 - \tfrac{\alpha_1^2 \alpha_2}{(\alpha_1+\alpha_2)^2}\right] - \left[\tfrac{\alpha_1 \alpha_2 \gamma a}{\alpha_1+\alpha_2}\right]^2\right)$$

Single-Peakedness of preferences

Preferences are single peaked with respect to a parameter a, if

(1) $\frac{\partial u_1(a \mid \alpha_1, \beta_1, \alpha_2, \beta_2)}{\partial a} = 0$ for one and only one a.

And

(2) $\frac{\partial^2 u_1(a|\alpha_1,\beta_1,\alpha_2,\beta_2)}{\partial^2 a} < 0$ for all a

(1) is proven by the solution of the optimization problem. (2) is easily shown:

$$\frac{\partial^2 u_1(a|\alpha_1,\beta_1,\alpha_2,\beta_2)}{\partial^2 a} = -\frac{1}{n_1}\left(\frac{\gamma\alpha_1\alpha_2}{\alpha_1+\alpha_2}\right) < 0$$

The derivatives of a^* are given by:

We rewrite a^*:

$$a_1^* = \frac{1}{\alpha_1\alpha_2\gamma}\left[\alpha_1^2 - \beta_1\left(\alpha_1+\alpha_2\right) - \frac{\alpha_1^2\alpha_2}{\alpha_1+\alpha_2}\right] = \frac{\alpha_1^2}{\alpha_2(\alpha_1+\alpha_2)} - \frac{\beta_1(\alpha_1+\alpha_2)}{\alpha_1\alpha_2}$$

$$\frac{\partial a_1^*}{\partial \alpha_1} = \frac{\alpha_1^2(2\alpha_2-1)+2\alpha_1^3\alpha_2+\alpha_2^2}{\alpha_1(\alpha_1+\alpha_2)^2} + \frac{\beta_1}{\alpha_1^2}$$

A sufficient condition for $\frac{\partial a_1^*}{\partial \alpha_1} > 0$ is $\alpha_2 > \frac{1}{2}$. Therefore we conclude, that $\frac{\partial a_1^*}{\partial \alpha_1} > 0$ if $\alpha_2 > \frac{1}{2}$.

$$\frac{\partial a_1^*}{\partial \alpha_2} < 0$$

as α_2 enters positively in the denominator and positive in the numerator.

Chapter 7

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Ich versichere hiermit eidesstattlich, dass ich die vorliegende Arbeit selbständig und ohne fremde Hilfe verfasst habe. Die aus fremden Quellen direkt oder indirekt übernommenen Gedanken sowie mir gegebenen Anregungen sind als solche kenntlich gemacht. Die Arbeit wurde bisher keiner anderen Prüfungsbehörde vorgelegt und auch noch nicht veröffentlicht.

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