Fiscal Federalism, Citizen-Candidate Mobility and Political Competition

Dissertation

zur Erlangung des akademischen Grades des Doktors der Wirtschaftswissenschaften an der Universität Konstanz, Fachbereich Wirtschaftswissenschaften

vorgelegt von

Stanislav Nastassine

Tag der mündlichen Prüfung: 02.10.2001

Referent: Prof. Dr. Heinrich W. Ursprung

Referent: Prof. Dr. Andreas Haufler

Konstanz 2005

Несомненный признак истинной науки –
сознание ничтожности того, что знаешь, в сравнении с тем, что раскрывается.
Л. Н. Толстой

(An undoubted feature of a true science is the perception that everything you already know is infinitesimal small in comparison with everything that remains to be discovered. L. N. Tolstoj)

For Katja, my wonderful and lovely wife

The present work has been completed in the time from November 2001 to January 2005 in the chair of Political Economy, Department of Economics of the University of Konstanz, under supervision of Prof. Dr. Heinrich W. Ursprung.

Special thanks to:

Prof. Dr. Heinrich W. Ursprung for giving me the opportunity to work in his group, for the interesting topic and discussions concerning my work and for his entire support;

Prof. Dr. Andreas Haufler for writing the second evaluation and interesting advices during my work;

Prof. Dr. Oliver Lorz for friendly, fruitful and cognitive cooperation and support during the work on joint papers;

Prof Dr. Matthias Wrede and participants of the CESIfo Economic Studies conference “Migration and the Welfare State” 2003 for their interesting scientific discussions;

Dr. Paola Profeta and participants of the Silvaplana Workshop on Political Economy 2003 for their valuable comments;

all members of the group for the nice and inspiring atmosphere, but most of all to Prof. Dr. Philipp Harms, Dr. Bodo Hilgers, Allesandro Maffei, Christian Wiermann, Benjamin Weigert for interesting and helpful advises during my work.

Last but not least I would like to thank and to express my deep gratitude to my family, my parents, my friend Michael Egorov for supporting and encouraging me during this time, and for my loving, understanding wife for her patience and her trust in me.

Content

1. Introduction

The present work consists of two logical parts both analyzing the behavior of individuals participating in the political process. It investigates the personal motivation of politicians acting at the federal and local governmental levels and elaborates the influence of both division of power in a federation and personal mobility on resulting policy outcome. The first part of the work is dedicated to interdependence between political participation and personal mobility and analyses the influence of the mobility on the citizens' willingness to run for a political office in their municipality and on the resulting local policy outcome. The second part is concerned with behavior of the politicians in a federation acting within a double-tiered government structure and analyzes the vertical contest that arises if local politicians, the governors, not only compete for re-election but also for the presidency.

The issues raised here are hot topics of public economics and relate to a significant amount of literature. The idea for this work originated from controversial academic and political debates on growing economic and political integration among different countries, growing degree of personal mobility, declining political participation and threat of deterioration of the welfare state. It also grew out of many stimulating discussions on building federalism in the European Union and on reforming already existing federal systems.

In broader sense this work is related to the political-economic literature on fiscal federalism. The traditional definition of federalism commonly used in political science is the definition by Riker (1964), which characterizes federalism as a system in which "(i) two levels of government rule the same land and people, (ii) each level has at least one area of action in which it is autonomous, and (iii) there is some [constitutional] guarantee… of the autonomy of each government in its own sphere." Hence, according to these principles of hierarchy and autonomy a governmental structure of a federation is characterized by different tiers (usually local, regional, and the highest national), where policy makers at each level are elected by the same population in order to accomplish their own responsibilities but nevertheless following the principle of subordination. The theory of fiscal federalism has been an important field of the economics for many years now. The usual analysis of fiscal federalism in economics has regarded various expenditures on producing the public goods financed by taxes, exploring which public goods should be produced by what level of government. However, as pointed out by Oates (2004, 39) "the choice of the term 'fiscal federalism' was probably unfortunate one, since it suggests a narrow concern with budgetary matters. The subject of fiscal federalism [used in economics] …encompasses much more, namely the whole range of issues relating to the vertical structure of the public sector". According to Oates (2004, 13) "fiscal federalism… explores, both in normative and positive terms, the roles of the different levels of government and the ways in which they relate to one another…" As an important part of public finance fiscal federalism includes thus a great number of highly significant topics which analysis could cover substantial number of books and scientific papers. The investigation of the present work covers actually only two narrow issues of fiscal federalism: first, the influence of deepening globalization and consequent growth of factor mobility on policy implementation and second, the interdependence of power allocation and politicians' behavior at different governmental tiers of a federal state.

The concept reflecting the abilities of the inferior levels of government to finance their expenditures from the raised tax revenues is called in the literature fiscal decentralization. The view of many scholars is that local governments are able to collect better information concerning population needs and preferences in public goods and can better suit them. Also, the residents themselves can better express their preferences at the local level. Imperfect information makes it impossible for a unitary government to provide uniform public goods satisfying the preferences of all population groups. Therefore, it is straightforward that division of power between different tiers allows collecting more precise, though still imperfect, information on local preferences and costs of providing public goods. In this spirit Oates (1972) establishes the "Decentralization Theorem", which states that uniform level of public goods and services across all jurisdictions will generally be inefficient. The theorem thus provides a conjecture in favor of the federal, decentralized, system.

The availability of multiple layers in a federal system inevitably gives rise to the competition among governments. Furthermore, the deepening of the regional and global economic integration nowadays sharpens the governmental competition across jurisdiction, which is reflected in a substantial number of contributions in economic and political literature. The most influential paper on governmental competition is Tiebout's (1956) "Pure Theory of Local Expenditures", in which interjurisdictional mobility of households motivates the existence of horizontal competition between governments inhabiting a given jurisdictional level. The mobile individuals who expect positive net social transfers have an incentive to move to a jurisdiction with a comparatively generous welfare system whereas the opposite holds for those who are net contributors to social welfare programs. The citizens "vote with their feet" for a jurisdiction where they can obtain a combination of taxes and social welfare programs which perfectly suites their preferences. Under these circumstances, interjurisdictional competition may induce governments to reduce tax rates and cut down on social welfare programs, the so-called "race to the bottom" effect emerges.

The first part of the present work (sections 2 and 3) is focused on an alternative mechanism through which interjurisdictional mobility can influence the local public policy. The model developed in this part of the work portrays heterogeneous policy preferences that are coupled with different exogenous degrees of citizens' interjurisdictional mobility. The model result is that citizens' mobility may influence the individual decision to participate in the political process and thereby may change policy outcomes. The participation effect may work against the "race to the bottom" effect since, under the circumstances if citizens who prefer a larger public sector are relatively immobile, the size of the welfare state may increase with increasing mobility. The model thus shows that raising mobility can be liable to shift the policy outcome towards the preferred policy of the less mobile citizens. It thus identifies an endogenous policy response to personal mobility diametrically opposed to the tax competition effect that has hitherto dominated the discussion of the political consequences of personal mobility.

Another challenging aspect of the existing models on political economy of fiscal federalism is that most of them investigate horizontal competition between authorities inhabiting the same jurisdictional tier, while using the mobility as a driving force for governmental competition. However, as pointed above, the main feature of a federation is the existence of different layers of government, and it is obvious that mobility of voters and production factors cannot be engaged in analyzing vertical government competition: persons and production factors can only move from one region to another, but there is no mobility among orders of government. On the other hand, the policy makers in a federation are able to move between different tiers of a federal system as they make a political career.

Following this argumentation the second part of the present work (section 4) analyzes the influence of the decentralization degree in a federation on the behavior of the policy makers at different jurisdictional tiers using a mechanism called vertical political yardstick competition that focuses on the pro-competitive effects resulting from a comparison of government performance across jurisdictions. As a benchmark I use the Besley and Smart (2002) model that focuses on horizontal yardstick competition between governments inhabiting the same jurisdictional level. The mechanism of horizontal yardstick competition assures that the voters can observe performance of different governments and can punish politicians whose performance is inferior to that of the others. In other words, in the Besley and Smart model the voters just compare the governments' performance in a confederation and then make their re-election decisions. In my model I transform the governance structure from a confederation to a federation introducing the federal level of government in order to analyze the additional, vertical, contest that arises if governors not only compete for re-election but also for the presidency. The main result of the analysis is that in a fully-fledged federal system admitting vertical competition new equilibria emerge in which unprincipled governors do not extract any rents from the general public. It thus transpires that federalism is an institution that reduces government appropriation.

2. Political Participation of Mobile Citizens and the Size of the Welfare State*

2.1. Introduction

Mobility is often seen as a reason for a decline in the size of the welfare state as it makes it more difficult for governments to redistribute incomes between individuals.[1] Citizens who expect positive net social transfers have an incentive to move to a jurisdiction with a comparatively generous welfare system whereas the opposite holds for those who are net contributors to social welfare programs. Under these circumstances, interjurisdictional competition may induce governments to cut down on social welfare programs – a "race to the bottom" results.

The first part of the dissertation considers an alternative mechanism by which interjurisdictional mobility can influence the size of the welfare state: mobility may reduce participation of citizens in the political decision-making process since mobile citizens may anticipate a possible relocation to another jurisdiction in the foreseeable future. Mobility then causes a participation bias towards less mobile citizens. This participation effect may work against the interjurisdictional competition effect described above if highly mobile citizens prefer a leaner welfare state than the less mobile ones.

In this part of the work I take a closer look at the potential implications of this participation effect for the size of the welfare state. I consider citizens who differ with respect to their education level and therefore with respect to their expected lifetime income. The assumption here is that better educated citizens with a higher expected permanent income prefer a smaller size of the welfare state.[2] In addition, the better educated are also generally more mobile than others. If one combines these

[*] This section is based on the joint paper Lorz and Nastassine (2004), Political Participation of Mobile Citizens and the Size of the Welfare State.

[1] Cf. Oates (1972). Formal models in this vein are provided, for example, by Brown and Oates (1987), Wildasin (1991) or Sinn (1997). For an overview cf. Brueckner (2000), Cremer et al. (1996) or Cremer and Pestieau (2003).

[2] Theoretical support for this hypothesis can be derived from political economy models on redistributive tax-transfer-systems as in the tradition of Meltzer and Richard (1981).

two elements, the participation effect works towards the policy preferences of those who prefer a larger welfare state.

This section is related to the political economy of interjurisdictional migration. Most notably in this respect is the contribution by Razin et al. (2002) who analyze the influence of migration on the size of the welfare state in a median voter setting. Immigration of low skilled workers changes the composition of voters and causes a "fiscal leakage effect" in their model. Both effects work in opposite directions with respect to the equilibrium level of redistributive taxes and transfers.

The first part of the dissertation is organized as follows. Section 2.2 presents some facts on the relationship between individual education levels and the mobility of citizens. Section 2.3 employs a simple cost-benefit calculus to show how political participation of citizens can be characterized from an economic viewpoint and how mobility can influence participation. Section 2.4 then applies this approach to the potential effects of mobility on political participation and the size of the welfare state. Section 2.5 extends the analysis, and Section 2.6 concludes.

2.2. Mobility of the High-Skilled

Mobility and migration are persistent facts in most developed countries. The share of the foreign population in the U.S., for example, reached 10.4% in 2000 (OECD, 2003), and for Europe the estimated number of people living in a country other than their country of origin is 21 million or 2.7% of the population (Wanner, 2002). In some countries, for example Germany with 8.9%, the share of foreigners is considerably above this European average.

Survey evidence on the mobility of European citizens suggests that of those 38% who changed residence during a period of ten years, 21% moved to another region and 4.4% to another country within the EU (Eurobarometer, 2001). Compared to the Europeans, citizens in the US are characterized by much higher levels of geographic mobility: they have about twice the mobility rate of EU citizens (European Commission, 2001).

Some groups of people are more mobile than others. Specifically, there exists a positive relationship between mobility and the education level of citizens. 67% of all immigrants to the USA and 88% of those to the OECD possess a secondary education or higher (Adams, 2003). With respect to international mobility, high-skilled citizens seem to be better suited to overcome linguistic and cultural barriers and also to be more welcome in recipient countries, presumably because of their contribution to the stock of human capital and to the welfare system. Recent changes in immigration laws in several countries therefore aim at facilitating the immigration of high-skilled workers (Mahroum, 2001). At the same time, a higher mobility of the better educated is also observable at the national level: the labor market for the better educated seems to be less localized than the market for the less educated (cf. Ehrenberg and Smith, 2003).

US Census data illustrates this positive relationship between education and mobility (Table 2.1). Between 2002 and 2003, 6.2% of the better educated (college or more) moved across the borders of their county of residence compared to 5.3% of the less educated. The pattern of a higher mobility among the better educated is visible across all age groups.

Table 2.1 USA: Mobility by Educational Attainment,
March 2002 to March 2003 (total number in thousand)

	Total number	Movers across county borders (percent of the total number)	
		High School and less	College and more
Age 25-29	18,721	10.2	13.3
Age 30-34	20,521	7.6	8.5
Age 35-44	44,073	5.5	5.8
Age 45-64	67,635	3.2	3.8
All	150,950	5.3	6.2

Source: U.S. Census Bureau (2004), own calculations

Comparable results can be found with respect to interregional mobility within Germany. According to a study by Haas (2002), 52.4% of the workers with higher education who took up a new employment also have moved to another region compared to only 31.5% of those with professional training and 26.1% of those without training (Table 2.2).[3]

Studies of emigration from Scandinavian countries show a similar pattern. Pirttilä's (2003) analysis of Finnish emigration and return migration in the 1990s reveals that individuals with higher academic education are 4.5 times more likely to emigrate than individuals with only secondary education. Pedersen at al. (2003)

[3] Similar patterns were found by Gregg et al. (2004) for inter-regional mobility rates in the UK, by Greenwood (1997) and Basker (2002) for the USA, Ledent (1990) for Canada and Carillo and Marselli (2003) for Italy.

analyze emigration from Denmark, Norway and Sweden and find that emigration propensities in all three countries are clearly increasing in the level of education.

Table 2.2. Germany: Share of Workers who take up a new employment in another region (as a percentage of all who take up a new employment)

Education level	**Job to job switcher***			**Change of location after unemployment**		
	1982	1990	1995	1982	1990	1995
With professional training	27.0	29.8	31.5	22.1	23.7	27.4
Without professional training	20.1	22.8	26.1	16.3	17.3	19.1
Higher education	47.7	48.9	52.4	38.3	43.3	49.2
With general qualification for university entrance (Germ.: Abitur)	43.0	44.2	47.1	36.2	41.1	44.8
Without general qualification for university entrance	24.2	27.2	29.4	20.0	21.1	24.4
Source: Haas (2002)						

* Direct change of workplace without previous unemployment.

2.3. Mobility and Political Participation

Citizens have many options of participating in the political decision-making process. To name just a few of them: citizens can vote; they can write letters to political representatives or newspapers; they can join interest groups and political parties or donate money to these organizations; they can start or support political initiatives, referenda and the like; they can also stand as candidates for a political office themselves. These political activities differ with respect to the costs for the participating citizen in terms of time, effort and money. They also differ with respect to their influence on policy outcomes and to other potential benefits for the person engaging in the respective political activity. To take one extreme, the individual act of voting is associated with only small costs for the voter on the one hand, but on the other hand also with a small, if not negligible, expected influence on policy outcomes. [4]

In this work I am interested in forms of political participation on the other side of the spectrum –political activities that come at significant costs and provide sizable potential benefits for the person undertaking the activity. Standing as a candidate for a political office or contributing financially to support a party or a political initiative

[4] For an analysis of voter participation see, for example, Franzese (2000).

are examples for such political activities. Participation of this kind bears some important parallels to an economic investment decision: citizens spend resources in the course of political participation that may yield benefits later on in the form of political influence or political rents. These benefits thus do not only derive from the citizen's political ideology, they may also result from non-political motives, for example, from obtaining access to social networks or gaining prestige from being a politically important person. Political investors compare the discounted sum of the benefits, the “political prize”, with the participation costs. They participate in the political process only if the discounted payoff is high enough to cover the participation costs.

Consider now a representative citizen who has to decide whether to invest to a specific political activity in her jurisdiction. If she participates, she has to bear participation costs amounting to c. The discounted sum of all benefits that accrue from this kind of political participation is denoted by R_0. For simplicity, I assume that the citizen takes the costs and benefits as exogenously given. She then decides to participate only if $R_0 \geq c$. For expositional reasons, I assume at this point that a politically active citizen receives the benefits of participation with certainty. One could easily extend this approach to include uncertainty concerning the individual success of political participation: a citizen, for example, may face a given probability of being successful in the political arena; R_0 then simply needs to be replaced by an appropriate expectation value.

In general, the terms R_0 and c depend on a number of factors and individual characteristics. What is important for the analysis is their relationship with mobility. In this respect, I assume that a citizen receives benefits from her political activity in a given jurisdiction as long as she resides there. After relocation to another jurisdiction the benefits from a previous political activity cease to accrue. The payoff from political participation then can be expected to decline with the degree of the citizen’s mobility.

To illustrate the relationship between mobility and the participation payoff, assume that in each period the citizen faces an exogenous probability θ of relocation to another jurisdiction.[5] The parameter θ may denote, for example, the probability that the citizen is sent to another jurisdiction by her employer. By assuming an exogenous relocation probability the present model abstracts from the citizen's option

[5] Glaeser et al. (2002) analyze the decision of individuals to invest in “social capital” in their jurisdiction of residence. They also use an exogenous relocation probability to model mobility.

of voting with her feet. This option may provide an alternative way for mobile people to obtain their preferred policy. I expect, however, this factor to work in the same direction, i.e. towards a lower political participation of the mobile citizens.

Let the representative citizen decide in period 0 whether to participate in the political process or not. If she participates, she receives benefits R from participation in each period as long as she resides in the jurisdiction. With an infinite time horizon and a discount rate of r the expected payoff from participation is given by

$$R_0^m = \frac{1-\theta}{r+\theta} R$$ [6]

for a mobile citizen. For an immobile citizen the payoff is $R_0 = R/r$. We see from the above equation that R_0^m declines with an increase in the relocation probability θ. The more mobile the citizen is, the lower is the expected discounted payoff and the less likely she invests the costs of participation c.

2.4. Mobility and the Size of the Welfare State

In this section I use the cost-benefit-calculus introduced above to discuss possible effects of personal mobility on the size of the welfare state. In section 2.2 I have provided some strong evidence indicating that different groups of citizens are exposed to different degrees of interregional mobility. In particular, the degree of mobility increases with the education level. In section 2.3 I have shown that mobile citizens may be less willing to participate in the local decision making process simply because they are inherently "footloose" and thus less interested in local political affairs.

Citizens differ in many respects: income, education, family size, age etc. All these factors influence their personal degree of mobility, but also their policy preferences. For these purposes, I focus on only one policy dimension, namely the size of the welfare state. I measure the size of the welfare state by the variable x, which is normalized to a value between 0 and 1. Let x denote, for example, the share of per capita government expenditures as a percentage of average income. Each citizen i has an ideal policy position x_i, which denotes her most preferred size of the

[6] With a relocation probability of θ, the probability of residing in the jurisdiction in period 1 is $[1 - \theta]$, and the benefit from participation in this period is $[1 - \theta]R$; in period 2 the probability of staying in the jurisdiction is $[1 - \theta]^2$, and the expected benefit is $[1 - \theta]^2R$. This procedure can be extended to any time horizon T. Summing up, discounting to period 0, and taking the limit of T approaching infinity then produces the equation in the text.

welfare state. I consider now political activities of citizen i that are liable to move the policy outcome towards the most preferred policy x_i.

I start from a situation without mobility and first assume that neither the payoff from political participation R_0 nor its costs c depend on the policy preferences of the citizen.[7] In this case the individual cost-benefit calculus is independent of the policy position x_i (Figure 2.1). Each citizen then has an incentive to participate if R_0 exceeds c as portrayed in Figure 2.1.

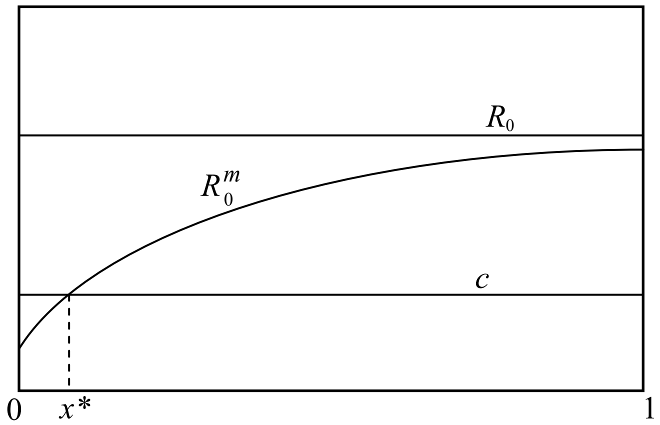

Figure 2.1

If one introduces mobility in this setting, the payoff from participation declines due to the positive probability of leaving the community in the future. The R_0-curve in Figure 2.1 shifts downwards to a new curve R_0^m, which depicts the payoff from participation for more or less mobile citizens. As I have argued above, there are reasons to assume that mobility is higher for citizens who prefer a smaller size of the welfare state. The downward effect caused by mobility is thus stronger for low values of x than for high values, and consequently R_0^m increases in x.

If the payoff curve R_0^m intersects the cost line as shown in Figure 2.1, then all citizens who prefer a smaller size of the welfare state than x^* exclude themselves from the political process. The payoff will not cover the costs of political participation for these citizens. Only those citizens participate whose ideal position is in the range between x^* and 1.

Up to now we have considered the cost-benefit calculus of a single citizen deciding about political participation. For a more general treatment of the participa-

[7] In section 2.5 I will consider some implications of relaxing these assumptions. Specifically, I will assume that R depends on the individual policy position x. A possible relationship between c and x can be analyzed analogously.

tion issue one also has to take into account the strategic relationship between citizens with different policy preferences who decide whether to participate politically or not. This can be done by setting up a game-theoretic model of political participation and by deriving the equilibrium policy outcomes with and without mobility in this setting of strategic interaction.

In the following, I provide an illustrative example for such a model of strategic participation. This example is not meant to provide a realistic portrait of the complex process of endogenous welfare policy determination. My objective is rather to demonstrate the potential effects of mobility on political participation in a simple and straightforward manner. Consider the two citizens 1 and 2 with ideal positions $x_1 = 1/4$ and $x_2 = 3/4$, respectively.[8] Both decide simultaneously and in a non-cooperative manner whether to become politically active by standing as a candidate in a "winner takes all"-election.[9] The candidate who wins the election can determine the policy x in the jurisdiction according to her own preferences.[10] If citizen 1 is the only candidate, she wins the election with certainty and can set $x = 1/4$. If citizen 2 is the only candidate, the resulting policy outcome is $x = 3/4$. For the case of both citizens running for election, each of them is elected with the same probability of 1/2.[11] The expected policy outcome in this case is given by $Ex = 1/2$. The payoff of a candidate who is elected and who can determine the policy according to her own preferences is $R_0 = 1$. The payoff is 0 for a candidate who is not elected or for both citizens if none of them runs for election.

With these assumptions one can characterize the equilibrium policy outcome for the case without mobility. The equilibrium policy depends on the cost c of running for election. For $c > 1$, the cost exceeds the payoff $R_0 = 1$ for each citizen and consequently nobody stands for election and the policy outcome remains undetermined. For $1/2 < c \leq 1$ there are two possible equilibria, each with one citizen

[8] I have chosen numbers instead of symbols for illustrative purposes. They are not crucial for the qualitative interpretations of the model.

[9] By assuming that only two citizens run as candidates, I sidestep questions concerning coalition formation.

[10] This kind of model would also be suitable to analyze political participation in the form of a lobbying contest.

[11] The assumption of the same election probabilities for both candidates simplifies the analysis and exposition as it makes the model perfectly symmetric. However, one could also think of other, more general, approaches in which election probabilities differ across candidates – for example, in a probabilistic voting set-up. Similar effects would also work in such a setting.

standing as a candidate and the other staying out. If citizen 1 enters as a candidate, citizen 2 does not have an incentive to enter as well and to challenge candidate 1, since the expected payoff of entering for citizen 2 would be 1/2. This is by assumption smaller than c.[12] If citizen 2 stays out, however, citizen 1 has an incentive to enter and to become a candidate. Thus, an equilibrium exists with only citizen 1 entering. By the same reasoning, one can show that an additional one-candidate equilibrium exists with citizen 2 as a political candidate. If c is even lower (c < 1/2), both citizens enter as political candidates and one obtains a two-candidate equilibrium.[13] The expected policy in this equilibrium with two candidates is 1/2.

Having introduced mobility in this setting, the payoff from participation declines for both citizens. Since the degree of mobility is higher for citizen 1 than for citizen 2, the payoff from participation R_0^m is lower for candidate 1 than for candidate 2. Figure 2.2 depicts possible combinations of R_0^{m1} and R_0^{m2}. Since $R_0^{m1} < R_0^{m2} < 1$ these payoff combinations are located above the 45°-line in the triangle 0BE. The benchmark case without mobility is given by point B. In Figure 2.2 I have assumed small costs of participation (c < 1/2), implying a 2-candidate equilibrium without mobility, the corresponding expected policy outcome amounting to 1/2.

If the payoff for both candidates exceeds $2c$, the two-candidate equilibrium persists with mobility. This is the case in area ABD. If mobility causes a larger decline of payoffs, however, the election game no longer admits this two-candidate equilibrium. Area FGADE depicts all payoff combinations with $R_0^{m2} > c$ and $R_0^{m1} < 2c$. In this area a two-candidate equilibrium cannot exist: if candidate 2 enters, candidate 1 prefers to stay out of the competition. Area FGHADE covers all payoff-combinations in which only candidate 2 enters in equilibrium. This area includes pay-off combinations where $R_0^{m2} > 2c$ and $c < R_0^{m1} < 2c$. In this area (rectangle ADKH) entering is a dominant strategy for citizen 2, and citizen 1 does not enter if citizen 2 does. The area FGHADE also includes all payoff combinations with $R_0^{m1} < c$ and $R_0^{m2} > c$ (rectangle FGKE) where citizen 1 does not enter irrespectively

[12] The expected payoff is given by the payoff of 1 times the probability of being elected. If both citizens are candidates, this probability is $1/2$.

[13] For c = 1/2 the two-candidate equilibrium and the two one-candidate equilibria co-exist. For c = 1 the one-candidate equilibria and the equilibrium with no candidate entering co-exist.

of what citizen 2 does and citizen 2 enters. The size of the welfare state resulting from this one-candidate equilibrium with citizen 2 being the only candidate is $3/4$.

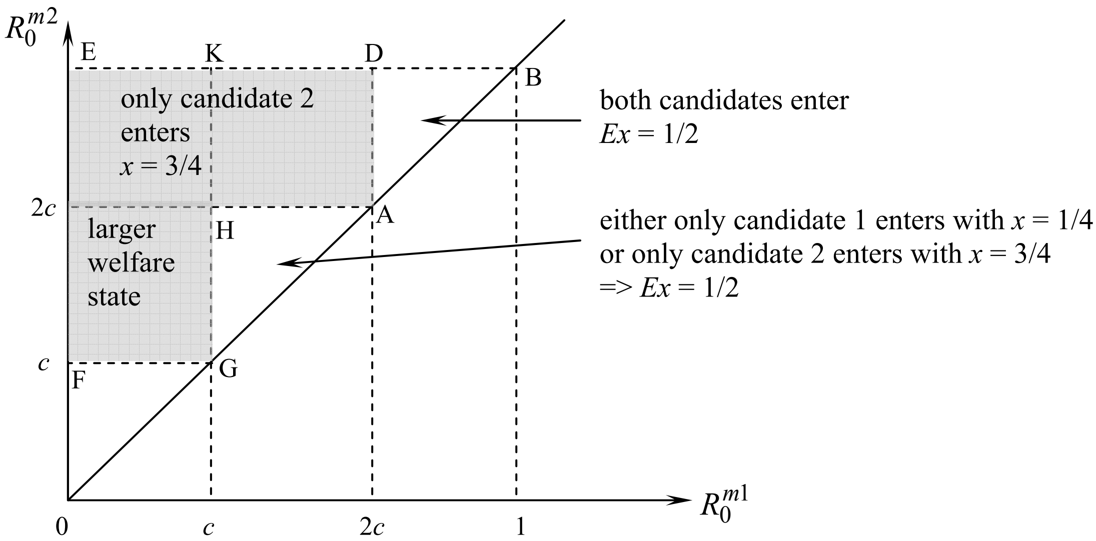

Figure 2.2

For the parameter combinations described by the triangle GAH ($c < R_0^{m1} < 2c$ and $R_0^{m2} < 2c$) we obtain an additional one-candidate equilibrium with citizen 1 being the only candidate. I thus have two possible one-candidate equilibria in this area with either citizen 1 or citizen 2 entering as a candidate.

Finally, in the area described by the triangle 0GF both candidates abstain from political participation since the payoff in this area is smaller than the participation costs for both candidates; the policy outcome is therefore undetermined.

This simple example thus illustrates that mobility can give rise to an increase in the expected size of the welfare state for large range of parameter values (area FGHADE). For these parameter constellations the two-candidate equilibrium, in which citizens on both sides of the political spectrum run for election, is replaced by a one-candidate equilibrium in which only a citizen who prefers a large welfare state has an incentive to enter the election.

In the section 3 of the present work I employ a more complete model of political candidacy with interjurisdictional mobility. That model builds on the citizen-candidate approach developed by Osborne and Slivinski (1996) and Besley and Coate (1997). It assumes an entire continuum of citizens with different policy preferences who may stand as political candidates. As in the current section, I assume that mobility differs between citizens with different policy preferences, such that relatively mobile citizens may be less willing to become candidates in local elections than citizens with a lower degree of mobility. In such a setting, equilibria with one, two or more than two candidates can emerge. Comparable to the two-citizen example presented here, mobility causes a policy shift towards the preferences of the less mobile citizens for certain parameter values.

2.5. Extensions

In the previous sections I have assumed that without mobility all citizens face the same payoffs and fixed costs of political participation – independently of their political position. In contrast to this assumption, some scholars point out that better educated citizens may have higher incentives to become active in the political arena than less educated citizens. Brady (2003), for example, develops a political contribution model in which the marginal returns from political participation are higher for citizens who expect a higher income.[14] The government imposes a proportional tax on high incomes and distributes the tax revenues between the income groups in proportion to political contributions received. If the rich are less numerous than the poor, individuals with a high income pay higher political contributions.

Translating this idea into the cost-benefit diagram, the R_0-curve, which depicts payoffs from political participation of immobile citizens, is no longer flat but decreasing in x: the political prize is higher for citizens who expect a higher income and therefore prefer a smaller size of the welfare state (see Figure 2.3). Those citizens who prefer a very large size of the welfare state may not find it worthwhile to become politically active in the benchmark case without mobility. For these citizens the discounted benefits do not cover the costs of participation.

[14] For empirical evidence concerning the influence of education on political participation, see, for example, Dee (2003) or Milligan et al. (2003).

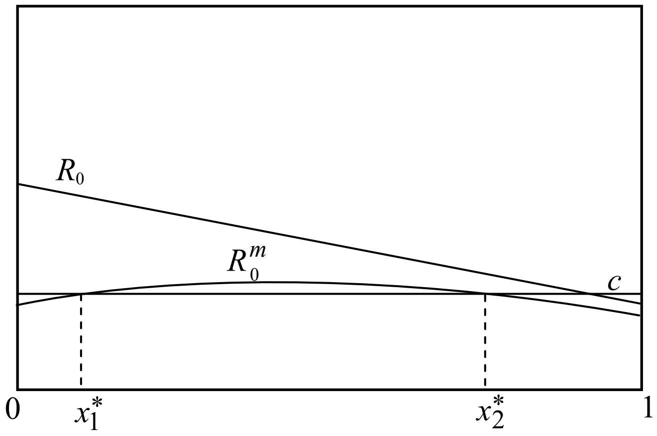

Figure 2.3

Introducing mobility in such a setting again reduces the payoff of political participation for all citizens, and the R_0-curve is replaced by the R_0^m-curve. Notice, that the new R_0^m-curve is not necessarily upward sloping anymore for all *x*. Instead, Figure 2.3 depicts a R_0^m-curve, which is upward sloping for low values of x, and downward sloping for high *x*.[15] For a citizen who prefers a very small size of the welfare state (below x_1^*) the payoff from participation is lower than the costs and the citizen refrains from participating. This is the standard mobility effect already analyzed in section 2.4. However, mobility may now also influence participation on the other side of the political spectrum: since high-*x* citizens have low benefits to begin with, mobility – even though it does not affect them as much as the low-*x* citizens – may well erode the benefits to such an extent that participation becomes unattractive (see Figure 2.3). Mobility then cuts off participants at both ends of the policy spectrum and in this sense can give rise to a convergence towards centrist policies.

As a second extension I replace the simplifying assumption that citizens can only choose between taking or leaving some kind of political activity. Instead, I consider a more general model in which the citizens can choose the degree of individual political involvement. For this purpose the fixed costs of participation *c* are replaced by the function $c(e)$, where *e* denotes the effort invested in the political activity. I assume a convex cost function ($c'(e) > 0$, $c''(e) > 0$) with $c(0) = c'(0) = 0$. The political benefit *R* now also depends on *e*, with $R'(e) > 0$ and $R''(e) \leq 0$. The

[15] The R_0^m-curve may also be upward or downward sloping over the entire range of *x*.

payoff from participation R_0^m is then also a function of e and θ: $R_0^m = R_0^m(e,\theta)$, with $\partial R_0^m / \partial e > 0$, $\partial R_0^m / \partial \theta < 0$, $\partial^2 R_0^m / \partial e \partial \theta < 0$ and $\partial^2 R_0^m / \partial e^2 \leq 0$. The marginal payoff from an increase in e thus declines in the relocation probability θ.

The utility maximizing effort level e^* is implicitly determined by the first-order condition $\partial R_0^m / \partial e - \partial c / \partial e = 0$. Without mobility θ = 0, and the effort level is independent of the citizen's policy position. For mobile citizens the optimal effort level varies according to

$$\frac{de^*}{d\theta} = -\frac{\partial^2 R_0^m / \partial e \partial \theta}{\partial^2 R_0^m / \partial e^2 - \partial^2 c / \partial e^2} < 0 .$$

The higher the relocation probability θ, the lower is the effort level e^*. This is in the line with the result derived in section 2.3: the level of effort invested in the political process declines with the degree of individual mobility.

2.6. Concluding Remarks

Personal mobility is the subject of controversial discussions since it may have severe political, economic and social consequences. Many of these mobility-induced effects have received due attention in the economic literature. In this work I analyze an aspect that has been neglected so far, namely the influence of mobility on political participation and the potential implications of this effect for the size of the welfare state. I have argued that mobility of citizens may influence policy outcomes if citizens who differ with respect to their preferred policy are also exposed to different degrees of interjurisdictional mobility. Specifically, empirical evidence suggests that the well-educated citizens, who in general prefer a smaller size of the welfare state, are also more mobile than the low-skilled citizens. Mobility may then reduce the most mobile citizens' willingness to participate in the political process since they have a relatively low attachment to their jurisdiction.

Focusing on the participation effect of mobility, I have neglected all other potential consequences of mobility for the size of the welfare state. I have followed this strategy for reasons of analytical convenience and not because I think that the participation effect dominates the other channels of influence. The most notable in this respect is tax competition for mobile factors of production. The standard result derived from a benchmark tax competition model is a “race to the bottom” as described in the introduction. Generalizing the basic tax competition model adds, however, some important qualifications. In a setting of asymmetric country sizes, for example, tax exportation motives may in some countries give rise to an increase in redistributive taxation (cf. Cremer et al., 1996, or Cremer and Pestieau, 2003). A promising field for future research would be to analyze the participation effect discussed in this work in a tax competition model to incorporate another important facet in the discussion of tax competition.

3. Citizen-Candidate Mobility and Endogenous Local Policy*

3.1. Introduction

Interjurisdictional mobility of citizens and its effects on public policy are a hot topic of local public economics. Building on the seminal contribution by Tiebout (1956), much research in this field has focused on interjurisdictional competition for mobile individuals. This section considers an alternative channel of influence: mobility may alter the citizens' decision to participate in the political decision-making process. Since mobile citizens are, as a rule, unable to reap the full benefits of their involvement in the political process if they move to another jurisdiction, they are less likely to be willing to spend time and effort for political activities, such as contesting an office of local authority in their jurisdiction of residence.

To analyze the implications of this participation effect for political decision-making, I employ a formal model of political equilibrium with endogenous candidacy. This model can be interpreted as a simplified version of the citizen-candidate approach pioneered by Osborne and Slivinski (1996) and Besley and Coate (1997). Citizens with exogenously given positions on a one-dimensional policy space decide whether they want to contest a political office at the local level. Candidacy is costly, and potential candidates compare these costs with the expected benefits from being elected when deciding about whether to run for the office or not. After citizens have made their candidacy decision an election is held, and the candidate who obtains the plurality of votes is elected. In this setting I introduce mobility by assuming that it lowers the benefits from a political office. The citizen-candidate model is a good starting point to analyze the participation effects of mobility, since it provides a coherent general framework incorporating the participation decision of citizens and its effects on policy outcomes. Citizen-candidates appear to be especially important treat at the local level as municipalities are often governed by honorary politicians who are less likely to be in a position to deviate from their political ideology for strategic reasons than professional politicians. Moreover,

* This section is based on joint paper Lorz and Nastassine (2004), Citizen-Candidate Mobility and Endogenous Local Policy.

political parties play a less prominent role at the local level since informational asymmetries are not so much an issue here; which makes a pure voting model an appropriate framework of reference.

The model developed in section 3 features in general many equilibria; these are characterized, among others, by the number of candidates. In the benchmark case without mobility the expected policy, which results from these equilibria, on average corresponds to the policy most preferred by the median voter. This property of the model no longer holds if citizens are mobile and if the degree of mobility differs across citizens. To account for different individual exposures to mobility, I assume that citizens are the more mobile, the further on the right of the political spectrum their ideal policy is located. Citizens on the right of the political spectrum may then refuse a candidacy, whereas citizens more to the left do not. With an odd number of candidates in equilibrium, this effect shifts the expected policy outcome to the left on average, i.e. towards the policy preference of the less mobile citizens. With an even number of candidates in equilibrium, mobility does not change the expected policy outcome. In this case, however, mobility still has an effect on local public policy since the range of possible candidate positions shrinks as mobility increases.

The results of this investigation can be applied to a variety of situations where the policy preferences of mobile and stationary citizens diverge. Mobility-induced policy preferences may arise, for example, with respect to the size of local government. Political economy models explaining the size of government usually predict that high-income citizens prefer lower taxes and thus a smaller size of the public sector than low-income citizens (see e.g. Meltzer and Richard, 1981). If it is true that it is the well-educated citizens with a correspondingly high expected income who are especially exposed to interjurisdictional mobility,[16] I may conclude that citizens who prefer a smaller size of local government are more mobile than other citizens. As a consequence of this asymmetry the expected size of local government may then, according to the present model, increase with increasing interjurisdictional mobility. This is in contrast to many political economy models, which predict that tax

[16] This second hypothesis can be supported by empirical studies on the determinants of individual migration. Several studies document a positive correlation between individual migration propensities and individual education levels – which in turn should be positively correlated to the expected lifetime income. See previous section 2 and the references cited therein. There is also some survey evidence that the willingness to migrate depends positively on education parameters (see Fertig and Schmidt, 2002).

competition caused by citizen mobility leads to the so-called "race to the bottom" effect.

Further potential applications of the model are policies towards housing or other forms of immobile property – citizens who own immobile property are probably more attached to their home jurisdiction than more footloose citizens. Empirical evidence at least suggests a negative relationship between homeownership and mobility (see e.g. Putnam, 2000). Interjurisdictional mobility may then be responsible for a policy shift towards the preferences of the homeowners.

Although there are several political-economy studies dealing with mobility and its consequences for public policy, I am not aware of any models that analyze the influence of mobility on the supply of political candidates.[17] Some empirical papers in the political science literature consider the effects of mobility on voter participation. Squire et al. (1987), for example, derive a negative influence of residential mobility on voter turnout in the United States. They explain this result with registration requirements for voters.

In a broader sense the present analysis is related to a paper by Glaeser et al. (2002) that considers individual investments in social capital. These authors find theoretical and empirical support for the hypothesis that mobile individuals are less active in building up social capital. The implications for the political process are, however, not analyzed. Di Pasquale and Glaeser (1999) consider the influence of homeownership on social capital formation.

The section is organized as follows: subsection 3.2 describes the model. Subsection 3.3 characterizes equilibrium outcomes if citizens are immobile. Subsection 3.4 introduces citizens' mobility, and subsection 3.5 concludes.

---

[17] For median-voter models see e.g. Epple and Romer (1991), Cremer and Pestieau (1998), and Razin et al. (2002). Lejour and Verbon (1994) and Mazza and van Winden (1996) assume that governments maximize a weighted aggregate welfare function.

3.2. The Model

In this subsection I outline a simple model of electoral competition with an endogenous number of candidates competing for a political office. As explained in the introduction, this approach can be regarded as a simplified citizen-candidate model of political participation.[18] I assume a jurisdiction inhabited by a continuum of citizens with different exogenously given preferences concerning the policy variable $x \in (0, 1)$. These policy preferences are represented by the utility function $u_i = -\gamma|x - x_i|$, with $\gamma > 0$ as a positive constant and x_i as the most preferred policy of citizen i – his (or her) bliss point. Preferences are thus single-peaked and symmetric. The bliss points of the different citizens are distributed independently and uniformly on (0, 1), and each policy position is the bliss point of a large number of citizens.

The political process can be divided into three stages: in the first stage each citizen decides whether to become a candidate or not. Candidacy is costly as each candidate bears fixed candidacy costs amounting to c. Candidates compete for a fixed incumbency rent of R, which I assume to exceed the costs of candidacy ($R \geq c$). This rent captures all potential benefits deriving from holding a political office, and it accrues only to the candidate who wins the election.

The political position of a candidate is exogenously given by his (or her) own bliss point in the policy space. The model thus assumes that candidates cannot commit to another political stance than to their own preferred position. Citizens become candidates only if the expected payoff of a candidacy is not negative, i.e. if

$$E\pi_i = p_i R - c \geq 0 . \tag{3.1}$$

The term p_i denotes the probability of candidate i with bliss-point x_i being elected to office.

Equation (3.1) shows the main difference between the model developed here and the citizen-candidate model developed by Osborne and Slivinski (1996). In the present model citizens only care for the office rent R when deciding whether to run as a political candidate or not; in Osborne and Slivinski (1996) the candidates are also policy motivated, i.e. they consider the influence of their candidacy on the

[18] As will become clear in the following, the present model is more closely related to the version of the citizen-candidate-model of Osborne and Slivinski (1996) than to the one developed by Besley and Coate (1997).

expected policy outcome.[19] The set-up in the model may thus be interpreted as a limit case of the standard citizen-candidate model where the political motivation of candidates is negligibly small compared to potential office rents and costs of candidacy. This assumption greatly simplifies the analysis and, in particular, allows us to derive the full equilibrium solution for an arbitrary number of candidates and even extend the model to the case of heterogeneous degrees of mobility while keeping the main structure and the most important results of the citizen-candidate approach.[20] In any event, this assumption seems to be in line with the mainstream of the public choice literature.

The election is held in the second stage of the political process. I assume deterministic and sincere voting without abstention under the plurality rule.[21] The candidate receiving the highest vote-share wins the election. Each citizen votes for the candidate whose platform is closest to the citizen's own bliss point. If voters are indifferent between several candidates, each of these candidates receives the same vote-share of the indifferent voters. In case of a tie between the candidates with the highest vote-share, these candidates face the same probability of winning the election. The election probability p_i of a candidate on position x_i is thus either equal to $p_i = 1$ if the candidate obtains a higher vote-share than each of his competitors, $p_i = 1/n_i$ if no other candidate obtains a higher vote-share but there are $(n_i - 1)$ other candidates with the same vote-share, or $p_i = 0$ otherwise.

After the election is held, the bliss point x_w of the winning candidate determines the equilibrium policy P in the final stage of the political process: $P = x_w$.

[19] In the model of Besley and Coate (1997) candidates care only about policy, i.e. the incumbency rent R is set to zero.

[20] At the end of the following section I compare the closed-economy results of my benchmark model with those obtained by Osborne, Slivinski (1996).

[21] The same is assumed in Osborne and Slivinski (1996)

3.3. Political Equilibria with Immobile Citizens

Citizen-candidate models feature, in general, a large number of equilibria. In this section I begin by working out equilibria with only a few candidates before I characterize the general case.

One-candidate equilibrium

Assume there is only one candidate (i = 1) with the bliss point x_1 running for election. The only position that is resistant against entry of other citizens is $x_1 = 1/2$. For all other positions a candidate closer to 1/2 could enter and win the election. By the same reasoning a candidate with an ideal position at $x_1 = 1/2$ cannot be defeated by any entering candidate from the left or from the right. The only possible competition may come from another candidate with the same bliss point as candidate 1, i.e. from a challenging candidate with $x_c = 1/2$ (the subscript c denotes the challenging candidate). The probability of winning the election for the entering candidate would then be equal to $p_c = 1/2$, and the expected payoff as defined in (3.1) would be $E\pi_c = R/2 - c$. As long as this expected payoff is not positive ($R \leq 2c$), an equilibrium with only one candidate can exist.

In a one-candidate equilibrium, the candidate is elected with certainty ($p_1 = 1$) and his expected payoff is $E\pi_1 = R - c$. Since I have assumed $R \geq c$ this expected payoff is not negative. A one-candidate equilibrium with $x_1 = 1/2$ thus exists in the model with immobile citizens if and only if $R \leq 2c$. The equilibrium policy resulting from the one-candidate equilibrium is $P_{e1} = 1/2$.[22]

Proposition 1.a: *A one-candidate equilibrium exists in the model with immobile citizens if and only if $R \leq 2c$. The policy resulting from this equilibrium is given by $P_{e1} = 1/2$.*

Two-candidate equilibria

An equilibrium with two candidates (i = 1, 2) can only exist if both candidates obtain the same vote-share, since any candidate with a non-maximum vote-share would lose the election with certainty and thus would expect a negative payoff. First, consider the case where both candidates are located on different positions. Let y_1 and y_2 denote the vote-shares of the two candidates in a two-candidate equilibrium and let

[22] The subscript $e1$ denotes the one-candidate equilibrium.

$x_1 < x_2$. The vote-share y_1 is given by $y_1 = x_1 + [x_2 - x_1]/2$, since all voters to the left of x_1 and those between x_1 and x_2 whose bliss-point is closer to x_1 vote for candidate 1. Analogously, the vote-share y_2 is given by $y_2 = 1 - x_2 + [x_2 - x_1]/2$. Rearranging yields $y_1 = [x_1 + x_2]/2$ and $y_2 = 1 - [x_1 + x_2]/2$. From these two equations and from $y_1 = y_2 = 1/2$ we obtain the condition that in equilibrium both candidates have to be located symmetrically around the position $1/2$, i.e.

$$1/2 - x_1 = x_2 - 1/2. \tag{3.2}$$

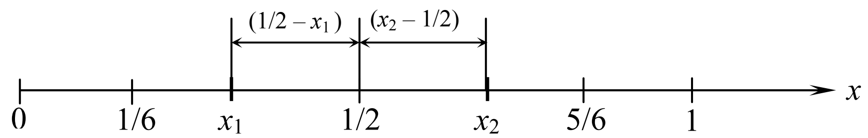

Figure 3.1

Second, note that an equilibrium with both candidates sharing the same position, i.e. $x_1 = x_2$, cannot exist. If both candidates are located at the median position, $x_1 = x_2 = 1/2$, a challenging candidate with an ideal position at $x_c = 1/2 \pm \varepsilon$ (where ε is small) could enter and win the election. The same holds for $x_1 = x_2 \neq 1/2$ since in this case an entering candidate closer to the position $1/2$ would obtain more than half of the votes. This implies $x_2 \neq x_1$ or, since I have assumed for this case $x_1 < x_2$, $x_1 < 1/2 < x_2$.

The election probabilities of both candidates in a two-candidate equilibrium are $p_1 = p_2 = 1/2$ such that the expected payoff of the candidates is $E\pi_i = R/2 - c$. The expected payoff is not negative for $R \geq 2c$.

A two-candidate equilibrium can only exist if $x_2 \leq 5/6$ (Appendix A.1).[23] Thus, we obtain a continuum of two-candidate equilibria for $R \geq 2c$, with $1/2 < x_2 \leq 5/6$ and with x_1 determined by the symmetry condition (3.2). For $R < 2c$ no two-candidate equilibrium exists.[24] The equilibrium policy in a given two-candidate

[23] The two-candidate equilibrium with $x_2 = 5/6$ exists only if $2c \leq R \leq 3c$ (see Appendix A.1).

[24] In contrast to the present model a two-candidate equilibrium may also exist in the model of Osborne and Slivinski (1996) for some $R < 2c$.

equilibrium depends on which candidate is elected. If candidate 1 is elected then $P = x_1$, if 2 is elected then $P = x_2$. However, because of the symmetry between x_1 and x_2 and because both candidates are elected with the same probability, the expected policy in a two-candidate equilibrium is $EP_{e2} = 1/2$.

Proposition 1.b: *A two-candidate equilibrium exists in the model with immobile citizens if and only if* $R \geq 2c$. *The expected policy resulting from this equilibrium is given by* $EP_{e2} = 1/2$.

Until now I have characterized two equilibria types, with one and two candidates running for election. However, these types represent rather special cases. In the next two subsections I derive existence conditions for the next two equilibria types (with 3 and 4 candidates), which can be generalized. Thereafter, deriving the general conditions, summarized in proposition 1.c, is just a matter of technique.

Three-candidate equilibria

No three-candidate equilibrium exists with more than one candidate on the same position (see Appendix A.2). Let the positions of the candidates be allocated according to $x_1 < x_2 < x_3$. As in the case of two candidates, an equilibrium with three candidates can only exist if all three candidates get the same share of votes, i.e. if $y_1 = y_2 = y_3 = 1/3$. This implies that in equilibrium the positions of the three candidates must be located symmetrically around the points 1/3 and 2/3, which I call attractors in the following. The ideal policy positions of the three candidates in equilibrium are then allocated around these two attractors according to

$$\frac{1}{3} - x_1 = x_2 - \frac{1}{3}, \text{ and } \frac{2}{3} - x_2 = x_3 - \frac{2}{3}. \tag{3.3}$$

Since $x_1 < x_2 < x_3$, expression (3.3) implies $2/3 < x_3 < 1$. Figure 3.2 shows possible equilibrium locations of the candidates.

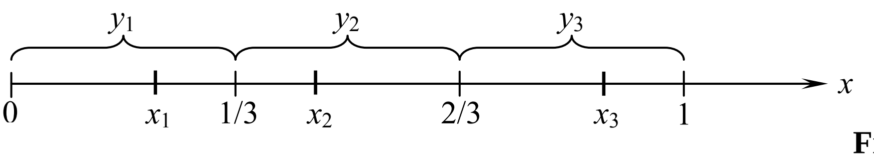

Figure 3.2

If the positions of the three candidates satisfy (3.3), then no citizen to the left of x_1 or to the right of x_3 enters the competition because such a candidate would lose the election with certainty. The same holds for candidates between x_1 and x_2 or between x_2 and x_3. The election probabilities of the three candidates are $p_1 = p_2 = p_3 = 1/3$ and the expected payoff for the candidates is $E\pi_i = R/3 - c$. A three-candidate equilibrium therefore exists if and only if $R \geq 3c$.

The expected policy in a given three-candidate equilibrium is $EP_{e3}(x) = [x_1 + x_2 + x_3]/3$. Inserting from (3.3) yields $EP_{e3}(x_3) = [2/3 + x_3]/3$, which can be less or greater than 1/2, depending on x_3. For a further interpretation I derive the expected policy outcome, which results on average from all three-candidate equilibria. For this purpose I assume that all three-candidate equilibria are equally probable, i.e. the equilibrium values of x_3 are distributed uniformly between $2/3$ and 1. This appears to be a reasonable assumption since all equilibria yield the same payoffs for the three candidates such that one cannot regard some equilibria to be more likely than others. The expected policy then is

$$\overline{EP}_{e3} = E(EP_{e3}(x)) = \frac{\int_{2/3}^{1} [2/3 + x_3]/3 \, dx_3}{\int_{2/3}^{1} dx_3} = \frac{1}{2}.$$

Four-candidate equilibria

Analogously, one obtains the conditions for an equilibrium with four candidates running for election. In this case the equilibrium positions of the candidates have to be located symmetrically around the three attractors 1/4, 1/2 and 3/4, such that the equilibrium conditions are

$$\frac{1}{4} - x_1 = x_2 - \frac{1}{4}, \; \frac{1}{2} - x_2 = x_3 - \frac{1}{2}, \text{ and } \frac{3}{4} - x_3 = x_4 - \frac{3}{4} \tag{3.4}$$

The range of all x_4 which are compatible with a four-candidate equilibrium is given by $3/4 < x_4 < 1$ since all candidates are located on different positions, i.e. $x_1 < x_2 < x_3 < x_4$ (see Appendix A.3). Figure 3.3 illustrates this case.

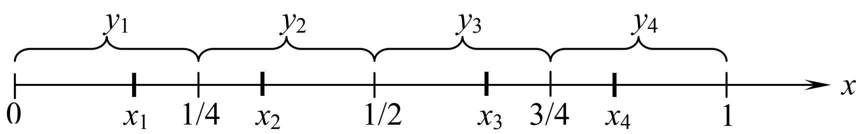

Figure 3.3

A four-candidate equilibrium exists for $R \geq 4c$ as the election probability for each candidate is $p_i = 1/4$. Again, we arrive at a continuum of possible four-candidate equilibria. The expected policy in all these equilibria is $EP_{e4} = [x_1 + x_2 + x_3 + x_4]/4 = 1/2$.

Figure 3.4 illustrates potential equilibria without mobility of citizens in the model as derived so far for different values of the political rent *R* and the entry costs *c*.

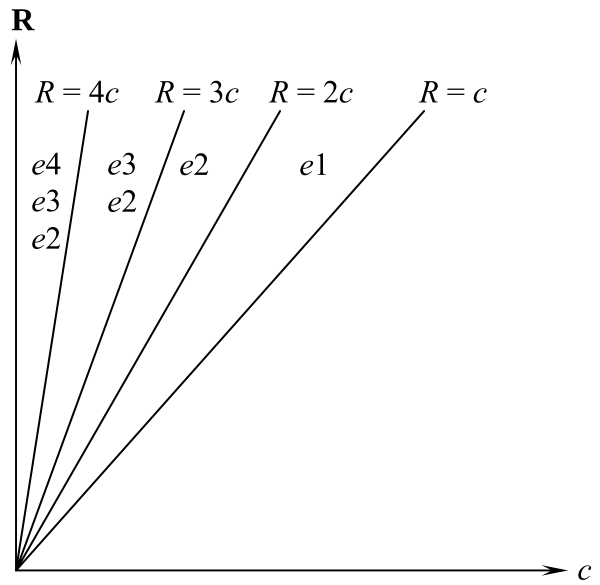

Figure 3.4

General Case

Proposition 1.c characterizes possible *n*-candidate equilibria ($n \geq 3$) of the model of political participation for the case without mobility.

Proposition 1.c: *An n-candidate equilibrium* ($n \geq 3$) *exists in the model with immobile citizens if and only if* $R \geq nc$. *The following two conditions need to be satisfied in this equilibrium:*

(i) $\frac{1}{n} - x_1 = x_2 - \frac{1}{n},\ \ldots,\ \frac{i}{n} - x_i = x_{i+1} - \frac{i}{n},\ \ldots,\ \frac{n-1}{n} - x_{n-1} = x_n - \frac{n-1}{n}$;

(ii) $\frac{n-1}{n} < x_n < 1$.

The expected policy is given by $EP_{en} = 1/2$ *for equilibria with an even number of candidates. The average expected policy is* $\overline{EP}_{en} = 1/2$ *for an odd number of candidates if the equilibrium values of* x_n *are distributed equally in the range determined by (ii).*

Proof: see Appendix A.4.

Before we turn to the consequences of introducing mobility into the model, let us briefly compare the equilibria derived so far with those obtained by Osborne and Slivinski (1996): as in the present work a one-candidate equilibrium at the median position exists for $R \geq c$ in their model.[25] The two-candidate equilibrium in Osborne and Slivinski (1996) also exhibits symmetry around the median as in this section. Three-candidate equilibria in Osborne, Slivinski (1996) are either allocated such that each candidate obtains 1/3 of all votes as in the present model. Or equilibria may exist where politically motivated citizens stand as candidates even if they lose the election with certainty. The present simplified framework excludes such equilibria. For the case of more than three candidates, Osborne, Slivinski (1996) do not provide a general characterization of the equilibrium properties. As shown above, the present simplified model makes this possible.

[25] Another one-candidate equilibrium may exist in Osborne and Slivinski (1996) with a candidate differing from the median if $R < c$. In the context of the present model where candidates are not policy-oriented such an outcome is not possible: if the rent R were lower than the costs of candidacy c, then clearly no citizen would have an incentive to become a candidate.

3.4. Political Equilibria with Mobile Citizens

In this section I analyze the influence of personal mobility on the citizens' decision to run for election and on the resulting political outcomes. To keep the model tractable and to focus on the effects of mobility on political participation, I do not explain the individual migration behavior. Instead, I assume that migration is beyond the citizens' control. Each citizen faces an exogenous individual probability θ ($0 \leq \theta \leq 1$) of migrating to another jurisdiction. This is the case, for example, if citizens are sent to another jurisdiction by their employer. The paper by Glaeser et al. (2002), mentioned in the introduction, considers mobility in a similar way. Migration occurs after candidates have spent their costs of candidacy but before the winning candidate receives any benefits from the political office.[26] After relocation to another jurisdiction the benefits from a previous political participation in the former jurisdiction of residence drop to zero. Because of this effect the payoff from political participation declines with the degree of the citizen's mobility.

To isolate the participation effect of mobility, I assume that the distribution of policy preferences with mobility is the same as in a closed economy, i.e. emigrating citizens are replaced by immigrants of the same type.[27]

The relocation probability θ is not the same for all citizens in the model but depends on the preferred political position, i.e. $\theta = \theta(x)$. Specifically, I assume that $\theta'(x) > 0$. In previous section 2, for instance, some evidence has be

en provided pointing out that different groups of citizens are exposed differently to interregional mobility. In particular, the degree of mobility increases with the education level. In terms of the present model the highly mobile and highly educated citizens thus prefer a policy position more to the right on the one-dimensional policy spectrum.[28] As mentioned in the introduction to this section, the differences in the policy preferences between highly educated and less educated people may arise, for instance, through the differences in the average expected income between these two

[26] Without altering the results of the model one could as well assume that a winning candidate who relocates after the election is able to reap a part but not all of the office rents before moving.

[27] If a political candidate emigrates, I assume that an individual with the same policy preferences can replace him. This is just a technical assumption to close the model intertemporally.

[28] "Left" and "Right" do not have any further meaning in this model. I could also have assumed that highly mobile citizens are located in the left part of the policy space. The main point is that policy preferences of mobile and less mobile citizens diverge.

population groups. If $(1 - x)$ measures the size of the government, the high-income citizens prefer a larger x than the low-income people. And these differences drive the model.

With the relocation probability $\theta(x)$ the expected rent from holding a political office is $ER(x) = [1 - \theta(x)]R$, and – since $\theta'(x) > 0$ – the expected rent decreases in x. Figure 3.5 illustrates the relationship between x and $ER(x)$. For this figure I employ a linear specification of $\theta(x)$, with $\theta(x) = \beta x$ and $0 < \beta < 1$. The probability that a citizen stays in the jurisdiction is then given by $1 - \beta x$, and the expected rent from being elected to a political office is $ER(x) = [1 - \beta x]R$.

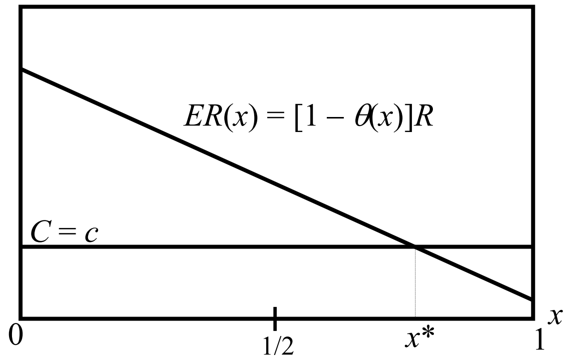

Figure 3.5

In the following it will be shown how individual mobility influences the different types of equilibria. Namely, as in the previous section, I first consider the equilibria types with one to four candidates. Then the general solution with mobility is characterized.

One-candidate equilibrium

The position $x_1 = 1/2$ can be a one-candidate equilibrium with mobility only if the expected rent $ER(x)$ at $x = 1/2$ is not lower than the cost of candidacy c – in other words, only if $R[1 - \theta(1/2)] \geq c$. This case is illustrated in Figure 3.5. Rearranging yields $\theta(1/2) \leq 1 - c/R$ as a first condition for the existence of a one-candidate equilibrium with $x_1 = 1/2$. For $ER(1/2) > 2c$ or $R[1 - \theta(1/2)] > 2c$, an additional candidate at the position $1/2$ has an incentive to enter the competition and a one-candidate equilibrium cannot exist. Rearranging results in $\theta(1/2) \geq 1 - 2c/R$ as a second existence condition, which prevents the entry of another candidate at $x_c = 1/2$. A one-candidate equilibrium at the median position $x_1 = 1/2$ as in the closed economy thus exists if and only if the following two inequalities are satisfied:

$$1 - 2c/R \leq \theta(1/2) \leq 1 - c/R\,. \tag{3.5}$$

The policy outcome remains in this case at $P = 1/2$.

If the curve $ER(x)$ intersects the cost curve c to the left of $x = 1/2$, i.e. if $\theta(1/2) > 1 - c/R$ (see Figure 3.6), a one-candidate equilibrium can only exist at this intersection point x_1^*. To the right of this position the expected rent from a political office is lower than the costs of candidacy; to the left of this position there would be an incentive for citizens between the incumbent candidate and the position x_1^* to enter. The position of the candidate in the one-candidate equilibrium is then given by $R\left[1 - \theta\left(x_1^*\right)\right] = c$ or $\theta\left(x_1^*\right) = 1 - c/R$. Such an equilibrium exists for $\theta(0) \leq 1 - c/R$.

Proposition 2.a: *With mobility of citizens, a one-candidate equilibrium exists at* $x_1 = 1/2$ *if and only if* $1 - 2c/R \leq \theta(1/2) \leq 1 - c/R$. *A one-candidate equilibrium with* $x_1 < 1/2$ *exists if and only if* $\theta(0) \leq 1 - c/R < \theta(1/2)$.

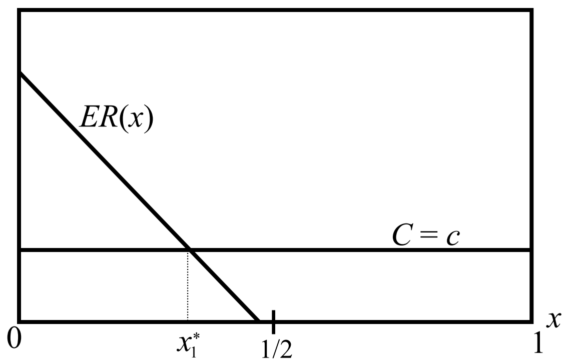

Figure 3.6

The linear example $\theta(x) = \beta x$ may give some more insights about the effects of mobility in the one-candidate equilibrium: a one-candidate equilibrium exists in this example if $\beta \geq 2[1 - 2c/R]$. For $\beta \leq 2[1 - c/R]$ the candidate in the equilibrium is located at the median position $x_1 = 1/2$ whereas for $\beta > 2[1 - c/R]$ the one-candidate equilibrium implies $x_1 < 1/2$. The equilibrium policy position of the candidate in the latter case is given by $x_1^* = \beta^{-1}[1 - c/R]$. If the mobility measure β is sufficiently high, mobility thus leads to a one-candidate equilibrium with the candidate being located to the left of the median's ideal position, and an increase in β shifts the equilibrium policy position further to the left.

Two-candidate equilibria

As in the case without mobility, a two-candidate equilibrium only exists if both candidates are located symmetrically around the median and obtain the same vote-share. Equation (3.2) thus has to be satisfied with $x_1 < 1/2 < x_2$. The expected payoff of the candidates is $E\pi_i = R[1-\theta(x_i)]/2 - c$. Since $\theta'(x) > 0$ the expected payoff of candidate 1 exceeds the expected payoff of candidate 2 and we only have to consider the entry decision of candidate 2. $E\pi_2$ is non-negative if $\theta(x_2) \leq 1 - 2c/R$. The set of all $x_2 > 1/2$ satisfying this condition is not empty as long as

$$\theta(1/2) < 1 - 2c/R \,. \tag{3.6}$$

Inequality (3.6) is necessary for the existence of a two-candidate equilibrium with personal mobility. Without mobility, the existence condition for a two-candidate equilibrium is $1 - 2c/R \geq 0$. Since $\theta(1/2) > 0$, inequality (3.6) is more restrictive than the condition for the existence of a two-candidate equilibrium without mobility. A two-candidate equilibrium can thus only exist with mobile citizens if it also exists without mobility, and for some c and R a two-candidate equilibrium exists if citizens are immobile but not if they are mobile.

As both candidates are located symmetrically around the position $1/2$, the expected policy outcome in a two-candidate equilibrium does not change compared to the case without mobility; it is still given by $EP_{e2} = 1/2$.

Proposition 2.b: *A two-candidate equilibrium exists in the model with mobile citizens if and only if $\theta(1/2) < 1 - 2c/R$. The expected policy resulting from this equilibrium is given by $EP_{e2} = 1/2$.*

Although mobility does not change the expected policy outcome in a two-candidate equilibrium, it may, nevertheless, have policy consequences: it influences the range of possible equilibria with two candidates. In the case without mobility this range is given by $1/2 < x_2 \leq 5/6$. With mobility, the equilibrium range for x_2 may be restricted by x_2^*, with x_2^* being defined by $\theta\left(x_2^*\right) = 1 - 2\,c/R$.[29] If $x_2^* < 5/6$, the range of possible two-candidate equilibria decreases, and mobility causes a convergence of policy positions towards the median.

Three-candidate equilibria

In a three-candidate equilibrium expression (3.3) and the condition $2/3 < x_3 < 1$ need to be satisfied. In addition, the participation constraint $ER(x)/3 \geq c$ needs to hold for candidate 3 (see Figure 3.7). This gives rise to the following inequality as a necessary existence condition:

$$\theta(2/3) < 1 - 3\,c/R\,. \qquad (3.7)$$

The condition for the existence of a three-candidate equilibrium without mobility ($1 - 3c/R \geq 0$) is weaker than inequality (3.7). As in the case of two candidates, the existence condition for a three-candidate equilibrium is thus more restrictive with mobility than without.

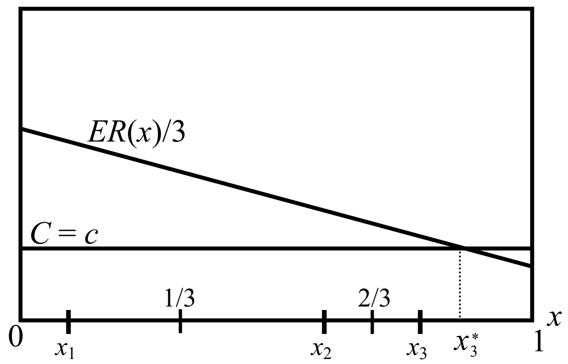

Figure 3.7

If the expected payoff of a candidate 3 with $x_3 \to 1$ is not negative, i.e. if $\theta(1) \leq 1 - 3\,c/R$, mobility does not have any influence on the political sphere and Proposition 1.c applies: the range of possible three-candidate equilibria is $2/3 < x_3 < 1$, and the average expected policy outcome resulting from all possible three-candidate equilibria is $\overline{EP_{e3}} = 1/2$.

[29] Analogously to the case without mobility a two-candidate equilibrium with $x_2 = 5/6$ can only exist as long as a challenging candidate at $x_c = 1/2$ would not expect a positive payoff (see Appendix A.1). Since p_c = 1/3, this condition becomes $\theta(1/2) \geq 1 - 3c/R$.

For $\theta(1) > 1 - 3c/R$, however, the expected rent curve $ER(x)/3$ intersects the cost curve $C = c$ at some $x_3^* < 1$, as in Figure 3.7. The position x_3^* of the candidate who is indifferent between running for election and abstaining from it is given by $\theta(x_3^*) = 1 - 3c/R$. In this case the range of three-candidate equilibria is restricted to $2/3 < x_3 \le x_3^*$. The average expected policy in a three-candidate equilibrium is then given by

$$\overline{EP}_{e3} = \frac{\int_{2/3}^{x_3^*} [2/3 + x_3]/3 \; dx_3}{\int_{2/3}^{x_3^*} dx_3} = \frac{[2 + x_3^*][3x_3^* - 2]}{6[3x_3^* - 2]} = \frac{2 + x_3^*}{6},$$

which is smaller than 1/2 since $x_3^* < 1$. As in the one-candidate equilibrium, mobility can therefore cause the expected policy to shift towards the preferences of the less mobile citizens. The reason is that the range of possible three-candidate equilibria is cut off at the right of the political spectrum if very mobile citizens who prefer a high *x* refrain from being a candidate for the political office.

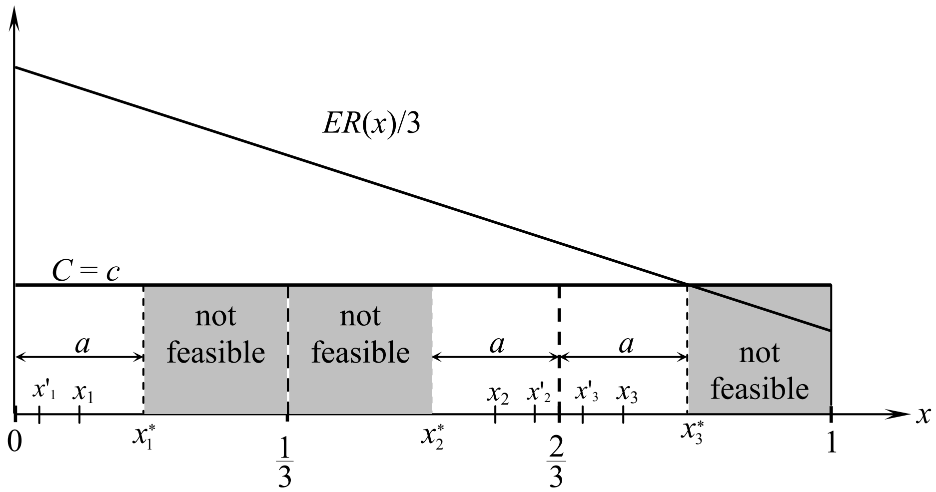

Figure 3.8

This situation is depicted in Figure 3.8. It shows possible candidate positions in a three-candidate equilibrium with $x_3^* < 1$. These positions are determined by the symmetry condition (3.3). Figure 3.8 shows two possible allocations of the three candidates according to this symmetry condition: (x_1, x_2, x_3) and (x_1', x_2', x_3'). The candidates' bliss points in these and all other possible three-candidate equilibria are positioned within the intervals denoted by *a* in Figure 3.8. One can see that for

$x_3^* = 1$ the intervals a would cover the whole policy spectrum, which means that citizens on all policy positions between 0 and 1 would be candidates in a three-candidate equilibrium. For $x_3^* < 1$, the intervals a leave some areas open; policy positions in these areas are no longer compatible with a three-candidate equilibrium with mobility. There emerge "holes" in the policy space – areas from which no citizen runs for election. These are the shaded areas in Figure 3.8. Mobility then results in a concentration of political candidates around some points in the policy space. These are point 0 and point 2/3. Inserting $a = x_3^* - 2/3$ into $\overline{EP}_{e3}$ yields $\overline{EP}_{e3} = 4/9 + a/6$. For all $a < 1/3$ the average expected policy outcome is to the left of the median voter position 1/2.

Inserting from our linear specification $\theta(x) = \beta x$ into inequality (3.7) yields $\beta < 3[1 - 3c/R]/2$ as the existence condition for a three-candidate equilibrium with mobility. Unrestricted three-candidate equilibria (with $a = 1/3$) as in the case without mobility exist if $\beta \leq 1 - 3c/R$ and the average expected policy outcome in an unrestricted three-candidate equilibrium is $\overline{EP}_{e3} = 1/2$. The average expected policy moves to the left if citizens' mobility increases such that $\beta > 1 - 3c/R$.

Therefore, I may guess from the three-candidate case that in the case with an odd number of candidates mobility can lead to a policy shift towards less mobile citizens. Later on I will verify whether this guess is true.

Four-candidate equilibria

The next and the last equilibrium type I present in detail is the equilibrium with four candidates contesting for political office. As in the previous cases, I obtain the following necessary condition for the existence of a four-candidate equilibrium:

$$\theta(3/4) < 1 - 4c/R \tag{3.8}$$

Again, this condition is more restrictive than the existence condition $0 \leq 1 - 4c/R$ applying to the case without mobility. Since the symmetry condition (3.4) needs to hold, the expected policy outcome in a four-candidate equilibrium is $EP_{e4} = 1/2$. Citizens' mobility thus does not influence the expected policy in a four-candidate equilibrium.

The range of candidate positions in the four-candidate equilibria is the same as in the case without mobility if $\theta(1) \le 1 - 4c/R$. For $\theta(1) > 1 - 4c/R$ the range is restricted by $x_4^* < 1$, with x_4^* given by $\theta(x_4^*) = 1 - 4c/R$.

In our linear specification $\theta(x) = \beta x$ the condition for an equilibrium with four candidates is $\beta < 4[1 - 4c/R]/3$.

Figure 3.9 shows possible candidate positions in a four-candidate equilibrium with $x_4^* < 1$. Here it is also clear that mobility causes a concentration of the candidate positions as in the previous case. The candidates' bliss points are concentrated symmetrically around 1/4 and 3/4. Since in the four-candidate equilibrium these bliss points are symmetrically located around 1/2 the expected policy outcome remains in the middle of the policy space.

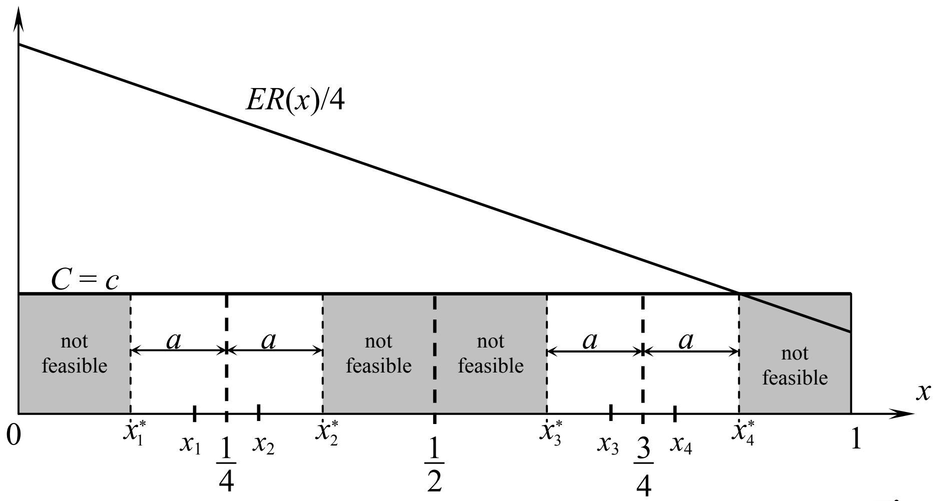

Figure 3.9

We can therefore suspect that the expected policy depends on the number of candidates. If there is an even number of candidates, the candidates' positions are symmetrically located around 1/2 and the expected policy remains at the median voter's bliss point. With an odd number, the candidates are not located symmetrically with respect to the median voter position. This may lead to a leftward policy shift.

General case

We are now in a position to characterize the general solution of the model with citizens' mobility for $n \geq 3$:[30]

Proposition 2.c: *An n-candidate equilibrium* ($n \geq 3$) *with mobile citizens exists if and only if* $\theta([n-1]/n) < 1 - nc/R$. *The following two conditions need to be satisfied in equilibrium:*

$$(i)\ \frac{1}{n} - x_1 = x_2 - \frac{1}{n}\ ;\ \ldots\ ;\ \frac{i}{n} - x_i = x_{i+1} - \frac{i}{n}\ ;\ \ldots\ ;\ \frac{n-1}{n} - x_{n-1} = x_n - \frac{n-1}{n}\ ;$$

$$(ii)\ \frac{n-1}{n} < x_n \begin{cases} \leq x_n^* & \text{for} \quad x_n^* < 1 \\ < 1 & \text{otherwise} \end{cases},$$

where x_n^* *is determined by* $\theta(x_n^*) = 1 - nc/R$. *The expected policy outcome in an n-candidate equilibrium is given by* $EP_{en} = 1/2$ *if n is even. If n is odd, the average expected policy outcome is* $\overline{EP}_{en} = 1/2$ *for* $\theta(1) \leq 1 - nc/R$ *and* $\overline{EP}_{en} = [n - 1 + x_n^*]/2n < 1/2$ *otherwise.*

Proof: see Appendix A.5.

With the help of the linear example $\theta(x) = \beta x$ one can illustrate how mobility of citizens influences the types of equilibria that may exist in my model and the policy outcome resulting from these different types of equilibria. Figure 3.10 shows how the equilibrium policy depends on the value of the mobility parameter β. For $\beta = 0$ there is no interjurisdictional mobility. I have chosen *R* and *c* such that in this case five types of equilibria are possible, with 2, 3, 4, 5 and 6 candidates.[31] On the interval *AB*, where β is relatively small, these five types of equilibrium can still be realized with mobility. As I have shown in section 3.3 all these equilibria yield an expected policy of $EP_{e6} = 1/2$. If β reaches the value $B = 6[1 - 6c/R]/5$, then the six-candidate equilibrium disappears and only four types of equilibria are possible, namely equilibria with 2, 3, 4 and 5 candidates. In the interval $[B, C]$ these equilibria imply an average expected policy of $\overline{EP}_{e5} = 1/2$. For $\beta > C = 1 - 5c/R$, the average expected policy in a five candidate equilibrium $\overline{EP}_{e5}$ is smaller than 1/2 and

[30] I derive the general conditions for $n \geq 3$ since the equilibria with one and two candidates running for election represent two extreme cases, which do not fall under the conditions in Proposition 2.c.

[31] More precisely, I have assumed $6c < R < 7c$.

decreases as β increases. If β reaches $D=5[1-5c/R]/4$, a five-candidate equilibrium is no longer feasible. In interval $[D,E)$ therefore only three types of equilibria can emerge – namely 2, 3 and 4 candidate equilibria.

As citizen mobility increases, more and more types of equilibria disappear: four-candidate equilibria at $E=4[1-4c/R]/3$, three-candidate equilibria at $G=3[1-3c/R]/2$, and two-candidate equilibria at $H=2[1-2c/R]$. For $\beta>H$ the only possible equilibrium is the one-candidate equilibrium. In the interval $\beta\in(F,G)$, with $F=1-3c/R$, the three-candidate equilibria give rise to an average expected policy, which is to the left of the median voter: $\overline{EP}_{e3}<1/2$.[32] The same holds for the one-candidate equilibrium if $\beta>K$.

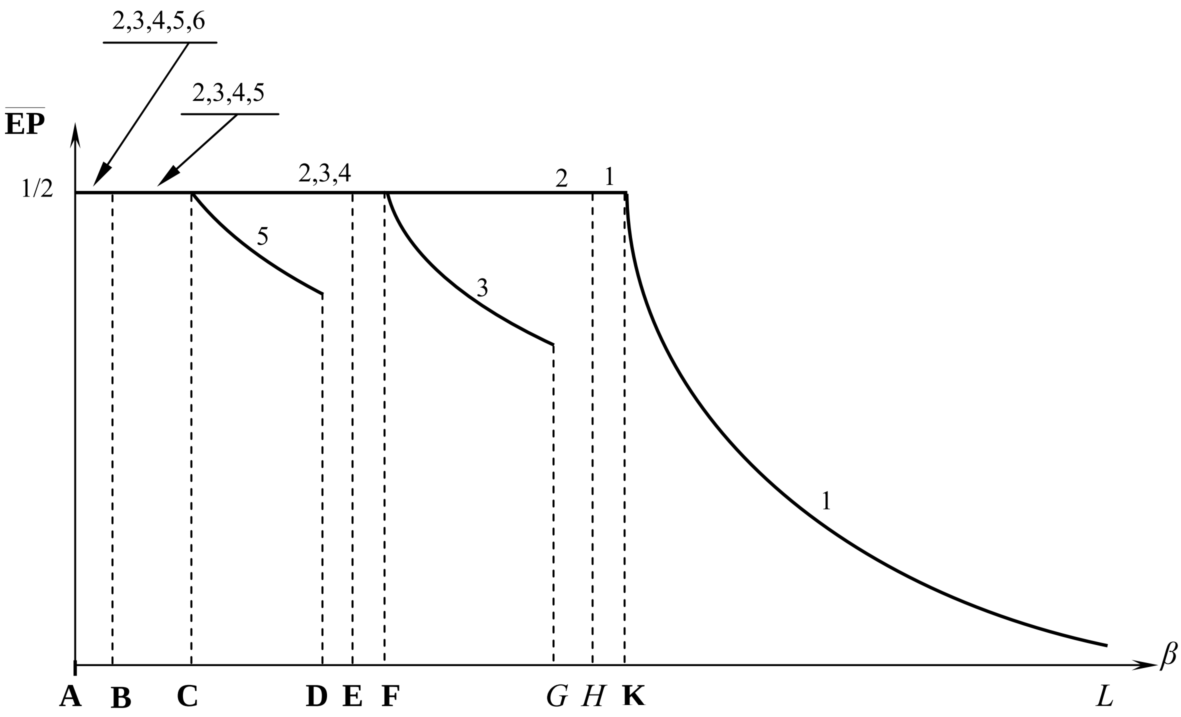

Figure 3.10

[32] Since I have set $R<7c$ for the illustration in figure 3.10, the point *C* lies to the right of *B* and *F* to the right of *E*. For a higher *R*, however, *C* and *F* could also be positioned to the left of *B* and *E*, respectively.

3.5. Summary and Concluding Remarks

In section 3 I have analyzed the influence of personal mobility on the supply of political candidates and on the resulting political outcome. It has been shown that mobility may influence the equilibrium policy if citizens who differ with respect to their preferred policy are also exposed to different degrees of interjurisdictional mobility. The reason is that mobility reduces the expected payoff from a political office. Relatively mobile citizens may then be less willing to become candidates in their municipality than citizens who are not likely to move to another municipality.

The presented model gives rise to some testable hypotheses. The model, for example, implies that certain policy platforms cannot be part of an equilibrium if mobility is sufficiently large. Notice that it is not only the positions on the extreme right of the political spectrum that are ruled out but, interestingly, also the some left positions. Another hypothesis is that citizen mobility is negatively correlated with the number of citizen-candidates running for office in their municipalities. And last but not least, the model implies, of course, that highly educated people, who are empirically shown to be the most mobile, will be less and less willing to be actively involved in local politics as they become more mobile. This effect can in fact also cause a deterioration in the quality of local politics. An empirical test of this implication would certainly be of a great interest and entail conceivable explosiveness.

In order to focus on the participation effect of mobility, I have set up a highly stylized model, abstracting from several factors that may be important for the effects of mobility on policy-making. Most notably in this respect is the exogenous mobility assumption of the present section. A model that endogenizes both the migration decision and the political participation of citizens in a unified framework appears to be a promising avenue for future research.

Appendix

A.1: Two-candidate equilibria

This appendix derives conditions for which no candidate in addition to the candidates with positions x_1 and x_2 enters. Given the symmetry of x_1 and x_2 around $1/2$, no candidate with a policy position to the left of x_1 enters the competition, as the vote-share of such an entering candidate would be lower than the vote-share of candidate 2. The same argument holds for potential candidates to the right of x_2. In addition, no candidate enters with the same bliss point as the two candidates on x_1 or x_2 as this entering candidate would also lose the election with certainty.

It remains to check whether a citizen with an ideal position between x_1 and x_2 has an incentive to enter the political competition. The vote-share of such a challenging candidate with position x_c would be $y_c = [x_2 - x_1]/2$. Inserting $x_1 = 1 - x_2$ from (3.2) implies $y_c = [2x_2 - 1]/2$. The vote-share of candidates 1 and 2 after the entry of a candidate on x_c would be $y_1 = [x_c + 1 - x_2]/2$ and $y_2 = [2 - x_2 - x_c]/2$. The challenging candidate would win the election with certainty if $y_1 < y_c$, which is equivalent to $x_c < 3x_2 - 2$, and if $y_2 < y_c$, which is equivalent to $x_c > 3 - 3x_2$. A policy position x_c satisfying both inequalities exists for $x_2 > 5/6$. An equilibrium with $x_2 > 5/6$ thus cannot exist. For $x_2 = 5/6$, y_c would be $y_c = 1/3$. If a candidate enters on $x_2 = 1/2$ then $y_1 = y_2 = 1/3$. The expected payoff of all candidates would then be $E\pi_i = R/3 - c$. Therefore, a two-candidate equilibrium with $x_2 = 5/6$ can only exist if $R \leq 3c$.

A.2: Three-candidate equilibria

No equilibrium can exist with more than two candidates on the same position. Otherwise a candidate close to this position could enter and win the election (see also Osborne and Slivinski, 1996, Lemma 2). To show that there is no three-candidate equilibrium with only two candidates sharing the same position, assume $x_1 = x_2 < x_3$. In this case, the condition $2/3 - x_1 = x_3 - 2/3$ has to hold for $y_1 = y_2 = y_3$ to be satisfied. With $x_3 \leq 1$ this implies $x_1 \geq 1/3$. If a candidate enters at $x_c < x_1$, he obtains $y_c = [x_1 + x_c]/2$. The entering candidate wins the election for

$x_1 + x_c > 2/3$. With $x_c \to x_1$ this inequality is satisfied for $x_1 > 1/3$. An equilibrium with $x_1 = x_2$ therefore can only exist at $x_1 = x_2 = 1/3$.

For $x_1 = x_2 = 1/3$ and $x_3 = 1$ an entering candidate between x_1 and x_3 would obtain $y_c = 1/3$, and the vote share of the other candidates would be $y_1 = y_2 = [3x_c + 1]/12$ and $y_3 = [1 - x_c]/2$. Since $1/3 < x_c < 1$, y_c exceeds y_1, y_2, and y_3, and a challenging candidate would win the election. Since the model is symmetric, one can show similarly that $x_1 < x_2 = x_3$ is not a three-candidate equilibrium.

A.3: Four-candidate equilibria

First, as in the three-candidate case, no four-candidate equilibrium can exist with more than two candidates on the same position. Moreover, no equilibrium can exist with four candidates on two different positions. To show this, suppose $x_1 = x_2 < x_3 = x_4$. In this case $y_1 = ... = y_4 = 1/4$ for $1/2 - x_1 = x_3 - 1/2$ as in the two-candidate equilibrium. A candidate entering to the left of x_1 would win the election for $x_1 + x_c > 1/2$. For $x_c \to x_1$ a necessary condition to prevent entry from the left is therefore $x_1 \le 1/4$.

A candidate between x_1 and x_3 would obtain $y_c = [x_3 - x_1]/2$. Inserting $1/2 - x_1 = x_3 - 1/2$ yields $y_c = [1 - 2x_1]/2$ compared to $y_1 = [x_1 + x_c]/4$ and $y_3 = 1/4 + [x_1 - x_c]/4$. For $x_c < 2 - 5x_1$ the entrant would win against candidate 1. For $x_c > 5x_1 - 1$ the entrant wins against candidate 3. Thus, if $5x_1 - 1 < 2 - 5x_1$ or $x_1 < 3/10$ an entrant between x_1 and x_3, for example at $x_c = 1/2$, can win the election.

To conclude, to avoid entry from the left x_1 has to satisfy $x_1 \le 1/4$ and to avoid entry from the right x_1 has to satisfy $x_1 \ge 3/10$. These two inequalities cannot be satisfied simultaneously; therefore the situation $x_1 = x_2 < x_3 = x_4$ cannot be an equilibrium. For the case of only two candidates on one position, see Appendix A.4

A.4: Proof of Proposition 1.c

As in the case with three and four candidates, no equilibrium can exist with more than two candidates on the same position. In the following, I show that there is also no *n*-candidate equilibrium with two candidates on the same position in the present model. To prove this by contradiction, first assume that there are two candidates on the position x_k, i.e. $x_{k-1} < x_k = x_{k+1} < x_{k+2}$. Both candidates on this position receive a vote-share of $y_k = 1/n$ if and only if $x_{k+2} - 2/n = x_{k-1} + 2/n$. An entrant to the right of x_k would obtain a vote-share of $y_c = [x_{k+2} - x_k]/2$ and would win the election for $x_k < x_{k+2} - 2/n$. Similarly, an entrant to the left would win the election for $x_k > x_{k-1} + 2/n$. With $x_{k+2} - 2/n = x_{k-1} + 2/n$, successful entry cannot be prevented by the incumbent candidates.

Second, if two candidates are located at x_1, i.e. $x_1 = x_2 < x_3$, then $2/n - x_1 = x_3 - 2/n$ has to be satisfied. An entering candidate to the right of x_1 obtains $y_c = [x_3 - x_1]/2 = 2/n - x_1$ and wins the election for $x_1 < 1/n$. An entering candidate to the left of x_1 obtains $y_c = \frac{x_c + x_1}{2}$. With $x_c \to x_1$ the entrant wins for $x_1 > 1/n$. Thus, an equilibrium with $x_1 = x_2$ is only possible if $x_1 = x_2 = 1/n$. In this case, y_c would be $y_c = 1/n$ and equal to $y_4 = y_5 = ... = y_n$ if $x_2 < x_c < x_3$. The expected payoff for the entering candidate would then be $E\pi_c = R/[n-2] - c$, which is positive for $R/n > c$. An equilibrium with $x_1 = x_2$ therefore does not exist. Because of the model's symmetry, the same can be shown for two candidates on position x_n. Hence no equilibrium can exist with more than one candidate on the same position.

Statement (*i*) then follows directly from $y_1 = y_2 = ... = y_i = y_{i+1} = ... = y_n = 1/n$: n candidates on different positions receive equal vote-shares if and only if their positions are located symmetrically around the $n-1$ attractors. Statement (*i*) describes this symmetry. The inequalities in statement (*ii*) ensure that $x_1 < x_2 < ... < x_n$.

For a proof of $EP_{en} = 1/2$ for even n and the average expected policy equals $\overline{EP}_{en} = 1/2$ for odd n see Appendix A.5.

A.5: Proof of Proposition 2.c

The inequality $\theta([n-1]/n) < 1 - nc/R$ ensures that there exists a candidate with $x_n > [n-1]/n$ who obtains a non-negative expected payoff from a candidacy. Due to the assumed increasing marginal probability of relocation, if candidate n expects a non-negative payoff, the other candidates also do.

The proof of statement (*i*) is the same as in Appendix A.4. In addition, the inequalities $[n-1]/n < x_n < 1$ in statement (*ii*) are the same as in Proposition 1.c. The term x_n^* in statement (*ii*) is defined by $[1-\theta(x_n^*)]R/n = c$.

The expected policy outcome in a given equilibrium is defined by $EP_{en} = [x_1 + x_2 + ... + x_n]/n$. First, assume that n is an even number. Since, according to (*ii*), the positions of all candidates are symmetrically located around the attractors, one can express x_1, x_2, …, x_{n-1} in EP_{en} in terms of x_n:

$$x_{n-1} = \frac{n-1}{n} - \left(x_n - \frac{n-1}{n}\right),\ x_{n-2} = \frac{n-3}{n} + \left(x_n - \frac{n-1}{n}\right),$$

$$x_{n-3} = \frac{n-3}{n} - \left(x_n - \frac{n-1}{n}\right), \ldots, x_2 = \frac{1}{n} + \left(x_n - \frac{n-1}{n}\right),$$

and $x_1 = \frac{1}{n} - \left(x_n - \frac{n-1}{n}\right)$.

EP_{en} is then solved as follows:

$$\begin{aligned} EP_{en(n:even)} = \frac{1}{n}\Bigg[& \frac{1}{n} - \left(x_n - \frac{n-1}{n}\right) + \frac{1}{n} + \left(x_n - \frac{n-1}{n}\right) + \frac{3}{n} - \left(x_n - \frac{n-1}{n}\right) + \\ & \frac{3}{n} + \left(x_n - \frac{n-1}{n}\right) + \ldots + \frac{i}{n} - \left(x_n - \frac{n-1}{n}\right) + \frac{i}{n} + \left(x_n - \frac{n-1}{n}\right) + \\ & \frac{i+2}{n} - \left(x_n - \frac{n-1}{n}\right) + \frac{i+2}{n} + \left(x_n - \frac{n-1}{n}\right) + \ldots + \frac{n-3}{n} - \left(x_n - \frac{n-1}{n}\right) + \\ & \frac{n-3}{n} + \left(x_n - \frac{n-1}{n}\right) + \frac{n-1}{n} - \left(x_n - \frac{n-1}{n}\right) + x_n \Bigg] \end{aligned}$$

$$= \frac{2}{n^2}[1 + 3 + 5 + \ldots + n - 1].$$

Since the expression in the squared brackets is an arithmetical progression with $n/2$ members, we come to the following solution:

$$EP_{en(n:even)} = \frac{2}{n^2}[1+3+5+\ldots+n-1] = \frac{2}{n^2} \cdot \frac{[1+n-1]\cdot \frac{n}{2}}{2} = \frac{1}{2}. \tag{A.1}$$

With similar logic we obtain the expression for EP_{en} with an odd number of candidates. First, I replace x_1, x_2, …, x_{n-1} in EP_{en} as follows:

$$x_{n-1} = \frac{n-2}{n} + (1-x_n),\ x_{n-2} = \frac{n-2}{n} - (1-x_n),\ ...,$$

$$x_2 = \frac{1}{n} + (1-x_n), \text{ and } x_1 = \frac{1}{n} - (1-x_n).$$

EP_{en} is then solved as

$$EP_{en(n:odd)} = \frac{1}{n}\Bigg[\frac{1}{n} - (1-x_n) + \frac{1}{n} + (1-x_n) + \frac{3}{n} - (1-x_n) + \frac{3}{n} + (1-x_n) +$$
$$... + \frac{i}{n} - (1-x_n) + \frac{i}{n} + (1-x_n) + \frac{i+2}{n} - (1-x_n) + \frac{i+2}{n} + (1-x_n) +$$
$$+ ... + \frac{n-2}{n} - (1-x_n) + \frac{n-2}{n} + (1-x_n) + x_n\Bigg]$$

$$= \frac{2}{n^2}[1+3+5+...+n-2] + \frac{x_n}{n}$$

Here we also have an arithmetical progression, now with $[n-1]/2$ members. Thus, I come to the following result:

$$\begin{aligned} EP_{en(n:odd)} &= \frac{2}{n^2}[1+3+5+...+n-2] + \frac{x_n}{n} \\ &= \frac{2}{n^2} \cdot \frac{[1+n-2] \cdot \frac{[n-1]}{2}}{2} + \frac{x_n}{n} = \frac{[n-1]^2}{2n^2} + \frac{x_n}{n} \end{aligned} \quad . \tag{A.2}$$

If all equilibria are distributed uniformly, then the average expected policy is

$$\overline{EP}_{en} = \frac{\int_{[n-1]/n}^{x_n^*} EP_{en} dx_n}{\int_{[n-1]/n}^{x_n^*} dx_n} . \tag{A.3}$$

The term x_n^* is determined by $\theta(x_n^*) = 1 - nc/R$ for $\theta(1) > 1 - nc/R$. Otherwise x_n^* has to be replaced by 1. Inserting from (A.2) and (A.3) yields

$$\overline{EP}_{en(n:odd)} = \frac{\frac{1}{2n}\left[x_n^*\right]^2 + \frac{[n-1]^2}{2n^2}x_n^* - \frac{[n-1]^2}{2n^2}}{x_n^* - \frac{n-1}{n}} = \frac{n\left[x_n^*\right]^2 + [n-1]^2 x_n^* - [n-1]^2}{2n^2 x_n^* - 2n[n-1]} = .$$

$$= \frac{\left[nx_n^* - n + 1\right]\left[n - 1 + x_n^*\right]}{2n\left[nx_n^* - n + 1\right]} = \frac{n - 1 + x_n^*}{2n}$$

Therefore, $\overline{EP}_{en(n:odd)} < 1/2$ for $x_n^* < 1$.

4. Vertical Yardstick Competition in Federal States

4.1. Introduction

The traditional view of governments is that governments represent monopolies of power. Economic and cultural integration, however, erode the monopoly power of governments: cross-border mobility of people and capital clearly limit the coercive power of public authorities, and cultural homogenization renders power relationships more transparent and thus more vulnerable to challenge because cultural similarity greatly facilitates the comparison of government performance and thus helps to reveal feasible alternatives. Today the power of public authorities is contained by intricate relationships of competition among governments [cf. Breton (1998)], and this kind of government competition will increase if regional and global economic integration continues to deepen. It is therefore hardly surprising that in our age of globalization economists have put a great deal of effort into investigating the mechanisms of government competition.

To be sure, the idea that governments compete against each other is by no means new. The conviction that political fragmentation generates competition among governments and thus contributes to protecting the citizens' civil rights and liberties can be traced back at least to the *Federalist Papers* of 1788. The founding fathers of the American constitution can probably also be credited for the insight that government competition can be induced via constitutional design. The most influential paper on government competition in the economics literature is arguably Tiebout's (1956) *"Pure Theory of Local Expenditures"*, in which interjurisdictional mobility of households motivates the existence of *horizontal* competition between governments inhabiting a given jurisdictional tier.

In the tradition of Tiebout much of the economic literature on government competition has focused on mobility: on personal mobility in the literature on government spending, and on mobility of production factors in the tax competition literature. All these investigations thus deal with competition between public authorities that are on a par with each other; examples are international competition and competition between provinces or municipalities in federal systems. This kind of *horizontal competition* is also analyzed in the recent literature on *yardstick* *competition* that focuses on the pro-competitive effects resulting from a comparison of government performance across jurisdictions.

The idea of political yardstick competition was introduced into the political economic literature by Salmon (1987) and made its break-through with the publication of the paper by Besley and Case (1995), which provided empirical evidence that yardstick competition significantly affects the behavior of incumbent U.S. governors. In the meantime similar evidence has been uncovered, for example by Ashworth and Heyndels (1997) for Belgium, Büttner (2001) for Germany, Schaltegger and Küttel (2002) for Switzerland, and Bordignon et al. (2002) for Italy. Recently a number of formal models portraying *horizontal yardstick competition* appeared in the literature: Wrede (2001), Besley and Smart (2002), Bordignon et al. (2002), Belleflamme and Hindriks (2002). Wrede (2001) portrays yardstick competition between two governors with infinite time horizon. In his model the voters judge an incumbent basing on observation of policy costs in both provinces. An incumbent can be re-elected infinite number of times if he performs always better than the politician in the other region. The two-period model of Belleflamme and Hindriks (2002) is very similar to that of Besley and Smart (2002). Former examine how performance comparisons between two identical jurisdictions affect the agency problem arising from uncertainty about politicians and their policies. Whereas they distinguish between two forms of inefficiency: the provision of non-valuable policies and the failure to provide valuable policies.

Federations, however, are characterized not only by a division of government into sub-national units (provinces), but also by the existence of different layers or tiers of government. It is somewhat unfortunate that economists have up to now mainly focused on the first kind of division of power because horizontal stratification is also an attribute of confederations. The second kind of division which distinguishes a federation from a mere confederation, i.e. the division of government into two or more tiers, is of course immaterial if *mobility* is considered to be the driving force of government competition: persons and production factors can only move from one province to another, but there is no mobility among orders of government. In the case of yardstick competition, however, it makes sense to explicitly consider the vertical structure of federal systems. As Breton and Ursprung (2002) have noticed, voters in a federation can, in principle, use performance signals of benchmark governments situated at different levels to evaluate and sanction the performance of all governments (municipal, provincial and national) they are subject to. This mechanism is called *vertical yardstick competition*.

Vertical yardstick competition has been analyzed in a formal model by Bodenstein and Ursprung (2004). Their model portrays two levels of government: the federal government headed by the president and an arbitrary number of province governments headed by governors. Yardstick competition is modeled via the governments' reelection probabilities and the individual governors' probabilities of being elected president. All these probabilities are modeled with the help of *contest success functions* whose arguments are the respective relative government performances.

The objective of the last part of the work is to develop a formal model of vertical yardstick competition that does not resort to black-box devices (such as contest success functions) but is firmly based on a micro-economic-foundation. For that purpose the signaling model of *horizontal* political yardstick competition by Besley and Smart (2002) is extended to accommodate also *vertical* yardstick competition. As in the Bodenstein and Ursprung model, the governors have the option of challenging the incumbent president, but they can of course also simply seek reelection. Moreover, the voters judge the president by comparing his performance with the performance of the governors. Since politicians are assumed to be either benevolent (in the sense of the traditional theory of economic policy analysis) or of the Leviathan-type, the election prospects of all politicians depend on whether the electorate believes the incumbents to be "good" or "bad".

The beliefs held by the electorate depend on the observed behavior of the incumbents. A governor's prospect to become president thus depends positively on his relative performance as a governor. This promotion mechanism gives the governors an additional incentive to behave nicely. One of the main results of the model is that this incentive scheme indeed changes the governors' behavior. In a vertically stratified political system, i.e. in a federation, "bad" politicians may abstain from rent extraction at the province level, whereas such an equilibrium behavior cannot occur in the confederation-type model of Besley and Smart; in their confederation model that exhibits only horizontal stratification the "bad" politicians always extract some rents from the general public. I thus come to the conclusion that one of the advantages of federal systems over confederations consists in the reduction of rent extraction associated with the specific kind of vertical competition that is unique to federal systems.

The last part of the dissertation is organized as follows. Section 4.2 briefly sketches the basic Besley and Smart (2002) model (4.2.1) and then applies it to the unitary state (4.2.2) and to the confederation (4.2.3). Section 4.3 extends the basic model by introducing vertical yardstick competition in a federal state. In this section I derive the existence conditions for the type of equilibrium analyzed in the paper of Besley and Smart (4.3.1), then go on to investigate a new type of equilibrium, which I call the "honest freshman-governor" equilibrium (4.3.2), and finally investigate whether other types of equilibria are compatible with vertical yardstick competition (4.3.3). Section 4.4 concludes.

4.2. Single-Tiered States

4.2.1. The Model

The model developed by Besley and Smart (2002) and slightly modified by Bordignon et al. (2002) portrays an economy with three types of agents: incumbent politicians, challengers and the voters. The model encompasses two time periods and two jurisdictions; in each jurisdiction and in each period the incumbent politician chooses a tax policy. The tax revenues are supposed to finance an exogenously given level of public good supply. Between the two periods an election takes place in each jurisdiction. The voters can choose between the incumbent and a challenger. There are two types of politicians: "good" ones, labeled by *g*, and "bad" ones, labeled by *b*. Good politicians provide the public good at the lowest possible cost, while bad ones maximize the expected discounted sum of rents *R* appropriated in the two periods: $R = R_1 + \delta P R_2$, where $\delta < 1$ is the discount factor, and *P* is the probability of being re-elected. Politicians know their own type, while the citizens a-priori expect a politician to be "good" with probability θ.

The production cost of the public good is subject to random shocks, which are not observable by the voters. The politicians however observe the shock and base their behavior on this information. The shocks can either be favorable (in this case the cost *c* of providing the public good is low: $c = l$) or unfavorable (in this case the cost is high: $c = l + \Delta$, where $\Delta > 0$), and $Prob(c = l + \Delta) = q$. Tax collection for one period amounts to $T = c\Gamma + R$, where Γ denotes the quantity of the public good provided. It is assumed that there is a maximum feasible level of tax collection $T^{max} = \Gamma(l + \kappa\Delta)$ set by the constitution, where $\kappa > 1$. The shocks are determined by nature in the first period and last for two periods, that is, if in the first period we have a favorable shock in one jurisdiction then we have the same shock in this jurisdiction in the next period.

Since good politicians always choose $R_t = 0$ for $t \in \{1, 2\}$, they collect either the tax revenue $T^h = \Gamma(l + \Delta)$, if the shock is unfavorable, or $T^l = \Gamma l$, if the shock is favorable. In the second period an incumbent faces no re-election constraint, bad politicians *b* thus always levy $T_2 = T^{max}$. In the first period, if the shock is favorable ($c = l$), bad politicians *b* have three sensible strategies to choose from. First, they can impose $T^h = \Gamma(l + \Delta)$, extracting the rent $R = \Gamma\Delta$, which is the difference between production cost Γl and collected tax T^h. Alternatively they can impose the maximal feasible tax level T^{max}, extracting $R = \kappa\Gamma\Delta$, or they can set $T^l = \Gamma l$, thereby abstaining from rent extraction: $R = \Gamma l - \Gamma l = 0$. If the shock is unfavorable ($c = l + \Delta$) a type-b politician may either impose $T^h = \Gamma(l + \Delta)$, yielding $R = 0$, or $T = T^{max}$, yielding $R = \Gamma\Delta(\kappa - 1)$. The strategy T^l is not available in this case since incumbents are not allowed to go into debt. All other moves are not sensible since voters would immediately recognize the bad type at a suboptimal level of rent extraction.

The voters will thus observe only one of three signals: T^l, T^h or T^{max}. The voters will re-elect the incumbent if their posterior expectation of the incumbent being of type-g is not lower than the a-priory expectation θ, i.e. it is assumed that incumbents have a slight advantage: when indifferent, the voter elects the incumbent. That is, the politician is re-elected if $Prob(g| T) \geq \theta$, where $Prob(g| T)$ is the conditional probability of the incumbent to be good given the only signal in a unitary state, namely the tax level T.

We are now ready to solve the presented game in the unitary state specification.

4.2.2. Unitary states: no stratification

Clearly if the shock is *unfavorable*, U, a bad type incumbent prefers to levy the maximum possible tax even if it implies dismissal after one period, since the strategy T^{max} dominates the strategy T^h:

$$EV(U, T^{max}) = T^{max} - T^h > \delta(T^{max} - T^h) = EV(U, T^h),$$

where $EV(U, T^x)$ denotes the expected pay-off of an incumbent if he plays T^x ($x = l, h, max$) after having observed an unfavorable shock.

If the shock is *favorable*, F, a type-b politician will never play T^l since, for the reasons given above, T^{max} also dominates T^l, and he prefers T^h to T^{max} if

$$EV(F, T^h) = T^h - T^l + \delta P(T^{max} - T^l) \geq \delta(T^{max} - T^l) = EV(F, T^{max}), \tag{4.1}$$

where the re-election probability P is determined by voters' posterior belief concerning the type of the politician playing T^h:

$P = 1$, if $Prob(g \mid T^h) \geq \theta$ and $P = 0$ otherwise.

These considerations give rise to

Proposition 1. *Let the discount factor be sufficiently large* ($\delta \geq \delta^0 = (\kappa - 1)/\kappa$) *and let the unfavorable shock occur with a sufficiently high probability* ($q \geq 1/2$). *Then the* *following strategies of the bad politician and the voter form together a unique perfect Bayesian equilibrium:*

$[c = l \rightarrow T = T^h,\ c = l + \Delta \rightarrow T = T^{max}]$;

$[T \in \{T^l, T^h\} \rightarrow Prob(g) \geq \theta \rightarrow P = 1,\ T = T^{max} \rightarrow Prob(g) < \theta \rightarrow P = 0]$.[33]

See Bordignon et al. (2002) for the proof. Intuitively, if the discount factor is sufficiently large a bad politician who decides to refrain from a part of the rent extractable in the first period can achieve re-election, and hence obtains the maximum rent in the second period. Moreover, if the unfavorable shock occurs with sufficiently high probability the voters believe that the probability of an incumbent choosing T^h to be good is high enough to re-elect him. This equilibrium is applicable if the tax level is the only piece of information on which the voters can base their election decision, as is the case in a unitary state.

4.2.3. Confederations: horizontal stratification

In a confederation the voters have more information at their disposal: they can compare policies across jurisdictions. This means that incumbents are exposed to yardstick competition since they are judged according to their comparative performance. To model yardstick competition, consider two identical jurisdictions with the properties described in section 4.2.1.

A necessary requirement for intergovernmental competition is that the jurisdiction-specific cost shocks are (positively) correlated. Under these circumstances, observing T^l in the neighboring jurisdiction will make the voter more confident that the shock has been favorable in his own jurisdiction.

Bordignon et al. (2002) model the correlation of the cost shocks as follows. Let $\text{Prob}(X_1, X_2)$ denote the joint probability that province i ($i = 1, 2$) is hit by a shock of type $X_i \in \{F, U\}$. Then we have:

$$\text{Prob}(U_1, U_2) = q\sigma$$

$$\text{Prob}(U_1, F_2) = \text{Prob}(F_1, U_2) = q(1 - \sigma)$$

$$\text{Prob}(F_1, F_2) = 1 - q(2 - \sigma), \tag{4.2}$$

[33] In words: the incumbent sets T^h if $c = l$ and $T^{\max}$ if $c = h$. The voter believes the incumbent to be good if and only if he observes T^l or T^h and will then and only then re-elect him.

where the parameter $\sigma \in [q, 1]$ measures the degree of shock correlation. For $\sigma = q$ the cost shocks are independent, for $\sigma = 1$ they are perfectly correlated and for $q < \sigma < 1$ they are positively but imperfectly correlated.

The politicians in both jurisdictions are assumed to decide simultaneously on their respective tax policies without knowing the type of the incumbent and the shock realization in the neighboring jurisdiction.[34]

As in the unitary state, the voter will re-elect the incumbent, if the posterior belief $Prob(g|T_i, T_j)$ that the incumbent is good (given the observed levels of tax collection in the two jurisdictions) is not lower than the a-priory probability θ that the challenger is good. The re-election probability $P_i(T_i, T_j)$ in jurisdiction i is thus now a function of the observed tax levels in both jurisdictions.

Just as in the unitary-state model, the bad type will never choose the tax level T^h if the shock is unfavorable in his jurisdiction, he will never play T^l in the case of a favorable shock, and it is possible to find parameter values supporting an equilibrium in which a b-type politician who faces a favorable shock chooses T^h, thereby not extracting the maximum rent. The results are summarized in the following two propositions.[35] Proposition 2 applies to situations in which the unfavorable shock is relatively unlikely ($q < 1/2$) and proposition 3 applies to situations in which it is relatively likely ($q \geq 1/2$).

***Proposition* 2**. *Let* $q < 1/2$, $\sigma > 1/2$, $\kappa < \kappa^*$, $\theta \geq \theta^*$ *and* $\delta \geq \delta^*$,

where $\kappa^* = \dfrac{1-q}{\theta\left(1-q(2-\sigma)\right)}$; $\theta^* = \dfrac{1-q(3-2\sigma)}{1-4(1-\sigma)q}$; $\delta^* = \dfrac{(\kappa-1)(1-q)}{\kappa\left[(1-\theta)(1-q)+\theta q(1-\sigma)\right]}$.

Then the following strategy combination is a unique perfect Bayesian equilibrium:[36]

$[c = l \rightarrow T^h,\ c = l + \Delta \rightarrow T^{max}]$;

$[P_i(T_i = T_i^h,\ T_j = T_j^{\max}) = P_i(T_i^h, T_j^h) = 1;\ P_i(T_i^h, T_j^l) = 0;$

$P_i(T_i^l, T_j) = 1$ *and* $P_i(T_i^{\max}, T_j) = 0$ *for all* T_j].

Notice, that Proposition 2 is not quite a mirror image of Proposition 1. First, without yardstick competition the voters always re-elect an incumbent who sends the signal T^h. Under yardstick competition the voters will replace the incumbent playing

[34] This assumption distinguishes the Bordignon model from the Besley and Smart model, in which the politicians are assumed to be perfectly informed.

[35] See Bordignon et al. (2002) for the proofs.

[36] In the following the equilibrium beliefs are not spelled out anymore.

T^h if they observe a low tax level T^l in the neighboring jurisdiction. Second, for some model parameters, an equilibrium in which a bad-type politician does not levy the maximum tax level is supported under yardstick competition when this would not be possible without yardstick competition ($q < 1/2$). Intuitively, if the correlation between the two economies is sufficiently large ($\sigma > 1/2$) and the initial reputation of the politicians is also sufficiently large ($\theta \geq \theta^*$), observing T_j^h or $T_j^{\max}$ in region j convinces the voter in region i that an unfavorable shock has indeed occurred in his region and that therefore the incumbent playing T_i^h might well be a good politician.

***Proposition* 3**. *Let* $1/2 \leq q < (1-\theta)$. *Then there exist* $q \leq \sigma^* < \sigma^{**} < 1$ *such that the bad type's first period equilibrium choice upon observing a favorable shock is* T^h *if one of the three following conditions is satisfied: (i)* $\sigma > \sigma^{**}$, $\delta \geq \delta^{**}$, $\kappa < \kappa^{**}$; *(ii)* $\sigma^* < \sigma < \sigma^{**}$, $\delta \geq \delta^*$, $\kappa < \kappa^*$; *(iii)* $\sigma \leq \sigma^*$, $\delta \geq \delta^0$; *where* $\delta^0 < \delta^* < \delta^{**} < 1$, $1 < \kappa^{**} < \kappa^*$, *and*

$$\kappa^{**} = \frac{1-q}{1-q\left(2-\sigma(1-\theta)-\theta\right)};\ \sigma^* = \frac{3q-1}{2q};\ \sigma^{**} = \frac{(3q-1)+\theta(1-4q)}{2q(1-2\theta)};$$

$$\delta^{**} = \frac{(\kappa-1)(1-q)}{\kappa(1-\theta)q(1-\sigma)}.$$

The voters' beliefs cum equilibrium strategies in that case are:

[$P_i(T_i^h, T_j) = P_i(T_i^l, T_j) = 1$ *and* $P_i(T_i^{\max}, T_j) = 0$ *for all* T_j].

The key difference between Proposition 3 and Proposition 2 is that under this parameter constellation the voters will always re-elect the incumbent who chooses the tax level T^h regardless the tax level in the other jurisdiction. Since now the probability of an unfavorable shock is relatively high ($q \geq 1/2$), the voters are led to believe that an incumbent setting T^h might well face an unfavorable shock and be of type *g*. However, to support this nicer equilibrium, stricter restrictions on the parameters need to be imposed than in Proposition 2. Moreover, these restrictions become stricter with increasing shock correlation between the regions.

The main result one can draw from the papers by Besley and Smart (2002) and Bordignon et al. (2002) is that under pure horizontal yardstick competition the best one can expect is that bad politicians use the "Besley and Smart-strategy", i.e. they set T^h in the case of a favorable shock and T^{max} if the shock is unfavorable. In other words, bad politicians always divert some rent in the first period.

4.3. Federations: vertical stratification

The objective of this section is to develop a model of yardstick competition in a federal state. To this end, the model described in the previous section is modified to incorporate a two-tiered system of government. The modified model portrays a political system with one province government headed by the governor and the federal government headed by the president. In other words, I split the economy of the basic model not horizontally but vertically by adding an upper governmental tier – the central government – to the lower governmental tier. This allows to model competition among governments at different levels of a federal state.

Let again the whole public sector provide a given set Γ of goods. Without loss of generality let $\Gamma = 1$. The fraction of the public goods provided by the lower governmental tier is denoted by γ, the federal government thus provides $(1 - \gamma)$.

In a federation the voter pays two kinds of taxes: a federal tax T_f imposed by the president and a province tax T_p imposed by the governor. [37]

The rules of the game are as follows. In the beginning of the first period, nature moves twice: it chooses the type of each politician and the shock realizations in the two jurisdictions. Each politician can only observe his own type and the realization of the shock in his own jurisdiction. Having observed the respective moves of nature, the incumbents make their decisions about the tax levels and therefore rent extraction. The rent extracted by a bad politician is again the difference between the tax revenue T_i and the cost C_i of the publicly provided goods: $R_i = T_i - C_i$, where $C_f = (1 - \gamma)c$, $C_p = \gamma c$ and $i = p, f$. At the end of the first period the elections take place. First, after observing the tax policies in each jurisdiction, the voters decide whether to re-elect the president or to replace him with the governor or with an outside challenger. Thereafter, the local election is held. If the governor is elected as president, an outsider will replace him. As in the basic model the world ends after the second period. Thus, the politicians make their decisions in the last period without a re-election constraint. Since the highest possible level of the tax rate is set to a tier-specific $T_i^{\max}$ by the constitution, a b-type incumbent i will always divert in the second period $R_i^{t=2} = T_i^{max} - C_i$.

To focus on aspects of constitutional design (not preferences) I assume here that the discount factor δ is equal to one. The expected pay-off accruing to a bad-type president is then given by

[37] The subscript p thus denotes the province government and f the federal government.

$$EV_f = R_f^{t=1} + G_f\left(X_f, T_f\right) R_f^{t=2} \;,$$

the expected pay-off of a bad-type *governor* by

$$EV_p = R_p^{t=1} + \left\{ G_p^f\left(X_p, T_p\right) ER_f^{t=2} + \left[1 - G_p^f\left(X_p, T_p\right)\right] G_p\left(X_p, T_p\right) R_p^{t=2} \right\} \;,$$

where $G_f(X_f, T_f)$ is the probability of a bad president to be re-elected depending on the shock realization in his jurisdiction ($X_f = U, F$) and on the chosen federal tax level ($T_f = T_f^l, T_f^h, T_f^{\max}$);[38] $G_p^f(X_p, T_p)$ is the probability of the governor to win the presidential election given the shock realization in the local jurisdiction and the strategy he has chosen; $G_p(X_p, T_p)$ is the probability of the governor to be re-elected in his jurisdiction; R_i^t denotes the level of rent extraction by the office holder in jurisdiction i in period t for $i = f, p$; $ER_f^{t=2}$, finally, denotes the rent, which the governor expects to receive if being elected as the president:

$$ER_f^{t=2}\left(X_p\right) = \Pr\left(F_f \middle| X_p\right)\left(T_f^{\max} - C_f^l\right) + \Pr\left(U_f \middle| X_p\right)\left(T_f^{\max} - C_f^h\right) ,$$

where $\Pr\left(F_f \middle| X_p\right)$ and $\Pr\left(U_f \middle| X_p\right)$ are conditional probabilities of the favorable and unfavorable shock realization in the federal jurisdiction for a given shock X_p in the local jurisdiction. Since the governor cannot observe the shock realization at the federal level he expects to obtain the president's rent amounting to $\left(T_f^{\max} - C_f^l\right)$ if the shock is favorable at the federal level, or to $\left(T_f^{\max} - C_f^h\right)$ otherwise.

4.3.1. A Besley and Smart-type federation equilibrium

As pointed out in section 4.2, in a confederation the best one can expect is that the bad politicians play T^h if the shock is favorable and T^{max} otherwise: $\{F \rightarrow T^h;\ U \rightarrow T^{max}\}$. In this section I examine whether this Besley/Smart equilibrium is also possible in a federation. In order to do so one needs to derive the incentive-compatibility (ICC) and participation constraints (PC) for the politicians, identify the parameter constellations under which these conditions are satisfied and examine whether the incumbents' strategies are compatible with the voters' beliefs. If, for example, the voters believe the bad type politicians to play T^h in the first period when

[38] Since the moves are simultaneous the probabilities are conditional on the respective players' information set and his instrument variable.

the shock is favorable then T^h must indeed be the best strategy for the bad incumbent if he faces a favorable shock. Otherwise he would choose another tax level and his behavior would be inconsistent with the voters' beliefs, which is not admissible in a perfect Bayesian equilibrium.

Incentive-compatibility and participation constraints

• ICC when shock is unfavorable

Consider first the type-*b governor* if the shock he faces is unfavorable. In this case he could levy the tax $T_p^{\max}$ earning the maximum rent. This is what the bad incumbents do in the Besley and Smart case. But after observing $T_p^{\max}$ the citizens immediately recognize that the sender is of type-*b* and kick him out from office at the end of the first period. The only alternative for an incumbent is to mimic a good politician by imposing the tax rate T_p^h, which earns him nothing in the first period but provides potential gubernatorial or even presidential rents in the second period, since the voters are then not sure what type of incumbent he is.

Since we are looking here for a Besley and Smart-type equilibrium we need to derive the conditions under which the bad governor will choose $T_p^{\max}$ in the first period if the shock is unfavorable, even if that implies losing his job and his bid for the presidency in the second period. The condition for this behavior is that the expected payoff from strategy $T_p^{\max}$ exceeds the expected payoff from strategy T_p^h ($EV_p(U_p, T_p^{\max}) \geq EV_p(U_p, T_p^h)$):

$$(T_p^{\max} - C_p^h) \geq 0 + \left[G_p^f \left(U_p, T_p^h \right) ER_f^{t=2}(U_p) + \left(1 - G_p^f \left(U_p, T_p^h \right)\right) G_p \left(U_p, T_p^h \right) \left(T_p^{\max} - C_p^h \right) \right] \quad (4.3)$$

where the expected rent of the president in the second period is obtained by using (4.2):

$$\begin{aligned} ER_f^{t=2}\left(U_p\right) &= \Pr\left(F_f \middle| U_p\right)\left(T_f^{\max} - C_f^l\right) + \Pr\left(U_f \middle| U_p\right)\left(T_f^{\max} - C_f^h\right) = \\ &= \frac{q(1-\sigma)}{q}(1-\gamma)\kappa\Delta + \frac{q\sigma}{q}(1-\gamma)\Delta(\kappa - 1) = (1-\gamma)\Delta(\kappa - \sigma) \end{aligned} \quad (4.4)$$

If condition (4.3) is satisfied a bad governor facing an unfavorable shock will choose the maximum possible tax level $T_p^{\max}$ in the first period, and hence forego a continuation of his political career.

The corresponding condition for the *president* is always satisfied as in the basic model, since the re-election probability of the president $G_f\left(U_f, T_f^h\right)$ is smaller than or equal to one:

$$EV_f\left(U_f,\ T_f^{\max}\right) = T_f^{\max} - C_f^h \geq G_f\left(U_f, T_f^h\right)\left(T_f^{\max} - C_f^h\right) = EV_f\left(U_f,\ T_f^h\right)$$

That is, *b*-type presidents will always play $T_f^{\max}$ in the case of an unfavorable shock.

• ICC when shock is favorable

In the case of a favorable shock a bad politician has three actions to choose from: $T^l < T^h < T^{max}$. In the considered equilibrium type, the governor and the president play T^h after observing the low cost $c = l$. Strategy T^h thus needs to be better than all other strategies. For the *governor* the strategy T_p^h is better than both T_p^l and $T_p^{\max}$, if the following two inequalities are satisfied:

$$\begin{aligned} EV_p\left(F_p, T_p^h\right) = T_p^h - C_p^l + G_p^f\left(F_p, T_p^h\right)ER_f^{t=2}\left(F_p\right) + \left[1 - G_p^f\left(F_p, T_p^h\right)\right]G_p\left(F_p, T_p^h\right)\left(T_p^{\max} - C_p^l\right) \geq \\ \geq G_p^f\left(F_p, T_p^l\right)ER_f^{t=2}\left(F_p\right) + \left[1 - G_p^f\left(F_p, T_p^l\right)\right]\left(T_p^{\max} - C_p^l\right) = EV_p\left(F_p,\ T_p^l\right) \end{aligned} \tag{4.5}$$

$$EV_p\left(F_p,\ T_p^h\right) \geq T_p^{\max} - C_p^l = EV_p\left(F,\ T_p^{\max}\right) \tag{4.6}$$

Notice, that in (4.5) the probability $G_p\left(F_p, T_p^l\right)$ equals unity because if a governor chooses T^l he will be re-elected for certain in the province, since in this case the governor is believed to be of type *g*. The probability of the governor to win the federal election $G_p^f\left(F_p, T_p^l\right)$ is not always equal to unity because the president may have a T^l record as well.[39]

The expected rent of the president in (4.5) and (4.6) is given by:

[39] I assume that if the president and the governor have the same past performance then flipping of a coin decides the election. But if the voters have to choose between a challenger from the population and an incumbent who's probability to be of type-g is equal to θ, then they decide in favor of the politician who was in charge in the first period, that is, the governor has a slight incumbency advantage. It should be also noticed, that the result does not change if one assumes the incumbent advantage also for the president.

$$ER_f^{t=2}\left(F_p\right) = \Pr\left(F_f \middle| F_p\right)\left(T_f^{\max} - C_f^l\right) + \Pr\left(U_f \middle| F_p\right)\left(T_f^{\max} - C_f^h\right) =$$
$$= \frac{1-q(2-\sigma)}{1-q}(1-\gamma)\kappa\Delta + \frac{q(1-\sigma)}{1-q}(1-\gamma)\Delta(\kappa-1) = \frac{(1-\gamma)\Delta\left(\kappa - q(1+\kappa-\sigma)\right)}{1-q} \quad (4.7)$$

For a bad *president* facing a favorable shock the strategy $T_f^{\max}$ is always better than T_f^l, since the following condition holds:

$$EV_f(F_f, T_f^{\max}) = T_f^{\max} - C_f^l \geq G_f\left(F_f, T_f^l\right)\left(T_f^{\max} - C_f^l\right) = EV_f(F_f, T_f^l),$$

and he prefers T_f^h to $T_f^{\max}$ if:

$$EV_f(F_f, T_f^h) = (T_f^h - C_f^l) + G_f\left(F_f, T_f^h\right)\left(T_f^{\max} - C_f^l\right) \geq (T_f^{\max} - C_f^l) = EV_f(F_f, T_f^{\max}) \quad (4.8)$$

• PC when shock is favorable

Finally, I derive the participation constraint for the governor if the province shock is favorable.[40] If the governor decides to participate in the federal election his expected pay-off amounts to $EV_p\left(F_p, T_p^h\right)$ given in expression (4.5), which needs to be greater than the expected pay-off in the case when he does not participate and runs for re-election as governor only. Let $EV_p^-\left(F_p, T_p^h\right)$ denote this pay-off. The participation constraint is given by:[41]

$$EV_p\left(F_p, T_p^h\right) = T_p^h - C_p^l + G_p^f\left(F_p, T_p^h\right) ER_f^{t=2}\left(F_p\right) + \left[1 - G_p^f\left(F_p, T_p^h\right)\right] G_p\left(F_p, T_p^h\right)\left(T_p^{\max} - C_p^l\right) \geq$$
$$\geq T_p^h - C_p^l + G_p\left(F_p, T_p^h\right)\left(T_p^{\max} - C_p^l\right) = EV_p^-\left(F_p, T_p^h\right),$$

which can be simplified to:

$$ER_f^{t=2}\left(F_p\right) \geq G_p\left(F_p, T_p^h\right)\left(T_p^{\max} - C_p^l\right). \quad (4.9)$$

To sum up, we have to deal with four incentive compatibility constraints (4.3, 4.5, 4.6, 4.8) and one participation constraint (4.9).

---

[40] If the shock is unfavorable he will set T^{max} and therefore refuse participation in the federal election, since T^{max} reveals his bad type.

[41] If the governor does not participate in the federal election he can also play T^{max} in the first period and the second participation constraint must have the following appearance: $EV_p^-\left(T^{\max}\right) \leq EV_p\left(T^h\right)$, which is equivalent to (4.6).

Election probabilities

In order to examine under what circumstances these five constraints are satisfied one has, first of all, to derive the election probabilities that appear in these constraints, i.e. $G_f\left(T_f^x\right)$, $G_p\left(T_p^x\right)$ and $G_p^f\left(T_p^x\right)$. Since task is straightforward but extremely tedious, it is relegated to Appendix A.1.

As shown in Appendix A.1, the values of the election probabilities G depend on the signs of the expressions $\left(q-\frac{1}{3-2\sigma}\right)$, $\left(\theta-\frac{1-3q+2q\sigma}{1-4q+4q\sigma}\right)$ and (σ - 1/2). These three crucial signs determine the voters' beliefs concerning the incumbents' types for given parameter constellations (q, θ, σ). There are, therefore, $2^3=8$ sign combinations, three of which are not feasible (cf. Table 4.1).

Table 4.1: The sign combinations in the crucial constraints for the parameters q, θ and σ.

		$\sigma-\frac{1}{2}\geq 0$	$\sigma-\frac{1}{2}<0$
$q-\frac{1}{3-2\sigma}\geq 0$	$\theta-\frac{1-3q+2q\sigma}{1-4q+4q\sigma}<0$	1. **Not feasible**, since if $q\geq\frac{1}{3-2\sigma}$ then $\theta<0$.	2. **Not feasible**, since if $q\geq\frac{1}{3-2\sigma}$ and $\sigma\geq q$ then $\sigma\geq$ 1/2.
	$\theta-\frac{1-3q+2q\sigma}{1-4q+4q\sigma}\geq 0$	3. Feasible, but there exist **no Besley/Smart equilibria**. Situation (*i*) in Proposition 4 below.	4. **Not feasible**, since if $q\geq\frac{1}{3-2\sigma}$ and $\sigma\geq q$ then $\sigma\geq$ 1/2.
$q-\frac{1}{3-2\sigma}<0$	$\theta-\frac{1-3q+2q\sigma}{1-4q+4q\sigma}<0$	5. Feasible and there exist **Besley/Smart equilibria**. Situation (*iii*) in Proposition 4.	6. Feasible, but there exist **no Besley/Smart equilibria**. Situation (*ii*) in Proposition 4.
	$\theta-\frac{1-3q+2q\sigma}{1-4q+4q\sigma}\geq 0$	7. Feasible and there exist **Besley/Smart equilibria**. Situation (*iii*).	8. Feasible and there exist **Besley/Smart equilibria**. Situation (*iv*).

After substitution of the probabilities $G_f\left(T_f^x\right)$, $G_p\left(T_p^x\right)$ and $G_p^f\left(T_p^x\right)$ into the incentive compatibility and participation constraints (4.3), (4.5), (4.6), (4.8) and (4.9) observing the three restrictions of the parameters constellations (q, θ, σ) above, one obtains a system of eight inequalities[42] in the seven parameters q, σ, θ, l, Δ, κ and γ. The solution of this system yields the parameter constellations for which a

[42] Four incentive compatibility constraints, one participation constraint and three constraints for q, σ and θ, which determine the election probabilities $G_f\left(T_f^x\right)$, $G_p\left(T_p^x\right)$ and $G_p^f\left(T_p^x\right)$.

Besley/Smart equilibrium with the proposed strategies $\{F \to T^h,\ U \to T^{max}\}$ does exist. Unfortunately, the inequality system is too complex to admit neat representations. In order to examine which parameter constellations possibly admit a solution, I use (for the cases 3, 5, 6, 7 and 8 in Table 1) [43] a grid search algorithm assigning numerical values to the three parameters q, θ, κ. No additional restrictions were imposed on the remaining four parameters σ, l, γ and Δ. The numerical analysis revealed that the parameter constellations 3 and 6 described in Table 1 do not admit Besley/Smart equilibria. This result is summarized in

Proposition 4. *If (i)* $q \geq \frac{1}{3-2\sigma}$, $\theta \geq \frac{1-3q+2q\sigma}{1-4q+4q\sigma}$, $\sigma \geq \frac{1}{2}$ *or (ii)* $q < \frac{1}{3-2\sigma}$, $\theta < \frac{1-3q+2q\sigma}{1-4q+4q\sigma}$, $\sigma < \frac{1}{2}$ *then the eight inequalities cannot simultaneously be satisfied. Therefore, there exists no Besley-Smart – type equilibrium. If either (iii)* $q < \frac{1}{3-2\sigma}$, $\sigma \geq \frac{1}{2}$ *or (iv)* $q < \frac{1}{3-2\sigma}$, $\theta \geq \frac{1-3q+2q\sigma}{1-4q+4q\sigma}$, $\sigma < \frac{1}{2}$, *then the eight inequalities can be satisfied, implying that a Besley-Smart-equilibrium exists for certain parameter constellations.*

Intuitively, the results (i) and (ii) can be explained as follows. In the first case, when both the probability q of an unfavorable shock and the a-priory probability θ of the politician being good are relatively high and the shock correlation σ among jurisdictions is also relatively high, it is not reasonable for a politician facing an *unfavorable* shock to follow the Besley/Smart strategy and to play $T_p^{\max}$, since under these circumstances a governor who sends signal T_p^h passes as a good politician and will be elected as president if the president sets $T_f^{\max}$.[44]

In the second case, when we have large probability of an favorable shock and the initial reputation of the politicians is relatively poor and the shock correlation is relatively small, the voters' strategy is such that no policy maker expects to be

[43] With a step size of 1/12 along the q and θ axes (q = 1/12, 2/12,…, 11/12 and θ = 1/12, 2/12,…, 11/12) and a step size of 1/4 along the κ-axis (κ = 1.25, 1.5,…, 3.75) I thus analyzed 11^3 = 1331 points in the q, θ, κ–space for each of the five cases, i.e. 6655 parameter constellations in all. An algorithm, which examines whether there exists an equilibrium in case (i), is given as example in Appendix A.2. The analysis of one representative parameter constellation is presented below.

[44] See Appendix A.1, expression (A33).

elected for the second period after having chosen T^h.[45] Therefore, it is not optimal for bad politician to mimic a good politician by playing T^h if the shock is *favorable*, since this strategy is clearly dominated by the strategy T^{max}.

In the other two cases (iii) and (iv) described in Proposition 4, the Besley-Smart type equilibrium may exist. To illustrate this claim, consider the following numerical example: q = 1/2, θ = 1/2, κ =1.2.[46] The election probabilities in this case are as follows:

$$G_p^f\left(U_p, T_p^h\right) = \frac{1}{4} - \frac{\sigma}{2};$$

$$G_p\left(U_p, T_p^h\right) = \frac{1+\sigma}{2};$$

$$G_p^f\left(F_p, T_p^l\right) = 1 - \frac{\sigma}{4};$$

$$G_p^f\left(F_p, T_p^h\right) = \frac{3-2\sigma}{4};$$

$$G_p\left(F_p, T_p^l\right) = 1;$$
$$G_p\left(F_p, T_p^h\right) = 1 - \frac{\sigma}{2};$$
$$G_f\left(F_f, T_f^h\right) = \frac{3-2\sigma}{4}.$$

Given these election probabilities, the inequality system (4.3), (4.5), (4.6), (4.8) and (4.9) is satisfied if and only if[47]

$$0.5 < \gamma \leq 0.61 \text{ and } \frac{14\text{-}13\gamma}{40\text{-}36\gamma} + \frac{1}{4}\sqrt{\frac{1156 - 2588\gamma + 1393\gamma^2}{\left(10-9\gamma\right)^2}} < \sigma < 1 \text{ or} \tag{4.10}$$

$$0.61 < \gamma < 2/3 \text{ and } \frac{1-7\gamma}{2\gamma-5} < \sigma < 1 \tag{4.11}$$

This gives rise to

---

[45] Since in that case applies: $G_p^f\left(X, T_p^h\right) = G_p\left(X, T_p^h\right) = G_f\left(X, T_f^h\right) = 0$ for all X = *U, F*. See Appendix A.1.

[46] In this case we are in situation (iii).

[47] These solutions of the inequality system were computed with the help of Mathematica 4.2.

***Corollary* 1.** *Suppose* $q = \theta = 1/2$, $\kappa = 1.2$ *and either the constraints given in* (4.10) *or in* (4.11) *are satisfied. Then there exists an equilibrium in which type-b politicians play* T^h *in the first period when the shock is favorable, and* T^{max} *when the shock is unfavorable.*

The region in σ-γ-space in which the Besley/Smart equilibrium exists for the parameter values q, θ and κ given in Corollary 1 (and all l and Δ) is represented by the shaded area in Figure 4.1.

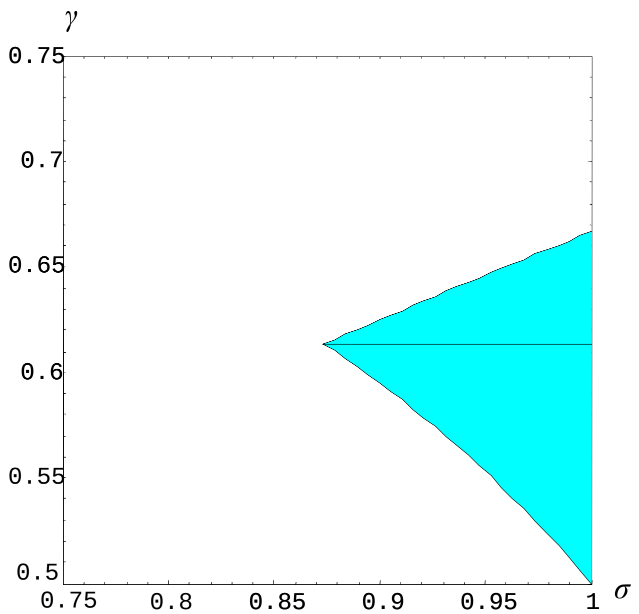

Figure 4.1

For the parameter constellation $q = \theta = 1/2$, $\kappa = 1.2$ the Besley/Smart equilibrium thus only exists if the shock correlation σ among jurisdictions is rather high and the governor has more political responsibility than the president ($1/2 < \gamma < 2/3$).

In the same way one can compute the regions in σ-γ-space in which the Besley/Smart equilibrium exists for other parameter constellations. Figure 4.2 shows such regions for $q = 1/2$, $\kappa = 1.2$ and eleven values of θ from 1/12 to 11/12. This figure makes clear that the Besley/Smart equilibrium neither exists for small nor for large values of γ. That is, the Besley/Smart equilibrium can only exist if the political power is more or less equally distributed among the two governmental tiers.

It should be also noted that without participation constraint (4.9) we are in the Bordignon model, in which both policy makers have equal political responsibility (γ

= 1/2) and Proposition 3 applies. This case corresponds to the line AB in Figure 4.2 according to the assumed values q = 1/2, κ = 1.2 and to conditions (*i*), (*ii*) and (*iii*) in Proposition 3. That is, the Besley/Smart equilibrium exists for $\sigma \in (2/3, 5/6)$. In this case, of course, the vertical yardstick competition does not take place; the model entails only horizontal yardstick competition.

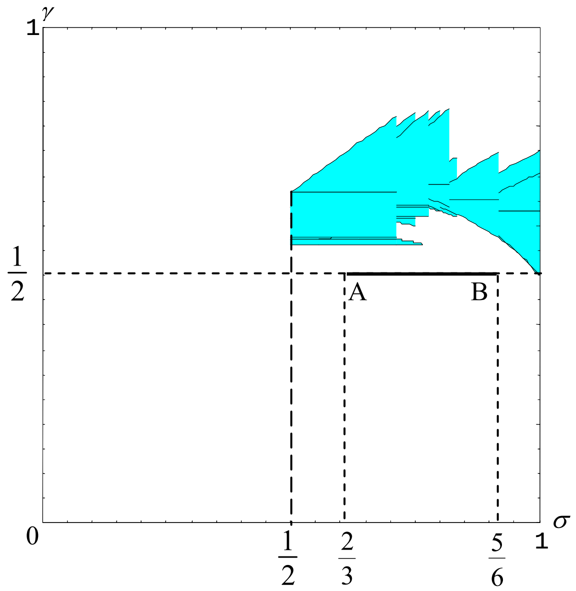

Figure 4.2

4.3.2. The honest freshman-governor equilibrium

In this section I address the question whether other kinds of equilibria are possible in a vertically stratified (federal) state. Consider first a strategy combination where the president plays the same strategy as before, namely $\{F_f \rightarrow T_f^h,\ U_f \rightarrow T_f^{\max}\}$;[48] the governor, however, plays the strategy $\{F_p \rightarrow T^l,\ U_p \rightarrow T^h\}$. If this strategy combination can constitute an equilibrium, bad governors will extract no rent in the first period. In such a "nice" equilibrium, freshman governors are thus honest.

Incentive compatibility and participation constraints

The incentive compatibility constraints for the president remain the same as in the previous section. The respective constraints for the governor now have the

[48] As shown in the previous section, bad presidents always extract some rent, since under an unfavorable shock $T_f^{\max}$ dominates T_f^h and under a favorable shock $T_f^{\max}$ dominates T_f^l. Therefore, "good" strategies are not feasible for the president.

following appearance. If the shock is *unfavorable* the governor prefers to play T^{h} instead of T^{max} if

$$EV_p\left(U_p, T_p^h\right) = 0 + \left[G_p^f\left(U_p, T_p^h\right) ER_f^{t=2}(U_p) + \left[1 - G_p^f\left(U_p, T_p^h\right)\right] G_p\left(U_p, T_p^h\right)\left(T_p^{\max} - C_p^h\right)\right] \geq \\ \geq (T_p^{\max} - C_p^h) = EV_p\left(U_p, T_p^{\max}\right) \tag{4.12}$$

In the case of *favorable* shock he plays T^{l} if following two conditions hold:

$$EV_p\left(F_p, T_p^l\right) = 0 + G_p^f\left(F_p, T_p^l\right) ER_f^{t=2}\left(F_p\right) + \left[1 - G_p^f\left(F_p, T_p^l\right)\right]\left(T_p^{\max} - C_p^l\right) \geq \\ \geq T_p^h - C_p^l + G_p^f\left(F_p, T_p^h\right) ER_f^{t=2}\left(F_p\right) + \left[1 - G_p^f\left(F_p, T_p^h\right)\right] G_p\left(F_p, T_p^h\right)\left(T_p^{\max} - C_p^l\right) = EV_p\left(F_p, T_p^h\right) \tag{4.13}$$

$$EV_p\left(F_p, T_p^l\right) \geq T_p^{\max} - C_p^l = EV_p\left(F_p, T_p^{\max}\right) \tag{4.14}$$

Now we have three participation constraints, the first one for the case with an *unfavorable* shock:

$$EV_p\left(U_p, T_p^h\right) = 0 + G_p^f\left(U_p, T_p^h\right) ER_f^{t=2}\left(U_p\right) + \left[1 - G_p^f\left(U_p, T_p^h\right)\right] G_p\left(U_p, T_p^h\right)\left(T_p^{\max} - C_p^h\right) \geq \\ \geq 0 + G_p\left(U_p, T_p^h\right)\left(T_p^{\max} - C_p^h\right) = EV_p^-\left(U_p, T_p^h\right) \tag{4.15}$$

The intuition behind this expression is as follows. If the governor decides to participate in the federal election, his expected pay-off amounts to $EV_p\left(U_p, T_p^h\right)$, which must be greater than the expected pay-off in the case when he does not participate and runs for re-election as governor only: $EV_p^-\left(U_p, T_p^h\right)$.

With the same logic on can derive two participation constraints for the governor in the case of a *favorable* shock. In this case the expected pay-off arising from participation in the federal election and playing "nice" strategy, $EV_p\left(F_p, T_p^l\right)$, must exceed, first, the pay-off if the governor does not run for the presidency and chooses the lowest tax level, $EV_p^-\left(F_p, T_p^l\right)$, and second, the pay-off if the governor does not run for the presidency and chooses the tax level $T_p^{\boldsymbol{h}}$, $EV_p^-\left(F_p, T_p^{\boldsymbol{h}}\right)$. Accordingly, one receives two participation constraints for the governor if the shock is favorable:

$$EV_p\left(F_p, T_p^l\right) = 0 + G_p^f\left(F_p, T_p^l\right) ER_f^{t=2}\left(F_p\right) + \left[1 - G_p^f\left(F_p, T_p^l\right)\right]\left(T_p^{\max} - C_p^l\right) \geq \\ \geq 0 + G_p\left(F_p, T_p^l\right)\left(T_p^{\max} - C_p^l\right) = EV_p^-\left(F_p, T_p^l\right) \tag{4.16}$$

$$EV_p\left(F_p, T_p^l\right) \geq T_p^h - C_p^l + G_p\left(F_p, T_p^h\right)\left(T_p^{\max} - C_p^l\right) = EV_p^-\left(F_p, T_p^h\right) \tag{4.17}$$

Election probabilities

An examination of the possible tax level constellations occurring in the above equations, gives rise to the following

***Lemma* 1.** *In a perfect Bayesian equilibrium in which a type-b governor never plays the strategy T^{max} in the first period, the voters' posterior belief about the type of the governor is always equal to the a-priory expectation θ.*

The proof of this lemma (see Appendix A.3) follows directly from the voters' posterior beliefs for all possible tax level combinations in the two jurisdictions. Intuitively, it is clear that in an equilibrium in which bad governors never reveal their type, the voters have no possibility to update their beliefs.

The direct consequence of Lemma 1 is that the governor will always be re-elected in his province if we assume, as before, that the voters re-elect for sure if their expectation of the governors' being good is lager than or equal to θ: $\Pr\left(g_p \middle| T_p^x, T_f^y\right) \geq \theta$, where $x = h, l$ and $y = h, l, max$. Hence, the probabilities G_p of the governor to win the provincial election are equal to one, independent of the strategies chosen by the president. Since $G_p(F_p, T_p^l)$ in expression (4.16) is equal to one, inequality (4.16) is equivalent to inequality (4.14).

The election probabilities G derived in Appendix A.3 depend on the values of two parameters: the probability of an unfavorable shock q and the shock-correlation parameter σ. The crucial signs that determine the voters' posterior beliefs concerning the incumbents' types in the honest-freshman equilibrium type are:

$$\text{sign}\left(\sigma - \frac{1}{2}\right) \text{ and } \text{sign}\left(q - \frac{1}{3 - 2\sigma}\right) \tag{4.18}$$

Taking into account that q is always smaller than σ, three regions in the q/σ-plane can be distinguished, namely A, B, and C as depicted in Figure 4.3. The following Proposition 5 parallels Proposition 4.

***Proposition* 5**. *A perfect Bayesian equilibrium with the strategies {$F \rightarrow T_p^l, T_f^h$; $U \rightarrow T_p^h, T_f^{\max}$} does not exist if the parameters σ and q lie in the regions A or C depicted in Figure* 4.3, *i.e. if* $\frac{1}{2} > \sigma > q \geq \frac{1}{3-2\sigma}$.

Proof. If parameter values σ and q lie in regions *A* and *C*, $G_p^f\left(F_p, T_p^h\right)$ equals $G_P^f\left(F_p, T_p^l\right)$.[49] Therefore the incentive compatibility constraint (4.13) is not satisfied and the strategy T^h dominates T^{max} for governors facing a favorable shock. □

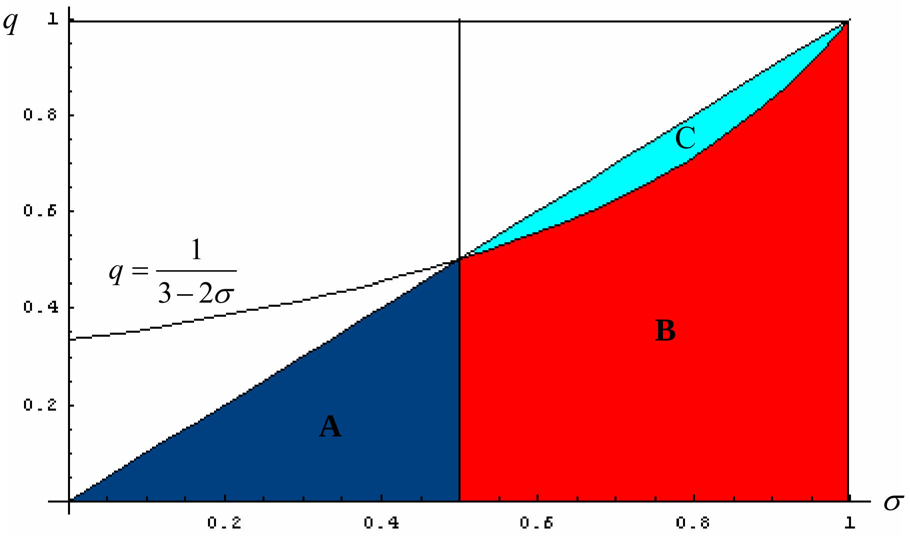

Figure 4.3

The question is thus whether honest freshman-governor equilibria do exist in the remaining region *B*. To answer this question the probabilities *G*, as computed in Appendix A.3, are substituted into the system of inequalities. Since this system of seven inequalities (4.12) – (4.18) is as complex as the respective system in the previous section, I again resort to a numerical analysis in order to find solutions for special cases. One of the numerical results is summarized in the following Corollary 2, which parallels Corollary 1:

[49] See Appendix A.3.

***Corollary* 2**. *Suppose* $q = \theta = 1/2$, $\kappa = 1.2$, $1/2 < \sigma < 5/6$ *and* $0 < \gamma < \frac{1+5\sigma}{12+5\sigma}$. *Then there exists a perfect Bayesian equilibrium in which the type-b governor diverts zero rent and the president always diverts a positive rent in the first period.*

It is thus possible to find parameter values in region *B* that support the existence of a honest freshman-governor equilibrium, in which even bad governors follow a "nice" strategy in the first period. In the chosen case an unfavorable shock is as likely as a favorable one, $q = 1/2$, the share of good politicians is equal to the share of the bad ones, $\theta = 1/2$, and the shocks are positively but imperfectly correlated, $q < \sigma$. Given these parameters, bad governors may abstain from extracting rents in the first period by mimicking the behavior of good governors if γ and σ lie in region *D* depicted in Figure 4.4.

That is, the honest freshman-governor equilibrium is possible only if the governor has fewer policy responsibilities than the president, $\gamma < 1/2$. Intuitively, the good behavior of the governor in the first period needs to be compensated by a potential reward in the second period. And this is only possible if the president's rent-base is larger than that of the governor. In other words, if the president has only few policy responsibilities one cannot force the governor to behave nicely since he can extract more rents in the province than at the federal level. In this case there would be no incentive to compete for the presidential office.

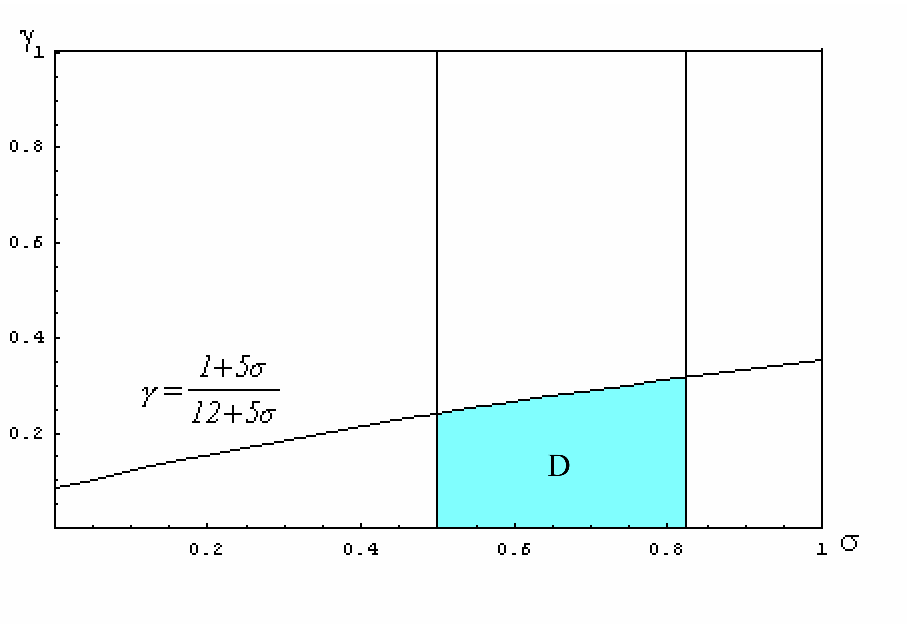

Figure 4.4

Figure 4.5 shows how the region in which honest freshman-governor equilibria exist, depends on the parameter θ (for κ = 1.2, q =1/2). Figure 4.5 thus parallels Figure 4.2.

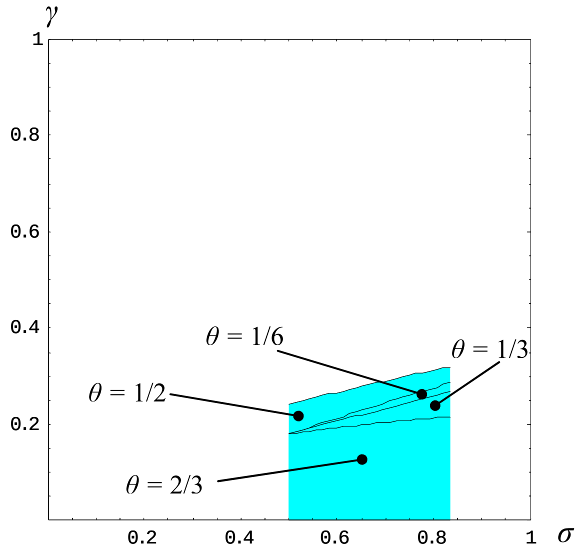

Figure 4.5

Figure 4.5 shows that the honest freshman-governor equilibrium exists only if the cost shocks are positively but imperfectly correlated ($q < \sigma < 1$). It can be explained as follows. If the shocks are perfectly correlated, σ = 1, and the governor chooses "nice" strategy T_f^l if the shock is favorable, the bad president reveals his type by playing T_f^h after observing favorable shock, since the voters observing signal T_f^l in the province know for sure that the cost shock is favorable at both governmental levels and will dismiss the president playing T_f^h. The bad president thus has no incentive to follow the strategy $\{F_f \to T_f^h, U_f \to T_f^{\max}\}$, he would rather prefer to play $T_f^{\max}$ in both states of nature.

4.3.3. Further types of equilibria

So far I have examined two types of equilibria: the “bad” Besley/Smart equilibrium (BS) and the “nice” honest freshman-governor equilibrium (HFG). These are, of course, not the only feasible combinations of strategies that are worth to be examined.

The president, to be sure, has not many strategies to choose from. As explained before, he always needs some rent in the first period: if the shock is unfavorable he definitively plays T^{max}, which dominates T^h; if the shock is favorable we can exclude T^l for the reason that T^{max} always dominates it. Therefore, in the case of a favorable shock the bad president can choose between T^h and T^{max}.

The bad governor, in contrast, has more possibilities, since he can be compensated by the presidency in the second period. If the shock is favorable in his jurisdiction he has three choices: T^l, T^h and T^{max}; if the shock is unfavorable he can play either T^h or T^{max}. Therefore, there are, including the BS and the HFG strategies, twelve possible strategy combinations, which are summarized in Table 4.2.

In order to determine whether an equilibrium exists in each of the ten additional cases one needs to repeat all the steps performed in the previous two sections: (i) define the incentive compatibility and participation constraints, (ii) find the voters' posterior beliefs for each tax level combination and (iii) solve the obtained inequality system. For the last step I again resorted to the numerical method described above.

Table 4.2: Possible strategy combinations and perfect Bayesian equilibria

F_f	T_f^h		T_f^{max}	
U_p / F_p	T_p^h	$T_p^{\max}$	T_p^h	$T_p^{\max}$
T_p^l	HFG	no PBE	no PBE	no PBE
T_p^h	no PBE	BS	no PBE	solvable for $\kappa > 2.4$
$T_p^{\max}$	solvable for $\kappa > 3$	solvable for $\theta \leq 1/2$	no PBE	solvable for $\kappa > 2$

Table 4.2 indicates that there are only three types of equilibria that make sense (shaded cells): the "nice" HFG equilibrium, the "bad" BS equilibrium and a "very bad" equilibrium, in which the governor always plays $T_p^{\max}$. The other strategy combinations either do not admit perfect Bayesian equilibria at all or they only admit PBE for unrealistic values of the parameter κ measuring the difference between T^{max} and T^h.

Figure 4.6 superimposes Figures 4.2 and 4.5 and indicates the location of the "very bad" equilibria.

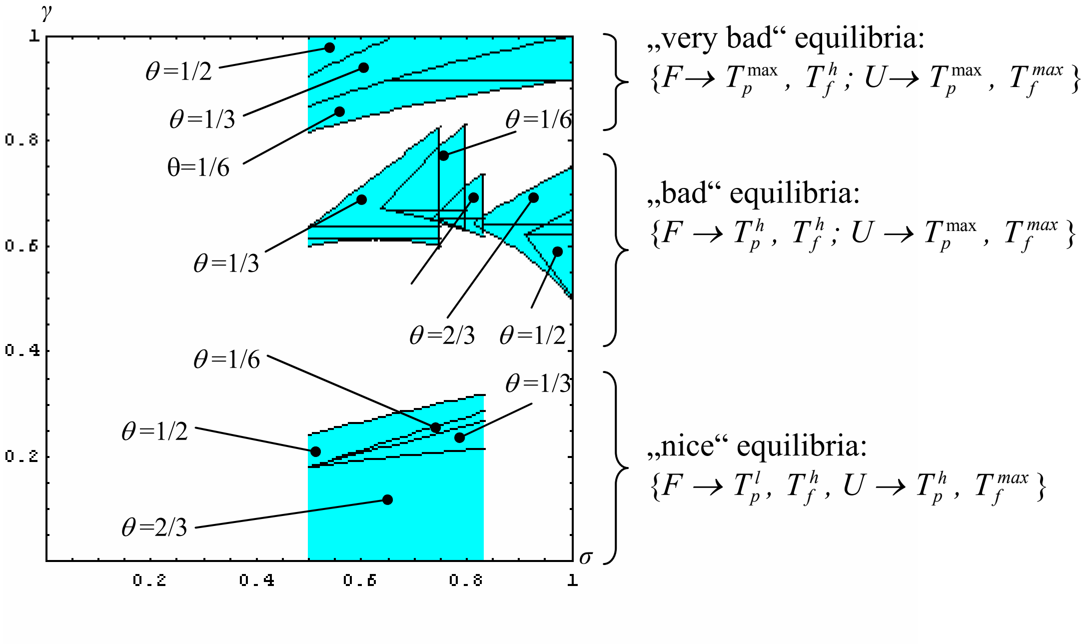

Figure 4.6

The crucial parameter that determines which type of equilibrium is feasible is γ, i.e. the parameter measuring the extent of the governor's policy responsibility. The intuition behind this figure is as follows. If γ is close to unity one can arrive at the “very bad” equilibrium, where the bad governor diverts the maximum possible rent in the first period and disappears in the second. In this case the governor has almost the entire political responsibility in the country and the bad governor has no incentive to compete for the presidency, which is worth nothing if $\gamma \rightarrow 1$. He rather prefers to receive as much as possible in the first period and does not even attempts to obtain an uncertain rent in the second period. If γ is set between 0.5 and 0.8 the “bad” BS equilibrium can be realized, i.e. the bad politicians pool with the good ones by playing T^h if the shock is favorable and they play the separating strategy T^{max} if the shock is unfavorable. In the case of a favorable shock bad politicians thus extract only a part of the rent in the first period in the hope to be compensated in the second period by a higher probability to win in the federal election. And finally, if the objective is to make freshman governors behave nicely and to divert zero rent in the first period one needs to compensate the bad governors in the second period by tempting them with a fat presidential rent ($\gamma < 0.4$).

4.4. Conclusion

The starting point for this section was the Besley and Smart model analyzing the horizontal type of yardstick competition. They have shown that under yardstick competition the voters dispose of more information comparing to the unitary state case: in a confederation they are able to compare the governments' performances across jurisdictions and thus update their beliefs concerning the politicians' types. This results in an improved screening process: in some cases a bad domestic incumbent may not be re-elected when he chooses a middle tax level T^h, if the neighboring incumbent levies a smaller tax rate T^l. However it does not imply a change in politicians' behavior. The incumbents of the Leviathan-type always divert some rent in the first legislature period: under favorable shock the bad policy makers pool with the good ones faced unfavorable shock by levying middle level tax T^h and under unfavorable shock they separate by choosing the maximum feasible level of tax collection T^{max}: $\{F \to T_p^h\ ;\ U \to T_g^{max}\}$.

The transformation of the governmental structure from the horizontal to the vertical one modeled in the current work gives rise to other equilibria types. First, it was shown that a situation is possible when a Leviathan in the governor position is forced to divert zero rent for the private consumption in the first period. In this “nice” honest freshman-governor (HFG) equilibrium the nice behavior of the bad governor in the first period is driven by the opportunity to win presidency in the second period. The next possible equilibrium is the "very bad" one in which the governor steals the maximum possible rent in the first period that reveals his type and results in his removal from office in the second period.

The realization of each equilibrium type depends ceteris paribus on parameter γ, which measures the responsibility allocation between the local and the federal governments. The more responsibility goes from the president to the governor (in this case γ increases) the worse is the governor's first period behavior. In the case when the president has almost no responsibility in the federation ($\gamma \to 1$) the bad governor has no incentive to compete for the presidential office, since he can divert more rent in his jurisdiction than at the federal level. Hence, the only mechanism to force the bad governor to behave as if he were of type g is to reward his good first period behavior by a possibility to make an upwards political career. If we exclude such possibility we will be back in the Besley/Smart framework, where the bad incumbents always divert some rent in the first period.

Since the president has no possibility to make an upwards-political career his behavior does not change. As in the Besley and Smart world a bad type president always diverts some rent in each legislature period.

In order to focus on the influence of political responsibility allocation in a federal state on incumbents' behavior I do not consider any welfare effects in my model. It can be possible that the "nice" HFG equilibrium results in a decreasing voters' welfare since the voters in the HFG equilibrium, in which bad governor pools with good politicians, are not able to update their beliefs concerning the type of the governor. A poorer screening process increases the probability that a bad politician is elected as the president in the second legislature period. There are thus two counteracting effects influencing the welfare. On the one hand, shifting political responsibility to the federal level forces the province incumbent to behave "nicely" that results in an increasing voters' welfare, on the other hand, there increases the probability that a bad governor reaches the presidential office that worsens the welfare. Therefore, one should take these considerations into account in order to derive an optimal allocation of the responsibility between the federal and the local governments. A model that incorporates both behavioral and welfare effect of political responsibility allocation appears to be a promising avenue for future research.

Appendix

A.1: The election probabilities in the Besley and Smart-type equilibrium.

In expression (4.3) the probability of the type-b governor to win the federal election if the shock is unfavorable and he deviates from strategy T^{max} by choosing the out-of equilibrium move T^h is given by:

$$G_p^f\left(U_p, T_p^h\right) = \Pr\left(F_f \middle| U_p\right)\left[\theta R_p^f\left(T_p^h, T_f^l\right) + (1-\theta) R_p^f\left(T_p^h, T_f^h\right)\right] + \\ + \Pr\left(U_f \middle| U_p\right)\left[\theta R_p^f\left(T_p^h, T_f^h\right) + (1-\theta) R_p^f\left(T_p^h, T_f^{\max}\right)\right] \tag{A19}$$

The logic behind this expression is as follows. If the shock is unfavorable in the province the president will have the favorable shock with probability Prob(F_f| U_p),[50] then with probability θ the governor with signal T_p^h plays against the good president, who plays T_f^l.[51] The voters replace then the president with the governor in the federal election with probability $R_p^f\left(T_p^h, T_f^l\right)$. With probability (1 – θ) the president is of type b and plays T_f^h in the postulated equilibrium. The governor thus wins the federal election with probability $R_p^f\left(T_p^h, T_f^h\right)$. The term in the second squared brackets in (A19) describes the situation when the shock at the feral level is unfavorable, which happens with probability Prob(U_f | U_p). The remaining election probabilities are derived with the same logic.

The re-election probability of the type-b governor, who plays T^h after observing the unfavorable shock, $G_p\left(U_p, T_p^h\right)$ in (4.3), is

$$G_p\left(U_p, T_p^h\right) = \Pr\left(F_f \middle| U_p\right)\left[\theta R_p\left(T_p^h, T_f^l\right) + (1-\theta) R_p\left(T_p^h, T_f^h\right)\right] + \\ + \Pr\left(U_f \middle| U_p\right)\left[\theta R_p\left(T_p^h, T_f^h\right) + (1-\theta) R_p\left(T_p^h, T_f^{\max}\right)\right] \tag{A20}$$

Similarly, if we have a favorable province shock, the election probabilities in (4.5) are defined as:

$$G_p^f\left(F_p, T_p^l\right) = \Pr\left(F_f \middle| F_p\right)\left[\theta R_p^f\left(T_p^l, T_f^l\right) + (1-\theta) R_p^f\left(T_p^l, T_f^h\right)\right] + \\ + \Pr\left(U_f \middle| F_p\right)\left[\theta R_p^f\left(T_p^l, T_f^h\right) + (1-\theta) R_p^f\left(T_p^l, T_f^{\max}\right)\right] \tag{A21}$$

---

[50] This probability is computed according to the formula for conditional probabilities:
Pr(F_f | U_p) =Pr(F_f, U_p)/Pr(U_p) = (1–σ).

[51] The election of the incumbent president is not modeled in this analysis. It is thus natural to assume that the incumbent is good with probability θ. In a more general model with more than two periods this assumption would have to be dropped.

$$G_p^f\left(F_p,T_p^h\right)=\Pr\left(F_f\middle|F_p\right)\left[\theta R_p^f\left(T_p^h,T_f^l\right)+\left(1-\theta\right)R_p^f\left(T_p^h,T_f^h\right)\right]+ \\ +\Pr\left(U_f\middle|F_p\right)\left[\theta R_p^f\left(T_p^h,T_f^h\right)+\left(1-\theta\right)R_p^f\left(T_p^h,T_f^{\max}\right)\right] \tag{A22}$$

$$G_p\left(F_p,T_p^h\right)=\Pr\left(F_f\middle|F_p\right)\left[\theta R_p\left(T_p^h,T_f^l\right)+\left(1-\theta\right)R_p\left(T_p^h,T_f^h\right)\right]+ \\ +\Pr\left(U_f\middle|F_p\right)\left[\theta R_p\left(T_p^h,T_f^h\right)+\left(1-\theta\right)R_p\left(T_p^h,T_f^{\max}\right)\right] \tag{A23}$$

And, finally, in (4.8) the re-election probability of the president if he chooses T^h facing a favorable shock is given by

$$G_f\left(F_f,T_f^h\right)=\Pr\left(F_p\middle|F_f\right)\left[\theta R_f\left(T_p^l,T_f^h\right)+\left(1-\theta\right)R_f\left(T_p^h,T_f^h\right)\right]+ \\ +\Pr\left(U_p\middle|F_f\right)\left[\theta R_f\left(T_p^h,T_f^h\right)+\left(1-\theta\right)R_f\left(T_p^{\max},T_f^h\right)\right] \tag{A24}$$

All these election probabilities, which are computed by the politicians at the beginning of the first period, depend on the voters' strategy, which is based on the following consideration. The voters elect a politician to be their president if they believe that the probability of his being good exceeds the expectation that any other candidate is good. If both the incumbent governor and the president are worthy to be elected as the president the decision is made by flipping of a coin. In the local election the governor will be re-elected for sure if his probability of being good is lager or equal to θ, that is if voters believe that the governor is better than an opposing politician. This is summarized in the following expressions:

$$\left.\begin{array}{l} R_p^f\left(T_p^x,T_f^x\right)=1, \text{ if } \Pr\left(g_p\middle|T_p^x,T_f^x\right)>Max\left\{\Pr\left(g_f\middle|T_p^x,T_f^x\right);\theta\right\} \\ R_p^f\left(T_p^x,T_f^x\right)=\frac{1}{2}, \text{ if } \Pr\left(g_p\middle|T_p^x,T_f^x\right)=\Pr\left(g_f\middle|T_p^x,T_f^x\right)\geq\theta \\ R_p^f\left(T_p^x,T_f^x\right)=0, \text{ if } \Pr\left(g_p\middle|T_p^x,T_f^x\right)<\theta \end{array}\right\} \tag{A25}$$

$$\left.\begin{array}{l} R_p\left(T_p^x,T_f^x\right)=1, \text{ if } \Pr\left(g_p\middle|T_p^x,T_f^x\right)\geq\theta \\ R_p\left(T_p^x,T_f^x\right)=0, \text{ if } \Pr\left(g_p\middle|T_p^x,T_f^x\right)<\theta \end{array}\right\} \tag{A26}$$

$$\left.\begin{array}{l} R_f\left(T_p^x,T_f^x\right)=1, \text{ if } \Pr\left(g_f\middle|T_p^x,T_f^x\right)>Max\left\{\Pr\left(g_p\middle|T_p^x,T_f^x\right);\theta\right\} \\ R_f\left(T_p^x,T_f^x\right)=\frac{1}{2}, \text{ if } \Pr\left(g_f\middle|T_p^x,T_f^x\right)=\Pr\left(g_p\middle|T_p^x,T_f^x\right)\geq\theta \\ R_f\left(T_p^x,T_f^x\right)=0, \text{ if } \Pr\left(g_f\middle|T_p^x,T_f^x\right)<\theta \end{array}\right\} \tag{A27}$$

where $\Pr\left(g_i \left| T_p^x, T_f^x\right.\right)$ is the conditional probability of incumbent i to be of type g given the tax levels T_p^x and T_f^x. In other words $\Pr\left(g_i \left| T_p^x, T_f^x\right.\right)$ is the voters' posterior belief about the type of politician i.

We now examine all tax level constellations, which define the election probabilities R in the expressions (A19) – (A24). Then after having computed the voters' beliefs $\Pr\left(g_i \left| T_p^x, T_f^x\right.\right)$ for each possible tax level constellation we can determine the election probabilities R_p, R_p^f and R_f, which, finally, yield the election probabilities G_p, G_p^f and G_f.

In the first situation $\left(T_p^h, T_f^l\right)$[52] the president is clearly of type g, since he plays T^l, and the voters' posterior belief concerning the governor's type follows from equations (4.2) and Bayes' rule:

$$\begin{aligned}\Pr\left(g_p \mid T_p^h, T_f^l\right) &= \frac{\Pr\left(T_p^h, T_f^l \left| g_p\right.\right)\Pr\left(g_p\right)}{\Pr\left(T_p^h, T_f^l \left| g_p\right.\right)\Pr\left(g_p\right)+\Pr\left(T_p^h, T_f^l \left| b_p\right.\right)\Pr\left(b_p\right)} = \\ &= \frac{\Pr\left(U_p, F_f\right)\Pr\left(g_f\right)\Pr\left(g_p\right)}{\Pr\left(U_p, F_f\right)\Pr\left(g_f\right)\Pr\left(g_p\right)+\Pr\left(F_p, F_f\right)\Pr\left(g_f\right)\Pr\left(b_p\right)} = \\ &= \frac{\left(1-\sigma\right)q\theta^2}{\left(1-\sigma\right)q\theta^2+\left[1-q\left(2-\sigma\right)\right]\theta\left(1-\theta\right)}\end{aligned} \tag{A28}$$

This expression is obviously smaller than one, therefore, in the case $\left(T_p^h, T_f^l\right)$ the governor will not win the federal election:

$$R_p^f\left(T_p^h, T_f^l\right)=0$$

On the other hand the governor wins the provincial election for sure if the right hand side in (A28) is lager than or equal to θ, that is, if the governor expects to be good with higher probability than an opposing politician. This is the case if $q \geq \frac{1}{3-2\sigma}$, that is, if the probability of an unfavorable shock is large enough. Therefore we can write:

$$R_p\left(T_p^h, T_f^l\right)=1 \text{ if } q \geq \frac{1}{3-2\sigma},\ R_p\left(T_p^h, T_f^l\right)=0 \text{ otherwise.} \tag{A29}$$

If voters observe $\left(T_p^h, T_f^h\right)$ they believe that incumbents are good with probability

[52] See expression (A19)

$$\Pr\left(g_p\left|T_p^h,T_f^h\right.\right)=\Pr\left(g_f\left|T_p^h,T_f^h\right.\right)=\frac{(1-\sigma)q\theta(1-\theta)+\sigma q\theta^2}{2(1-\sigma)q\theta(1-\theta)+\sigma q\theta^2+\left(1-q(2-\sigma)\right)(1-\theta)^2}\quad\text{(A30)}$$

Both politicians have a fair chance to win the presidential election if the expression (A30) is lager than or equal to θ, i.e. if $\theta\geq\frac{1-3q+2q\sigma}{1-4q+4q\sigma}$. Hence, we arrive at the result:

$$R_p^f\left(T_p^h,T_f^h\right)=R_f\left(T_p^h,T_f^h\right)=\frac{1}{2}\text{ if }\theta\geq\frac{1-3q+2q\sigma}{1-4q+4q\sigma},$$

$R_p^f\left(T_p^h,T_f^h\right)=R_f\left(T_p^h,T_f^h\right)=0$ otherwise.

$$R_p\left(T_p^h,T_f^h\right)=1\text{ if }\theta\geq\frac{1-3q+2q\sigma}{1-4q+4q\sigma},\ R_p\left(T_p^h,T_f^h\right)=0\text{ otherwise.}\quad\text{(A31)}$$

In other words, if the share of good politicians in population is sufficiently large, $\theta\geq\frac{1-3q+2q\sigma}{1-4q+4q\sigma}$, both politicians sending T^h win the presidential election with probability 1/2, moreover, if the governor in this case looses the federal election he will be re-elected with certainty in the province election.

If the voters observe $\left(T_p^h,T_f^{max}\right)$ they know for sure that the president sending $T_f^{\max}$ is bad, hence they will never re-elect him, $R_f\left(T_p^h,T_f^{max}\right)=0$; and the governor in this situation is of type-g with probability

$$\Pr\left(g_p\left|T_p^h,T_f^{\max}\right.\right)=\frac{\sigma q\theta}{(1-\sigma)q(1-\theta)+\sigma q\theta},\quad\text{(A32)}$$

which exceeds θ if the shock correlation parameter is sufficiently high: $\sigma>1/2$. Therefore, we can write:

$$R_p^f\left(T_p^h,T_f^{\max}\right)=R_p\left(T_p^h,T_f^{\max}\right)=1\text{ if }\sigma\geq\frac{1}{2},$$

$$R_p^f\left(T_p^h,T_f^{\max}\right)=R_p\left(T_p^h,T_f^{\max}\right)=0\text{ otherwise.}\quad\text{(A33)}$$

The cases $\left(T_p^l,T_f^l\right)$ and $\left(T_p^l,T_f^{max}\right)$ are straightforward, since T^l is sent only by type-g and T^{max} can be sent only by type-b. The corresponding probabilities are:

$R_p^f\left(T_p^l,T_f^l\right)=R_f\left(T_p^l,T_f^l\right)=\frac{1}{2}$ for all values of σ, θ and q since in this case the voters believe that both politicians are of type-g;

$R_p^f\left(T_p^l, T_f^{\max}\right) = 1$ also for all values of σ, θ and q since the governor is certainly good and the president is bad.

The values of the probabilities G thus depend on the signs in the three crucial inequalities: $q \geq< \frac{1}{3-2\sigma}$; $\theta \geq< \frac{1-3q+2q\sigma}{1-4q+4q\sigma}$ and $\sigma \geq < 1/2$, whereas the following combinations are not feasible:

$$q \geq \frac{1}{3-2\sigma} \text{ and } \theta < \frac{1-3q+2q\sigma}{1-4q+4q\sigma} \text{ and } \sigma \geq \frac{1}{2};$$

$$q \geq \frac{1}{3-2\sigma} \text{ and } \sigma < \frac{1}{2}, \text{ since } \sigma \geq q.$$

Therefore, putting the computed probabilities R into the expressions (A19) – (A24) one obtains the corresponding expressions for the G-expressions. The first period probability of the governor to be elected as the president if the local shock is unfavorable and the governor plays T^h can take the following four values depending on the model parameters:

$$G_p^f\left(U_p, T_p^h\right) \begin{cases} G_p^f\left(U_p, T_p^h\right) = \frac{(1-\sigma)(1-\theta)}{2} + \frac{\sigma\theta}{2} + \sigma(1-\theta) & \text{if } \theta \geq \frac{1-3q+2q\sigma}{1-4q+4q\sigma} \text{ and } \sigma \geq \frac{1}{2} \\ G_p^f\left(U_p, T_p^h\right) = \frac{(1-\sigma)(1-\theta)}{2} + \frac{\sigma\theta}{2} & \text{if } \theta \geq \frac{1-3q+2q\sigma}{1-4q+4q\sigma} \text{ and } \sigma < \frac{1}{2} \\ G_p^f\left(U_p, T_p^h\right) = \sigma(1-\theta) & \text{if } \theta < \frac{1-3q+2q\sigma}{1-4q+4q\sigma} \text{ and } \sigma \geq \frac{1}{2} \\ G_p^f\left(U_p, T_p^h\right) = 0 & \text{if } \theta < \frac{1-3q+2q\sigma}{1-4q+4q\sigma} \text{ and } \sigma < \frac{1}{2} \end{cases}$$

The re-election probability of the governor playing T^h in the case of an unfavorable shock is given by the following five equations:

$$G_p\left(U_p, T_p^h\right) \begin{cases} G_p\left(U_p, T_p^h\right) = 1 & \text{if } q \geq \frac{1}{3-2\sigma} \text{ and } \theta \geq \frac{1-3q+2q\sigma}{1-4q+4q\sigma} \text{ and } \sigma \geq \frac{1}{2} \\ G_p\left(U_p, T_p^h\right) = (1-\sigma)(1-\theta) + \sigma & \text{if } q < \frac{1}{3-2\sigma} \text{ and } \theta \geq \frac{1-3q+2q\sigma}{1-4q+4q\sigma} \text{ and } \sigma \geq \frac{1}{2} \\ G_p\left(U_p, T_p^h\right) = \sigma(1-\theta) & \text{if } q < \frac{1}{3-2\sigma} \text{ and } \theta < \frac{1-3q+2q\sigma}{1-4q+4q\sigma} \text{ and } \sigma \geq \frac{1}{2} \\ G_p\left(U_p, T_p^h\right) = (1-\sigma)(1-\theta) + \sigma\theta & \text{if } q < \frac{1}{3-2\sigma} \text{ and } \theta \geq \frac{1-3q+2q\sigma}{1-4q+4q\sigma} \text{ and } \sigma < \frac{1}{2} \\ G_p\left(U_p, T_p^h\right) = 0 & \text{if } q < \frac{1}{3-2\sigma} \text{ and } \theta < \frac{1-3q+2q\sigma}{1-4q+4q\sigma} \text{ and } \sigma < \frac{1}{2} \end{cases}$$

If the shock in the province is favorable the corresponding probabilities for the governor are defined as follows:

$$G_p^f\left(F_p,T_p^h\right)\begin{cases} G_p^f\left(F_p,T_p^h\right)=\dfrac{1-q(2-\sigma)}{2(1-q)}(1-\theta)+\dfrac{(1-\sigma)q}{1-q}\left(1-\dfrac{\theta}{2}\right) & \text{if } \theta\geq\dfrac{1-3q+2q\sigma}{1-4q+4q\sigma} \text{ and } \sigma\geq\dfrac{1}{2} \\ G_p^f\left(F_p,T_p^h\right)=\dfrac{1-q(2-\sigma)}{2(1-q)}(1-\theta)+\dfrac{(1-\sigma)q}{2(1-q)}\theta & \text{if } \theta\geq\dfrac{1-3q+2q\sigma}{1-4q+4q\sigma} \text{ and } \sigma<\dfrac{1}{2} \\ G_p^f\left(F_p,T_p^h\right)=\dfrac{(1-\sigma)q}{1-q}(1-\theta) & \text{if } \theta<\dfrac{1-3q+2q\sigma}{1-4q+4q\sigma} \text{ and } \sigma\geq\dfrac{1}{2} \\ G_p^f\left(F_p,T_p^h\right)=0 & \text{if } \theta<\dfrac{1-3q+2q\sigma}{1-4q+4q\sigma} \text{ and } \sigma<\dfrac{1}{2} \end{cases}$$

$$G_p\left(F_p,T_p^h\right)\begin{cases} G_p\left(F_p,T_p^h\right)=1 & \text{if } q\geq\dfrac{1}{3-2\sigma} \text{ and } \theta\geq\dfrac{1-3q+2q\sigma}{1-4q+4q\sigma} \text{ and } \sigma\geq\dfrac{1}{2} \\ G_p\left(F_p,T_p^h\right)=\dfrac{1-q(2-\sigma)}{(1-q)}(1-\theta)+\dfrac{(1-\sigma)q}{(1-q)} & \text{if } q<\dfrac{1}{3-2\sigma} \text{ and } \theta\geq\dfrac{1-3q+2q\sigma}{1-4q+4q\sigma} \text{ and } \sigma\geq\dfrac{1}{2} \\ G_p\left(F_p,T_p^h\right)=\dfrac{(1-\sigma)q}{(1-q)}(1-\theta) & \text{if } q<\dfrac{1}{3-2\sigma} \text{ and } \theta<\dfrac{1-3q+2q\sigma}{1-4q+4q\sigma} \text{ and } \sigma\geq\dfrac{1}{2} \\ G_p\left(F_p,T_p^h\right)=\dfrac{1-q(2-\sigma)}{(1-q)}(1-\theta)+\dfrac{(1-\sigma)q}{(1-q)}\theta & \text{if } q<\dfrac{1}{3-2\sigma} \text{ and } \theta\geq\dfrac{1-3q+2q\sigma}{1-4q+4q\sigma} \text{ and } \sigma<\dfrac{1}{2} \\ G_p\left(F_p,T_p^h\right)=0 & \text{if } q<\dfrac{1}{3-2\sigma} \text{ and } \theta<\dfrac{1-3q+2q\sigma}{1-4q+4q\sigma} \text{ and } \sigma<\dfrac{1}{2} \end{cases}$$

Finally, if the bad governor deviates from equilibrium strategy and chooses the low tax level T^l he expects to defeat the president with probability

$$G_p^f\left(F_p,T_p^l\right)=\frac{\left(1-q(2-\sigma)\right)}{1-q}\left(1-\frac{\theta}{2}\right)+\frac{(1-\sigma)q}{1-q} \qquad \text{for all values of } q,\ \sigma \text{ and } \theta.$$

Since both incumbents play the same strategy in the considered Besley and Smart-type equilibrium, it is simple to show that the re-election probability of the president if he chooses T^h after observing a favorable shock is equal to the respective probability of the governor to win the federal election: $G_f\left(F_f,T_f^h\right)=G_p^f\left(F_p,T_p^h\right)$.

A.2: A Mathematica-Algorithm for examination of the existence of a Besley and Smart equilibrium.

The following algorithm examines whether a Besley and Smart equilibrium exists if

$q\geq\dfrac{1}{3-2\sigma}$, $\theta\geq\dfrac{1-3q+2q\sigma}{1-4q+4q\sigma}$ and $\sigma\geq\dfrac{1}{2}$.

In[1]:= << Algebra`InequalitySolve`, "*loading of a needed package*"

In[2]:= main1 = $q \geq \frac{1}{3-2\sigma}$; main2 = $\theta \geq \frac{1-3q+2q\sigma}{1-4q+4q\sigma}$; main3 = $\sigma \geq \frac{1}{2}$ "*this line defines the crucial inequalities*"

The expected rent of the president in the second period:

In[3]:= ERfUp=FullSimplify[(1 – σ) (1 – γ) κ Δ + σ (1 – γ) Δ (κ – 1)] "*expected rent of the president given unfavorable shock in the province, expression* (4.4) *in the text*"

In[4]:= ERfFp = FullSimplify$\left[\frac{1-q(2-\sigma)}{1-q}(1-\gamma)\kappa\Delta+\frac{q(1-\sigma)}{1-q}(1-\gamma)\Delta(\kappa-1)\right]$ "*expected rent of the president given favorable shock in the province, expression* (4.7) *in the text*"

The election probabilities, computed in Appendix A.2:

In[5]:= GpfUTph = FullSimplify$\left[\frac{(1-\sigma)(1-\theta)}{2}+\frac{\sigma\theta}{2}+\sigma(1-\theta)\right]$ "*probability of the governor to win federal election if he plays* T_p^h *after observing unfavorable shock*"

In[6]:= GpUTph = 1 "*probability of the governor to be re-elected if he plays* T_p^h *after observing unfavorable shock*"

In[7]:= GpfFTpl = FullSimplify$\left[\frac{(1-q(2-\sigma))}{1-q}\left(1-\frac{\theta}{2}\right)+\frac{(1-\sigma)q}{1-q}\right]$ "*probability of the governor to win federal election if he plays* T_p^l *after observing favorable shock*"

In[8]:= GpfFTph= FullSimplify$\left[\frac{1-q(2-\sigma)}{2(1-q)}(1-\theta)+\frac{(1-\sigma)q}{1-q}\left(1-\frac{\theta}{2}\right)\right]$ "*probability of the governor to win federal election if he plays* T_p^h *after observing favorable shock*"

In[9]:= GpFTph= 1 "*probability of the governor to be re-elected if he plays* T_p^h *after observing favorable shock*"

In[10]:= GfFTfh = GpfFTph "*re-election probability of the president playing* T_f^h *is equal to corresponding probability of the governor to win the federal election if the shock is favorable*"

Next I define the tax values, participation and incentive-compatibility constraints:

In[11]:= {Tpmax = γ(l + κ Δ), Tph = γ(l + Δ), Tpl = γ l, Tfmax = (1 – γ)(l + κ Δ),
Tfh = (1 – γ)(l + Δ), Tfl = (1 – γ) l} "*this line defines the possible tax levels*"

In[12]:= {part1 = FullSimplify[(Tpmax – Tph)/Δ ≥ (GgfUTgh (ERfUg) +
(1 – GgfUTgh) GgUTgh (Tpmax – Tph))/Δ],
"*the first incentive compatibility constraint for the governor, which is simplified by dividing both sites by* Δ"}

In[13]:= {part2 = FullSimplify (GgfFTgl (ERfFg) + (1 – GgfFTgl) (Tpmax - Tpl))
2 (q – 1)^2/ Δ ≤ ((Tph – Tpl) + GgfFTgh (ERfFg) + (1 – GgfFTgh) GgFTgh
(Tpmax –Tpl)) 2 (q – 1)^2/ Δ,
"*the second incentive compatibility constraint for the governor, which is simplified by multiplying both sites by* 2(q – 1)^2/Δ"}

In[14]:= {part3 = FullSimplify[(Together[(Tph - Tpl) + GgfFTgh (ERfFg) +

(1 - GgfFTgh) GgFTgh (Tpmax - Tpl)]) 2 (q – 1)^2/ Δ ≥ (Together[Tpmax - Tpl])

2 (q – 1)^2/ Δ, "*the third incentive compatibility constraint for the governor, which is simplified by multiplying both sites by* 2(q – 1)^2/Δ"}

In[15]:= {part4 = FullSimplify[(Tfh - Tfl + GfFTfh (Tfmax - Tfl))

2 (1 – q)/ (Δ (1 – γ)) ≥ (Tfmax - Tfl) 2 (1 – q)/ (Δ (1 – γ)), "*the first incentive compatibility constraint for the president, which is simplified by multiplying both sites by* 2 (1 – q)/(Δ (1 – γ))"}

In[16]:= {part5 = FullSimplify[(GgfFTgh (ERfFg) - GgfFTgh GgFTgh

(Tpmax - Tpl)) 2 (q – 1)^2/ Δ ≥ 0, "*participation constraint for the governor*"}

In[17]:= Timing[q = 0; θ = 0; κ = 1; n = 0; While[(q = q + 1/12) < 1,

While[(θ = θ + 1/12) < 1, While[(κ = κ + 1/4) < 4, n = n + 1;

If[InequalitySolve[part1 && part2 && part3 && part4 && part5

&& main1 && main2 && γ > 0 && γ < 1 && Δ > 0 && main3 && σ > q

&& σ < 1, {γ, Δ, σ}] == False, Continue[], "?",

Print["q=", q, ", θ=", θ, ", κ=", κ, ", n=", n]]];

κ = 1]; θ = 0]; Print["n=", n]; Clear[σ, θ, q, κ, γ, Δ]]

(**the while-loops for q, θ between* 0 *and* 1 *and κ between* 1 *and* 4 *with step* 1/12*)

The output of the above loop should be the points in the q-θ-κ-space, if in this points the program finds a solution of the inequality system. In this particular case the algorithm returns nothing, that is, in the considered 1331 points no Besley and Smart equilibrium exists if $q \geq \frac{1}{3-2\sigma}$, $\theta \geq \frac{1-3q+2q\sigma}{1-4q+4q\sigma}$ and $\sigma \geq \frac{1}{2}$.

In order to examine whether a Besley/Smart equilibria can exist in the remaining four cases described in Proposition 4 one needs to change the following lines in the above code: line [2], which defines the three crucial constrains, and lines [5]-[10], which define the corresponding election probabilities.

A.3: The election probabilities in the "nice" equilibrium.

The election probabilities are defined similarly as in the Appendix A.1:

$$\begin{aligned}G_p^f\left(U_p, T_p^h\right) &= \Pr\left(F_f \middle| U_p\right)\left[\theta R_p^f\left(T_p^h, T_f^l\right) + (1-\theta) R_p^f\left(T_p^h, T_f^h\right)\right] + \\ &+ \Pr\left(U_f \middle| U_p\right)\left[\theta R_p^f\left(T_p^h, T_f^h\right) + (1-\theta) R_p^f\left(T_p^h, T_f^{\max}\right)\right]\end{aligned} \tag{A34}$$

$$\begin{aligned}G_p\left(U_p, T_p^h\right) &= \Pr\left(F_f \middle| U_p\right)\left[\theta R_p\left(T_p^h, T_f^l\right) + (1-\theta) R_p\left(T_p^h, T_f^h\right)\right] + \\ &+ \Pr\left(U_f \middle| U_p\right)\left[\theta R_p\left(T_p^h, T_f^h\right) + (1-\theta) R_p\left(T_p^h, T_f^{\max}\right)\right]\end{aligned} \tag{A35}$$

$$G_p^f\left(F_p, T_p^l\right) = \Pr\left(F_f \middle| F_p\right)\left[\theta R_p^f\left(T_p^l, T_f^l\right) + (1-\theta) R_p^f\left(T_p^l, T_f^h\right)\right] + \\ + \Pr\left(U_f \middle| F_p\right)\left[\theta R_p^f\left(T_p^l, T_f^h\right) + (1-\theta) R_p^f\left(T_p^l, T_f^{\max}\right)\right] \tag{A36}$$

$$G_p^f\left(F_p, T_p^h\right) = \Pr\left(F_f \middle| F_p\right)\left[\theta R_p^f\left(T_p^h, T_f^l\right) + (1-\theta) R_p^f\left(T_p^h, T_f^h\right)\right] + \\ + \Pr\left(U_f \middle| F_p\right)\left[\theta R_p^f\left(T_p^h, T_f^h\right) + (1-\theta) R_p^f\left(T_p^h, T_f^{\max}\right)\right] \tag{A37}$$

$$G_p\left(F_p, T_p^h\right) = \Pr\left(F_f \middle| F_p\right)\left[\theta R_p\left(T_p^h, T_f^l\right) + (1-\theta) R_p\left(T_p^h, T_f^h\right)\right] + \\ + \Pr\left(U_f \middle| F_p\right)\left[\theta R_p\left(T_p^h, T_f^h\right) + (1-\theta) R_p\left(T_p^h, T_f^{\max}\right)\right] \tag{A38}$$

$$G_f\left(F_f, T_f^h\right) = \Pr\left(F_p \middle| F_f\right)\left[\theta R_f\left(T_p^l, T_f^h\right) + (1-\theta) R_f\left(T_p^l, T_f^h\right)\right] + \\ + \Pr\left(U_p \middle| F_f\right)\left[\theta R_f\left(T_p^h, T_f^h\right) + (1-\theta) R_f\left(T_p^h, T_f^h\right)\right] \tag{A39}$$

Here there are six possible tax constellations: $\left(T_p^h, T_f^l\right)$,$\left(T_p^h, T_f^h\right)$, $\left(T_p^h, T_f^{\max}\right)$, $\left(T_p^l, T_f^l\right)$, $\left(T_p^l, T_f^h\right)$ and$\left(T_p^l, T_f^{\max}\right)$. The voter's belief concerning the type of the governor in all situations is equal to θ. This follows from the fact that both bad and good governors play the same strategy. Therefore, the conditional probabilities of playing strategy T_p^x equals for both types: $\Pr\left(T_p^x, T_f^y \middle| g_p\right) = \Pr\left(T_p^x, T_f^y \middle| b_p\right)$, where x = l, h and $y = l, h, max$. From Bayes' rule then follows:

$$\Pr\left(g_p \middle| T_p^x, T_f^y\right) = \frac{\Pr\left(T_p^x, T_f^y \middle| g_p\right)\Pr\left(g_p\right)}{\Pr\left(T_p^x, T_f^y \middle| g_p\right)\Pr\left(g_p\right) + \Pr\left(T_p^x, T_f^y \middle| b_p\right)\Pr\left(b_p\right)} = \\ = \frac{\Pr\left(T_p^x, T_f^y \middle| g_p\right)\theta}{\Pr\left(T_p^x, T_f^y \middle| g_p\right)\theta + \Pr\left(T_p^x, T_f^y \middle| g_p\right)(1-\theta)} = \frac{\Pr\left(T_p^x, T_f^y \middle| g_p\right)\theta}{\Pr\left(T_p^x, T_f^y \middle| g_p\right)} = \theta$$

That is, the voter's posterior belief is equal to the a-priory probability of an incumbent to be good, θ; there is no information improvement in this equilibrium type. And it follows that the governor will be always re-elected with probability 1 independent on signals chosen by the president and shock realization in both jurisdictions, $G_p = 1$.

Therefore, to obtain the federal election probabilities one has to compute only the conditional probabilities concerning the type of the president.

There are only two situations, $\left(T_p^h, T_f^h\right)$ and $\left(T_p^l, T_f^h\right)$, where we need to compute the posterior beliefs concerning the type of the president in order to obtain all election probabilities. In all other situations the voters' beliefs follow directly from the simple reasoning.[53]

$$\Pr\left(g_f \middle| T_p^h, T_f^h\right) = \frac{\Pr\left(T_p^h, T_f^h \middle| g_f\right)\Pr\left(g_f\right)}{\Pr\left(T_p^h, T_f^h \middle| g_f\right)\Pr\left(g_f\right) + \Pr\left(T_p^h, T_f^h \middle| b_f\right)\Pr\left(b_f\right)} = \tag{A40}$$
$$= \frac{\sigma q \theta}{\sigma q \theta + \left(1-\sigma\right) q \left(1-\theta\right)}$$

$$\Pr\left(g_f \middle| T_p^l, T_f^h\right) = \frac{\Pr\left(T_p^l, T_f^h \middle| g_f\right)\Pr\left(g_f\right)}{\Pr\left(T_p^l, T_f^h \middle| g_f\right)\Pr\left(g_f\right) + \Pr\left(T_p^l, T_f^h \middle| b_f\right)\Pr\left(b_f\right)} = \tag{A41}$$
$$= \frac{\left(1-\sigma\right) q \theta}{\left(1-\sigma\right) q \theta + \left(1-\left(2-\sigma\right)q\right)\left(1-\theta\right)}$$

The conditional probability in (A40) exceeds θ if $\sigma > 1/2$. And the conditional probability in (A41) is lager than θ if $q > \frac{1}{3-2\sigma}$. Hence, the election probabilities are given by:

$R_p^f\left(T_p^h, T_f^h\right) = 0,\ R_f\left(T_p^h, T_f^h\right) = 1$ if $\sigma > 1/2$;

$R_p^f\left(T_p^h, T_f^h\right) = 1,\ R_f\left(T_p^h, T_f^h\right) = 0$ if $\sigma < 1/2$;

$R_p^f\left(T_p^h, T_f^h\right) = R_f\left(T_p^h, T_f^h\right) = 1/2$ if $\sigma = 1/2$;

$R_p^f\left(T_p^l, T_f^h\right) = 0,\ R_f\left(T_p^l, T_f^h\right) = 1$ if $q > \frac{1}{3-2\sigma}$;

$R_p^f\left(T_p^l, T_f^h\right) = 1,\ R_f\left(T_p^l, T_f^h\right) = 0$ if $q < \frac{1}{3-2\sigma}$;

$R_p^f\left(T_p^l, T_f^h\right) = R_f\left(T_p^l, T_f^h\right) = 1/2$ if $q = \frac{1}{3-2\sigma}$.

The election probabilities of the governor in the other cases are:

$R_p^f\left(T_p^h, T_f^l\right) = R_p^f\left(T_p^l, T_f^l\right) = 0$, since the president here is certainly good if he levies T^l and the governor is as good as an outside challenger;[54]

$R_p^f\left(T_p^h, T_f^{\max}\right) = R_p^f\left(T_p^l, T_f^{\max}\right) = 1$, because the sender of T^{max} is certainly bad.

---

[53] Since if the president sends T_f^l or $T_f^{\max}$ the voters immediately recognize his type.

[54] A bad president in the considered equilibrium never plays T^l.

Consequently, inserting the obtained values for probabilities *R's* into equalities (A34)-(A39) we obtain the following values for the election probabilities *G's*:

$$G_p^f\left(U_p,T_p^h\right)\begin{cases} G_p^f\left(U_p,T_p^h\right)=\sigma(1-\theta) & \text{if } \sigma>\frac{1}{2}; \\ G_p^f\left(U_p,T_p^h\right)=(1-\sigma)(1-\theta)+\sigma & \text{if } \sigma<\frac{1}{2}; \\ G_p^f\left(U_p,T_p^h\right)=\frac{(1-\sigma)(1-\theta)+\sigma\theta}{2}+\sigma(1-\theta) & \text{if } \sigma=\frac{1}{2}; \end{cases}$$

$$G_p^f\left(F_p,T_p^l\right)\begin{cases} G_p^f\left(F_p,T_p^l\right)=\frac{(1-\sigma)q}{1-q}(1-\theta) & \text{if } q>\frac{1}{3-2\sigma}; \\ G_p^f\left(F_p,T_p^l\right)=\frac{(1-q(2-\sigma))}{1-q}(1-\theta)+\frac{(1-\sigma)q}{1-q} & \text{if } q<\frac{1}{3-2\sigma}; \\ G_p^f\left(F_p,T_p^l\right)=\frac{(1-q(2-\sigma))}{2(1-q)}(1-\theta)+\frac{(1-\sigma)q}{1-q}\left(1-\frac{\theta}{2}\right) & \text{if } q=\frac{1}{3-2\sigma}; \end{cases}$$

$$G_p^f\left(F_p,T_p^h\right)\begin{cases} G_p^f\left(F_p,T_p^h\right)=\frac{(1-\sigma)q}{1-q}(1-\theta) & \text{if } \sigma>\frac{1}{2}; \\ G_p^f\left(F_p,T_p^h\right)=\frac{1-q(2-\sigma)}{1-q}(1-\theta)+\frac{(1-\sigma)q}{1-q} & \text{if } \sigma<\frac{1}{2}; \\ G_p^f\left(F_p,T_p^h\right)=\frac{1-q(2-\sigma)}{2(1-q)}(1-\theta)+\frac{(1-\sigma)q}{1-q}\left(1-\frac{\theta}{2}\right) & \text{if } \sigma=\frac{1}{2}; \end{cases}$$

$$G_f\left(F_f,T_g^h\right)\begin{cases} G_f\left(F_f,T_f^h\right)=1 & \text{if } \sigma>\frac{1}{2} \text{ and } q>\frac{1}{3-2\sigma}; \\ G_f\left(F_f,T_f^h\right)=\frac{(1-\sigma)q}{1-q} & \text{if } \sigma>\frac{1}{2} \text{ and } q<\frac{1}{3-2\sigma}; \\ G_f\left(F_f,T_f^h\right)=\frac{1-q(2-\sigma)}{2(1-q)}+\frac{(1-\sigma)q}{1-q} & \text{if } \sigma>\frac{1}{2} \text{ and } q=\frac{1}{3-2\sigma}; \\ G_f\left(F_f,T_f^h\right)=0 & \text{if } \sigma<\frac{1}{2} \text{ and } q<\frac{1}{3-2\sigma}; \\ G_f\left(F_f,T_f^h\right)=\frac{(1-\sigma)q}{2(1-q)} & \text{if } \sigma=\frac{1}{2} \text{ and } q<\frac{1}{3-2\sigma}. \end{cases}$$

References

Adams, R. H. Jr. (2003), International Migration, Remittances and the Brain Drain, *World Bank Policy Research Working Paper* no. 3069.

Ashworth, J. and Heyndels, B. (1997), Politicians' Preferences on Local Tax Rates: an Empirical Analysis, *European Journal of Political Economy*, V. 13(3): 479-502.

Basker, E. (2002), Education, Job Search and Migration, *University of Missouri-Columbia Working Paper* no. 02-16.

Belleflamme, P. and Hindriks, J. (2002), Yardstick Competition and Political Agency Problems, *Core Discussion Paper* 2002/29.

Besley, T. and Case, A. (1995), Incumbent behavior: vote seeking, tax setting and yardstick competition, *American Economic Review.* V. 85(1): 25-45.

Besley, T. and Coate, S. (1997), An Economic Model of Representative Democracy, *Quarterly Journal of Economics* 112, 85-114.

Besley, T. and Smart, M. (2002), Does Tax Competition Raise Voter Welfare? *Centre for Economic Policy Research, Discussion Paper* No. 3131 (2002).

Bodenstein, M. and Ursprung, H. (2004), Political Yardstick Competition, Economic Integration, and Constitutional Choice in a Federation, *Public Choice,* forthcoming.

Bordignon, M., Cerniglia, F. and Revelli, F. (2002), In Search for Yardstick Competition: Property Tax Rates and Electoral Behavior in Italian Cities, *CESifo Working Paper* No. 644.

Brady, H.E. (2003), *An Analytical Perspective on Participatory Inequality and Income Inequality,* paper for the Russel Sage Foundation Project on the "Social Dimensions of Inequality", University of California, Berkeley.

Breton, A. (1998), *Competitive Governments: An Economic Theory of Politics and Public Finance,* Cambridge University Press.

Breton, A. and Ursprung, H. (2002), Globalisation, Competitive Governments, and Constitutional Choice in Europe, *CESifo Working Paper* No. 657 (2).

Brown, C.C. and Oates, W.E. (1987), Assistance to the Poor in a Federal System, *Journal of Public Economics* 32, 307-330.

Brueckner, J.K. (2000), Welfare Reform and the Race to the Bottom: Theory and Evidence, *Southern Economic Journal* 66, 505-525.

Büttner, T. (2001), Fiscal Externalities in Local Tax Competition: Empirical Evidence from a Panel of German Jurisdictions, *ZEW Discussion Paper* No. 01-11. Mannheim.

Carillo, M. R. and Marselli, R. (2003), *Internal Migration and Search Costs in Italy: the Role of the Regional Production System*, Working Paper.

Cremer, H., Fourgeaud, V., Leite-Monteiro, M., Marchand, M. and Pestieau, P. (1996), Mobility and Redistribution: A Survey, *Public Finance/Finances Publique* 51, 325-352.

Cremer, H. and Pestieau, P. (1998), Social Insurance, Majority Voting and Labor Mobility, *Journal of Public Economics* 68: 397-420.

Cremer, H. and Pestieau, P. (2003), *Factor Mobility and Redistribution: A Survey*, Working Paper.

Dee, T.S. (2003), Are there Civic Returns to Education? *NBER Working Paper* no. 9588.

Ehrenberg, R.G. and Smith, R.S. (2003), *Modern Labor Economics: Theory and Public Policy*, Addison Wesley, 8th Edition.

Epple, D. and Romer, T. (1991), Mobility and Redistribution, *Journal of Political Economy* 99: 828- 858.

Eurobarometer (2001), *The Social Situation in the European Union*, Report no. 54.2, European Opinion Research Group, Brussels.

European Commission (2001), *High Level Task Force on Skills and Mobility Final Report*. Brussels

Fertig, M. and Schmidt, C.M. (2002), Mobility within Europe: What Do We (Still Not) Know? *IZA Discussion Paper* 447.

Franzese, R.J., Jr. (2000), *Political Participation, Income Distribution and Public Transfers in Developed Democracies*, Working Paper.

Glaeser, E.L., Laibson, D. and Sacerdote, B. (2002), An Economic Approach to Social Capital, *Economic Journal* 112, F437-F458.

Greenwood, M.J. (1997), Internal Migration in Developed Countries, in M.R. Rosenzweig and O. Stark eds., *Handbook of Population and Family Economics*, Volume 1B, Elsevier Science, Amsterdam.

Gregg, P., Machin, S. and Manning, A. (2004), Mobility and Joblessness, in D. Card, R. Blundell, and R. B. Freeman eds., *Seeking a Premier Economy: The Eco-*

nomic Effects of British Economic Reforms 1980-2000. NBER Comparative Labor Market Series, University of Chicago Press.

Haas, A. (2002), Regionale Mobilität gestiegen, *IAB Kurzbericht*, German Institute for Labor Market Research, Nurenberg.

Ledent, J (1990), Canada, in C. B. Nam, W. J. Serow, and D. F. Sly eds., *International Handbook on Internal Migration*, Greenwood Press, New York.

Lejour, A.M. and Verbon, H.A.A. (1994), Labor Mobility and Decision Making on Social Insurance in an Integrated Market, *Public Choice* 79: 161-185.

Mahroum, S. (2001), Europe and the Immigration of Highly Skilled Labor, *International Migration* 39 (Special Issue 1), 27-43.

Mazza, I. and van Winden, F. (1996), A Political Economic Analysis of Labor Migration and Income Redistribution, *Public Choice* 88: 333-363.

Meltzer, A.H. and S.F. Richard (1981), A Rational Theory of the Size of the Government, *Journal of Political Economy* 89, 914-927.

Milligan, K., Moretti, E. and Oreopoulos, P. (2003). Does Education Improve Citizenship? Evidence for the U.S. and the U.K., *NBER Working Paper* no. 9584.

Mueller, D. (1998), Constitutional Constraints on Governments in a Global Economy, *Constitutional Political Economy*. V. 9(3): 171-186.

Oates, W.E. (1972), *Fiscal Federalism*, Harcourt Brace Jovanovich, New York.

Oates, W.E. (2004), An Essay on Fiscal Federalism, in M. Baimbridge and P. Whyman eds., *Fiscal Federalism and European Economic Integration*, Routledge Studies in the European Economy, London.

OECD (2003), *Trends in International Migration: Continuous Reporting System on Migration,* SOPEMI Annual Report 2002 Edition, Paris.

Osborne, M.J. and Slivinski, A. (1996), A Model of Political Competition with Citizen Candidates, *Quarterly Journal of Economics* 111, 65-96.

Pedersen, P., Røed, M. and Schröder, L. (2003), Emigration from the Scandinavian Welfare States, in Andersen T. and P. Molander eds, *Alternatives for Welfare Policy*, Cambridge University Press.

Pirttilä, J. (2003), *Is International Labor Mobility a Threat to the Welfare State? Evidence from Finland in the 1990s*, Paper presented at the CESifo Economic Studies Conference "Migration and the Welfare State".

Putnam, R.D. (2000). *Bowling Alone: The Collapse and Revival of American Community*, Simon & Schuster, New York.

Razin, A., Sadka, E. and Swagel, P. (2002), Tax Burden and Migration: A Political Economy Theory and Evidence, *Journal of Public Economics* 85, 167-190.

Riker, W.H. (1964), *Federalism – Origin, Operation, and Significance*, Little Brown, Boston and Toronto.

Salmon, P. (1987), Decentralization as an Incentive Scheme, *Oxford Review of Economic Policy*. V. 3(2): 24-43.

Schaltegger, C. and Küttel, D. (2002), Exit, Voice and Mimicking Behavior: Evidence from Swiss Cantons, *Public Choice*. V. 113(1): 1-23.

Schleifer, A. (1985), A Theory of Yardstick Competition, *Rand Journal of Economics*. V. 16(3): 319-327.

Sinn, H.-W. (1997), The Selection Principle and Market Failure in Systems Competition, *Journal of Public Economics* 66, 247-274.

Squire, F., Wolfinger, R.E. and Glass, D.P. (1987), Residential Mobility and Voter Turnout, *American Political Science Review* 81: 45-65.

Tiebout, C.M. (1956), A Pure Theory of Local Expenditures, *Journal of Political Economy* 64: 416-424.

U.S. Census Bureau (2002), *Current Population Survey*, 2003 Annual Social and Economic Supplement, Washington D.C.

Wanner, P. (2002), Migration Trends in Europe, *European Population Papers Series* No. 7, Council of Europe, Strasbourg.

Wildasin, D.E. (1991), Income Redistribution in a Common Labor Market, *American Economic Review* 81: 757-774.

Wrede, M. (2001), Yardstick Competition to Tame the Leviathan, *European Journal of Political Economy*. V. 17: 705-721.

Zusammenfassung

Diese Arbeit besteht aus zwei thematischen Hauptteilen, die sich mit der Analyse der Verhaltensweise der am politischen Prozess teilnehmenden Individuen befassen.

Die Arbeit erforscht die persönlichen Motivationen der Politiker, die auf den föderalen und lokalen Regierungsebenen agieren, sowie die Auswirkungen der Kompetenzverteilung in einer Föderation und der im Laufe der Globalisierung steigenden Mobilität der Wähler auf die zu implementierende Politik.

In dem ersten Teil dieser Arbeit wird die Problematik der Zusammenhänge zwischen dem politischen Engagement und der Mobilität der Wähler diskutiert. Untersucht werden die Auswirkung der steigenden Mobilität auf die Bereitschaft der Bürger, in den lokalen Wahlen (wie z.B. auf der Gemeindeebene) zu kandidieren und die daraus resultierende Politik.

Der zweite Teil befasst sich mit der Verhaltensweise der Politiker in einer Föderation, die innerhalb einer zweistufigen Regierungsstruktur handeln, und liefert die Analyse des vertikalen politischen Wettbewerbs, der dann entsteht, wenn die lokalen Politiker (Gouverneure) nicht nur um ihre Wiederwahl, sondern auch um die Präsidentschaft kämpfen.

Die Themen, die in der vorliegenden Arbeit behandelt werden, sind von höchster Aktualität in *Public Economics* und begründen eine umfangreiche politisch-ökonomische Literatur des fiskalischen Föderalismus. Als Motivation für diese Arbeit dienten umstrittene akademische und politische Debatten über die wachsende wirtschaftliche und politische Integration verschiedener Länder, steigende Mobilität und abnehmendes politisches Engagement der Bevölkerung, sowie die Diskussionen um die vermutlich negative Auswirkung der Globalisierung auf die Größe des Sozialstaates. Weitere Diskussionen um den Aufbau des Föderalismus in der Europäischen Union und die Reformen des Föderalismus in Deutschland haben dieser Arbeit Anregungen gegeben.

Die ökonomischen Theorien des Föderalismus analysieren die Vor- und Nachteile hierarchisch geordneter Staatswesen in Bezug auf die Ziele der Förderung von Wohlfahrt, Freiheit und Gemeinschaftswerten. Zwei Ansätze können dabei unterschieden werden, nämlich die traditionelle *finanzwissenschaftliche Theorie* des

„fiskalischen Föderalismus“ und die *Politische Ökonomie* des Föderalismus, deren Ansatz der vorliegenden Arbeit zugrunde liegt. Die beiden Ansätze unterscheiden sich dadurch, dass in der finanzwissenschaftlichen Literatur - bei gegebenen institutionellen Rahmenbedingungen - die bestmögliche Politik hergeleitet wird, währenddessen in der Politischen Ökonomie die realistischerweise zu erwartende oder gar die schlimmstenfalls mögliche Politik im Zentrum der Analyse steht.

Aus der Sicht der Politischen Ökonomie sprechen zwei Gründe für eine föderalistische Dezentralisierung politischer Entscheidungen. Der erste bezieht sich auf Anreizprobleme (Probleme der Übertragung und Verarbeitung von Information), der zweite auf Probleme der Informationsgewinnung. Man kann dabei zwei Anreizmechanismen unterscheiden: (1) Systemwettbewerb aufgrund von verbesserten Vergleichsmöglichkeiten der Bürger und (2) Systemwettbewerb aufgrund von räumlicher Mobilität. Beide Anreizmechanismen sind geeignet, den Spielraum der Politiker einzuschränken und den politischen Prozess stärker an die Präferenzen der Wähler zu binden.

Demzufolge konzentriert sich der erste Teil der Arbeit auf die räumliche Mobilität und ihre Auswirkung auf das politische Engagement der Wähler und die daraus resultierenden politischen Maßnahmen, lässt aber den Systemwettbewerb außer Sicht. Das Modell bildet die heterogenen politischen Präferenzen ab, die auch mit den unterschiedlichen exogenen Graden der räumlichen Mobilität der Bürger verbunden sind. Das zentrale Resultat dieses Modells besteht darin, dass die Mobilität der Wähler ihre persönlichen Entscheidungen, sich politisch zu engagieren, beeinflusst und dadurch auch die implementierende lokale Politik ändern kann. Es wird gezeigt, dass eine Erhöhung der Wählermobilität die resultierende Politik in die Richtung der von weniger mobilen Bürgern bevorzugten Politik verschieben kann. Dieses Ergebnis ist folglich diametral entgegengesetzt dem sogenannten "Race to the Bottom" Effekt, der bisher die Diskussion der politischen Konsequenzen der räumlichen Mobilität der Bürger dominierte.

Ein zentrales Problem, dem sich der zweite Teil dieser Arbeit zuwendet, ist der Systemwettbewerb zwischen zwei politischen Ebenen in einer Föderation. Das im zweiten Teil entwickelte Modell untersucht den Einfluss der Kompetenzverteilung in einem föderativen System auf das Verhalten eigennützig handelnder politischer Akteure, wobei die Beziehung zwischen Wählern und Politikern als Principal-Agent-Interaktion aufgefasst und spieltheoretisch analysiert wird. Anliegend werden die

Ausmaße der Rentenextraktion der Politiker in der "Föderation" und in der "Konföderation" miteinander verglichen. Das Ergebnis dieses Vergleiches zeigt, dass der Föderalismus eine Institution darstellt, welche die Regierungsappropriation reduziert.