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„Leviathans in local tax competition, and housing markets“

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Diplom-Volkswirt Jürgen Göbel

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(Dr. rer. soc. oec.)

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Abstract

This thesis seeks to contribute to an optimal fiscal constitution. Such a constitution shall follow the task to constrain the power to tax. A government may be given the power to tax to solve the free-rider problem in the provision of local public goods. Constraints are needed, since governments are assumed to follow their own interests. Each government behaves as a 'Leviathan'.

Part I deals with the stipulation of local tax bases into the constitution. We theoretically analyze the properties of four distinct bases, namely: land rent, capital rent, housing sales, and property value. We construct two-stage models in which Leviathans offer local fiscal packages. Each household seeks to maximize its utility from local public goods, housing, and composite private goods. Since the households can use local public goods only where they reside, fiscal choices have an impact on the housing market. Especially, we analyze the reactions of housing firms, households, and housing prices on tax rate changes. As we find out, some reactions depend in quality on a specific condition. In a constitutional approach, we cannot assess the aggregate effect of a tax base. However, we can derive some general and abstract rules on the choice of a tax base. A fiscal constitution might help to protect such rules.

Citizens may react on local fiscal policy by migration. Such reaction changes the demand for housing. In part II, we seek to estimate the impact of local fiscal variables on the housing prices. For our estimates, we can draw from an extensive discussion on the capitalization of property taxes. As it shows, the given task implies several severe methodological problems. This part assesses some of the proposed solutions. Furthermore, it seeks to find an optimal methodology for its own estimates. The estimates will be based on a sample of 234 US-counties in 2002 and 2003. Capitalization effects from property taxes and from other fiscal variables are measured in four steps. As it turns out, property taxes rather raise housing prices. However, the effects tend to be dominated by other determinants, especially income and mobility variables. Out of all local fiscal variables, the total public expenditure shows the highest robustness. - Based on these results, we shall judge how effectively the citizens constrain Leviathans by migration.

In a constitutional approach, a government is considered as a monolithic and self-interested entity, called Leviathan. His self-interest generally consists of maximizing his own fiscal revenue or surplus. Salient theoretical tools for a fiscal constitution were introduced by Brennan and Buchanan (1980). In particular, they maintained that there exists a negative relationship between the degree of fiscal decentralization and the power of the Leviathans.

Based on this hypothesis, some authors contrived empirical tests for the 'real existence' of Leviathans. In part III, we will briefly discuss those tests. It will be argued that their approach is altogether insufficient. Therefore, a new approach will be introduced. This approach claims that a Leviathan's social power can be measured by the relative deviation of his income from the average income in his jurisdiction. His social power depends on the sources of fiscal revenue. To estimate the dependencies, we work with samples of 234 US-counties in 1989/ 1992 and 1999/ 2002. Our main result can be put as follows: Local Leviathans derive more social power from intergovernmental grants than from property taxes or other sources of local public revenue.

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Chapter 1

Introduction

In an anarchic local economy, self-interested agents might fail to organize the provision of local public goods. Typically, each self-interested agent seeks to free-ride. The group as a whole thus faces a social dilemma. One central way to solve such a dilemma is to establish a local government with a particular social power, with the power to tax. - However, a local government may be regarded as just another type of a self-interested agent, called 'Leviathan'. A Leviathan seeks to use his social power in his own interest. The group seems to exchange one social dilemma against another. But, the exchange may be favorable to the group, because the 'new' dilemma can be reduced by constraints on Leviathan's policy.

A central way to constrain Leviathan's policy is to fix rules into a constitution. Thus, the group may search for the best constitutional rules. At the beginning of this search, the key issue is which criteria should be taken for the choice of the rules. What is the meaning of 'best' in this context? - One key methodological criterion is that each agent would agree to the rules. To exclude any strategic disagreement, we may assume that the choice of the rules is made behind a 'veil of ignorance'. None of the agents knows her future position within the group. Furthermore, all decisions must be taken unanimously. The rules must be fixed for the whole life-time of the economy. The constitutional rules will therefore be characterized by a higher degree of generality or abstraction than other social rules.

A constitution can constrain Leviathan's policy on two major fields: a) the assignment of government tasks; b) the citizens' modes of reaction.

a) In our context, Leviathan's main task is to provide local public goods. The constitution should help to guide his own interest to the citizens' needs.

Some rules could, for example, prescribe how the choice of the specific public offering has to be made. In order to finance this offering, Leviathan has got the power to tax. But merely following his own interest, he charges as much as possible. Thus, some rules could specify the modes of taxation, namely in three areas: tax base, tax rate, and tax revenue. - In this study, we are going to focus on the choice of the tax base. The impact of a tax base might in particular depend on the government structure. Hence, it could be another important part of the constitution to define such a structure as a constraint for Leviathan.

b) There are two basic modes in which the citizens can react on Leviathan's policy; namely: 'voice' and 'exit'. Some specification of these two basic modes may be stipulated in the constitution. - By voice, a citizen seeks to change existing (political) rules. Thus, she deliberately takes influence on the respective decision-making process. She may for example: run as a political candidate, vote in an election, publicly comment on the fiscal policy, and so on. - By exit, a citizen seeks to avoid the consequences of existing rules. In a legal manner, she merely has the option to leave the respective rule's domain. If the rule is defined for the group's territory, then she needs to migrate. In our context, the salient example for such a rule is a residence-based tax.

If a citizen reacts on fiscal policy by migration, then she reveals some true, non-strategic information on her preferences. Hence, we could think of migration as the key 'driver' in a mechanism for an efficient allocation of local public goods. However, this mode of reaction has also some impact on the housing markets. Therefore, these markets become a necessary part of the allocation mechanism. Generally, housing markets have extreme features. We will thus ask which functions they may take within this mechanism. For various reasons, it may seem plausible to choose housing as a tax base. We will discuss some possible ways; their pros and cons.

If citizens are free to migrate and able to make a positive (net) contribution to the fiscal budget, then Leviathans from different local groups compete for them. They get incentives to adjust their fiscal policies to the preferences of such citizens. Generally, any aspect of fiscal policy can influence a Leviathan's competitiveness. In this study, however, we assume that Leviathans are only allowed to determine the tax rates. Thus, they might cause citizens to immigrate or emigrate due to a change of the tax rate. In this competitive process, a key role is played by the housing markets. Thus, we will analyze and evaluate this role. What are the pros and cons of local tax competition as a constraint on Leviathans? - A fundamental way to correct for the cons

of local tax competition could be to stipulate a system of intergovernmental grants into the constitution. There are various possibilities to specify such a system. We will search for the best specification. Then, we may ask: Does this system of grants tend to have positive or negative effects on the results from the local tax competition?

Chapter 2

Related Literature

2.1 Models and Ideas

Analytical foundations for a fiscal constitution were laid by Brennan and Buchanan in several publications (1977, 1978, 1979, 1980). The two authors described a theoretical setting which serves to find socially optimal rules for fiscal policy. Each agent is assumed to behave as a 'homo economicus'. The theoretically constructed society passes through two stages: In the first (constitutional) stage, the agents stand behind a so-called 'veil of ignorance'; which means that they do not know their economic position in the second (postconstitutional) stage. The agents have to make abstract predictions about economic interactions in the second stage. While external conditions, as resources or technology for instance, may change, the constitutional rules have to remain the same. The essential question is: What will be the typical patterns of economic interaction between rational agents under different sets of rules? - The sets of rules shall be compared and assessed with regard to two criteria: efficiency and fairness. At the end of the first stage, all the agents have to agree on fixing a certain set into their fiscal constitution.[1]

In order to find optimal rules for their fiscal constitution, the (ignorant) agents must also make predictions about the impact of a government's actions in the postconstitutional stage. Thus, they need a clear conception of what a government consists in. If they considered the government as a heterogeneous network of rational individuals, then the whole constitutional matter would likely become too complicated. For the purpose of a constitu-

[1]Brennan and Buchanan did not specify their setting for a fiscal constitution as narrowly as Buchanan and Tullock (1965) did for a democratic constitution.

tional analysis, it seems to be expedient to make rather rigorous assumptions about the behavior of governments. Thus, Brennan and Buchanan suggested to consider the government as a monolithic entity. They called it 'Leviathan'. In the general form, Leviathan's self-interest is to maximize his own income. But, what is this income derived from? - Brennan and Buchanan worked with two different specifications for Leviathan's objective: a) the tax revenue, b) the tax surplus.[2]

a) Tax revenue may simply be tax rate times tax base. If the tax base does not depend on the amount of local public goods, then Leviathan has no incentive to provide any such good. In a basic model, Brennan and Buchanan (1977, 1980) assumed that the social income and local public goods are not directly related to each other. Nonetheless, Leviathan is allowed to tax income. Only leisure must remain untaxed. As Brennan and Buchanan showed, Leviathan would be able then to transfer nearly all of the social income to his own budget - namely by using a regressive tax rate structure; and the citizens would get nothing in return. Leviathan would choose a regressive rate structure, because it counters the incentives for the citizens to substitute leisure for labor. As the two authors stated, the citizens' loss can be reduced by some constitutional constraints on the tax structure. However, this alone hardly makes the government a worthwile venture for the society.

Brennan and Buchanan proposed to stipulate a certain amount of local public goods into the constitution. Given such an amount, the agents could compare different tax bases or tax rate structures by the excess burden that each would incur. - We may doubt, however, whether this method is adequate for a constitutional approach. In the constitutional stage, the agents would already have to determine all the three tax variables: base, structure, and amount of revenue. To find an optimal combination, they would need full information about resources, technology and demand schedules, as these arise in the postconstitutional stage. But, these conditions plausibly cannot be met behind a 'veil of ignorance'.[3]

[2]To analyze a government as a heterogeneous network of rational individuals remains the task of other fields within public choice theory. At present, a Leviathan model seems to profit most from the theory of bureaucracy and the theory of dictatorship. For an overview, see Mueller (2003), chapters 16 and 18.

[3]The proposed method is very close to the 'theory of optimal taxation' in public finance. Brennan and Buchanan used this method in several examples. These examples indicate two weaknesses of this method (which the authors do admit). First, the assumptions of the model have to be very strict to keep the derivations tractable (two agents only, linear demand curves, and so on). Second, the results are very sensitive to changes in these assumptions.

b) If Leviathan's objective is to maximize his tax surplus, then he will try to minimize the costs for public goods. But, there might be a constraint or a positive relationship between public goods and tax revenue. Thus, his optimal amount of public goods will be greater than zero. Brennan and Buchanan (1978) followed this idea in another model. In this model, the tax base does directly depend on the public good: the two are complements. The proportion of the base which can be collected as tax revenue is assumed to be exogenous. Hence, Leviathan seeks to maximize the tax surplus with respect to the provided amount of public goods. Brennan and Buchanan derived a condition for which the surplus positively depends on the public good. As they stated, this condition will be satisfied under 'normal' parameters. The authors finally interpreted their results as efficiency-arguments for 'earmarking': each government task should be assigned a specified tax instrument. Thus, the fiscal constitution does not only insure a certain amount of tax revenue, but it also generates a positive link between the task and the tax instrument. The stronger the link the better.[4]

In a federal state, fiscal interventions can be assigned to different levels of government. Following the standard theory of public finance, there are three potential fields for fiscal interventions: allocation, distribution, and stabilization. In our context, the provision of public goods principally concerns the field of allocation. To find some optimal rules for this task, we have to keep in mind that public goods might be different in style. In a pure form, they have two essential characteristics: non-excludability, and non-rivalry in consumption. If the benefits from a public good are limited to a rather small geographical region, then we call it 'local'. Major examples are: parks, roads, sewerage systems or fire protection. In a strict sense, pure public goods do not really exist, namely for two reasons: First, excludability is always a matter of costs. Sure, the costs may be prohibitively high. Second, in a world of limited resources, every consumption causes external effects. These effects can be described by different functional forms, which will normally be monotonically increasing. But, individuals use to perceive crowding or congestion, only after some point. Therefore, the optimal style of a certain public good depends on specific circumstances. This should be taken into consideration on the search for an optimal fiscal constitution.

The optimal federal structure is also determined by the specific styles of the public goods, demanded by the citizens. Following this insight, Olson (1969) sought to set up general norms for such an optimum. As a central

[4] As Brennan and Buchanan showed, the probability that the tax surplus and the public good are positively correlated increases with the number of complementary tax bases.

norm, he developed the principle of 'fiscal equivalence': According to this principle, for each public good, there should be a match between those who benefit and those who pay. This could mean that each public good must be provided by an own, separate government that rules over all specific users. We thus could come to an extremely complicated structure of overlapping jurisdictions. The boundaries of each jurisdiction are determined by the number of users and the per capita production cost for the public good. Consequently, there will be no external effects between jurisdictions in such a government structure. But, as Olson emphasized, a serious problem arises when a jurisdiction contains all specific users and has increasing per capita production costs. Then, a reduction of the jurisdiction's size would overall increase efficiency, although it causes externalities, spillovers. Olson proposed to solve this problem with the help of rules for internalization. Hence, each jurisdiction produces at the minimum of per capita production costs. Spillovers have to be compensated by government grants. In order to implement the payment of these grants, a higher government unit might be needed.[5]

Brennan and Buchanan (1980) claimed that the principle of fiscal equivalence acquires little normative strength, if we take governments as self-interested rather than benevolent. As the authors explained, the principle only specifies a lower bound on the size of a jurisdiction: which is the size of optimal production costs. However, there seems to be no reason why the power to decide on the provision of a local public good should not be transfered to a higher government level. This public good still could be administered on the local level. Thus, the principle of fiscal equivalence does not specify any upper (!) bound on the size of a higher level jurisdiction. It seems to be fully compatible with a centralized federal structure. A centralized structure might even have the advantage that grants incur less transaction costs. Anyway, this principle hardly seems to leave any room for competition among jurisdictions.[6]

Tiebout (1956) asserted that competition among jurisdictions could lead to efficiency in the provision of local public goods. He assigned the leadership of each jurisdiction to a 'city manager'. Each city manager seeks to maximize

[5]To derive his main results, Olson made the assumption that there is no 'complementarity' in the production of the public goods. But, he also admitted that the problem becomes much more complicated, if this assumption does not hold. Government grants might not be an appropriate solution, anymore.

[6]The essence of the argument could be put as follows: If the government is benevolent, then there is no reason to share its power. In the standard theory of public finance, federalism in a strict sense must be counterproductive.

the profits of his jurisdiction by offering a special, fixed package of public goods. The citizens in the whole economy have heterogeneous preferences. Each of them can choose the package that best fits her individual preferences by moving to the corresponding jurisdiction. A package is also characterized by a specific cost function. The city manager tries to minimize the costs per user or resident. According to the actual number of residents, he will promote entry or exit. He charges every resident the same contribution. The competition between the city managers puts their profits under pressure and allows citizens to divide into more homogeneous groups of local public goods consumers. The intensity of competition mainly depends on: the diversity of jurisdictions, the technological properties of the public goods, and the costs of mobility.[7]

Competition among jurisdictions may take over two important functions: First, it serves as a mechanism for revealing preferences. In that sense, if a citizen moves from one jurisdiction to another where merely the package of local public goods and taxes is different, then she reveals that she prefers this offer. This is the function which Tiebout focused on. Second, competition among jurisdictions serves as a device to discipline self-interested governments. If a government offers a comparatively bad fiscal package, then a citizens can sanctionize this by her exit option. This is the function that Brennan and Buchanan (1980) focused on. They asked: Can competition among Leviathans be a substitute for explicit constitutional constraints? - The answer surely depends on the competition's intensity. The intensity itself may depend on some constitutional rules. On the one hand, they can influence the costs for the citizens to exit, and on the other hand, they can influence the costs for the Leviathans to collude. As Brennan and Buchanan supposed, the rules for the federal structure might be the key factors. Hence, they put forward the following hypothesis: Leviathans abuse their power to tax - ceteris paribus - less, the more decentralized are the fiscal decisions, and the more homogeneous are the separate jurisdictions.

Buchanan and Goetz (1972) examined the competition between jurisdictions for its efficiency limits. They based their assessment on a highly favorable setting. This means, in particular, that the problems of spillovers and the problems of discreteness were neglected. The authors showed that even in such a setting inherent inefficiencies remain in the competitive process. The main reason for these inefficiencies were found in the 'fact of location'. The

[7]Tiebout himself did not make clear what 'his' jurisdictions distinct from private clubs. He neither described the city managers as monopolists for land, nor he interpreted the contributions as (head) taxes.

authors stressed that Tiebout had deliberately avoided to deal with this fact. Thus, his analytical object should rather be seen as an adjustment process in a non-spatial world of voluntary clubs. In such a world, there seems to be nothing that prevents the citizens from optimizing both separately: the value of private goods and the value of public goods. But, in a spatial world, a move from one jurisdiction to another affects total benefits and average costs in both jurisdictions. The users of local public goods can generate crowding effects. If the crowding pushes the marginal costs of public goods above the average costs, then fiscal external effects are generated. Without full compensation, the total allocation becomes less efficient.[8]

Hamilton (1975) asserted that it was possible to install a system of prices for local public goods into a spatial world; which would lead the competition between jurisdictions to Pareto optimal outcomes. Brennan and Goetz had failed to consider such a system of prices. Hamilton therefore assessed their point of critique as being rather empirical. Even in their own model, the outcomes can be Pareto optimal, if the empirical conditions are favorable. We could argue that the per unit cost curve for a local public good is typically U-shaped - due to a combined effect from publicness and from crowding. Hence: when there are only few users, the marginal cost is close to zero, while the average cost is high. When the number of users increases, the average cost falls and the marginal cost rises. As crowding becomes more extensive, the marginal cost may rise above the average cost. Thus, if the cost structure satisfies some special conditions, then a Pareto optimum may be reached where the marginal cost equals the average cost in each jurisdiction.[9]

Not to depend on empirical cost conditions, Hamilton suggested to make use of a special price system for local public goods. His model adds two components to the basic Tiebout model. As a first, the local governments generate revenues solely with a proportional property tax. As a second, each government practices zoning policy, or more precisely, it dictates a minimum of housing consumption. Hamilton described the local adjustment process as follows: If a citizen lives in a jurisdiction where the dictated minimum housing consumption is lower than her personal optimum, then she will move to another one where the minimum is higher. The reason is that the average tax base in this other jurisdiction will be broader. Consequently, the corresponding local government gets the option to increase its provision of local public goods or to decrease its property tax rate. In general, a government

[8] A non-spatial world may exist under two key assumptions: first, there are no mobility costs; second, all personal incomes are from dividends.

[9] Here, Hamilton bases his reasoning on McGuire (1972).

will adjust its fiscal policy until its total capitalization becomes zero. At the end of the adjustment process, Hamilton's spatial economy obtains the following features:

- each jurisdiction is internally homogeneous;
- the property tax acts as an efficient price for local public goods;
- local governments do not engage in income redistribution;
- the consumption structure is Pareto efficient.

In Hamilton's model, the efficiency of competition among jurisdictions hinges on the zoning policy. Zoning policy transforms the property tax into a head tax, which is a user charge in this case. Due to the minimum housing requirement, citizens cannot choose a package of local public goods without paying their full share of the costs. Hence, the property tax does not generate any distortion in the public policy. In each jurisdiction, the marginal cost of the local public goods equals their average cost.

In an extension of his basic model, Hamilton (1976) showed that his efficiency result also holds, when jurisdictions are not homogeneous with respect to the housing values. His main additional assumption is that the heterogeneous jurisdictions are fully developed. Then, the residents still cannot vary their housing consumption in response to a change of the property tax. If a disequilibrium arises, then home owners will have to offer housing for a new price that compensates for the 'fiscal differential' (which is the present value of all future tax payments net of the respective benefits). Thus, fiscal policy is perfectly capitalized; which turns the property tax into a benefit tax.[10]

Given that the efficiency of competition among jurisdictions depends on the zoning policy and the development degree of the housing stock, it seems consistent to check whether the task of housing development should be uniquely assigned to the local government. A very instructive analysis for this was made by Sonstelie and Portney (1978). They constructed a model in which each local government has a monopoly on housing production. Based on the monopoly, each government seeks to maximize its profits. It decides on the local amount of housing and the local package of public goods. Housing stocks will be fixed in the short run, but not in the long run. The citizens are free to move. They try to maximize their individual utility, which depends

[10]Perfect capitalization within one jurisdiction also implies that the smaller a housing unit is, the higher is its capitalization rate.

on their consumption of housing, private goods, and local public goods. Sonstelie and Portney came to the conclusion that competition between profit maximizing governments leads to socially optimal amounts of local public goods and socially optimal sizes of jurisdicitons - in the short as well as in the long run. Governments behave equivalently to property value maximizers. But, as Epple and Zelenitz (1984) showed, the proof for this result, given by Sonstelie and Portney, is not correct. Therefore, it seems that the necessary conditions for an efficient allocation are more specific than Sonstelie and Portney suggested. Anyway, in an extension of their basic model, the two authors did not consider governments as dictators anymore, but as enforcers of collective choices. Here, residents are allowed to vote on the amount of local public goods and on the property tax rate. As it turns out, the total allocation will not be efficient under these new assumptions - neither in the short, nor in the long run. Zoning measures can lead to an optimum in the provision of local public goods, but not in the housing stocks.[11]

Zoning measures specify which types of structures and activities are admissible on a certain parcel of land. The purpose of these measures is primarily to correct for both: fiscal and non-fiscal externalities. Next, we may ask who should be in charge of the allocation of land itself.

Epple and Zelenitz (1981) took the allocation of land as exogenous. Jurisdictions have fixed boundaries, possibly fixed by an overall constitution. In their basic model, each government tries to maximize its profits by choosing its local public goods and its property tax rate. Housing is offered by private, competitive firms. The citizens can costlessly move between jurisdictions. The authors assumed that the citizens have identical incomes and preference structures. Therefore, competition forces each jurisdiction to offer the same utility level. Moreover, to reach an overall equilibrium, every housing market must clear and every citizen must be housed (in exactly one jurisdiction). Epple and Zelenitz derived the comparative statics for such an equilibrium. This showed the following: If a government raises its property tax rate, then local residents exit, the net price of housing falls. If a government raises its supply of public goods, then other citizens enter; except that the increase in housing demand, which is due to the increase in local residents, offsets the decrease of the housing demand, which is due to the price increase. In a next step, Epple and Zelenitz assumed that each government seeks to maximize its budget surplus. The authors found out that such a Leviathan is able to misuse some part of the tax revenue for his own purposes,

[11] The essential problem with collective choices in this context is that they tend to incur unequal distributions of profits (housing owners versus renters).

although the residents can costlessly move. The main reason is that land is fixed. Thus, Leviathan can usurp the part of the land rent that stems from the elasticity of the housing supply. Epple and Zelenitz showed the follwing: The higher the number of jurisdictions in the economy is, the lower will be the misuse of tax revenue. But, it never can be zero. Hence, competition among jurisdictions is, by itself, not sufficient to ensure an efficient provision of local public goods.[12]

Henderson (1985) advised not to treat the allocation of land exogenously, when analyzing the provision of local public goods. He showed that interjurisdictional land markets can promote efficiency in the total economy. One necessary condition for the promotion, however, is that land developers play an active role on the market. Sure, the total outcome may depend on the fiscal policy, as well. Henderson examined how entrepreneurial landowners interact with three different types of policy makers: a) the club; b) the benevolent dictator; c) Leviathan. To simplify his model, the author made four assumptions (which are similar to those made by Epple and Zelenitz (1981)):

1. non-land income, non-housing production, and the cost of capital are exogenous;
2. citizens have idential incomes and preference structures;
3. local public goods are financed solely by a property tax, which may distort housing decisions;
4. local public goods are essentially collectively provided private goods.

Henderson derived the conditions for an intrajurisdictional equilibrium with respect to each type of policy maker: He found out that such an equilibrium is efficient and robust, when the fiscal policy is made by a club. When the fiscal policy is made by a benevolent dictator, the equilibrium is efficient, too, but very sensitive to external influences, as to migration for instance. Leviathan will misuse some tax revenue in the respective equilibrium. - In a next step, Henderson examined under which circumstances these outcomes can be consistent with a long-run, interjurisdictional equilibrium. He found out that the intrajurisdictional equilibrium is consistent in the case of clubs. Then, the landowners can always convert their land to the use that offers the highest rent. The land market will thereby clear at a uniform price across all

[12] As Epple and Zelenitz emphasized, the essential feature of the model is that jurisdictional boundaries are fixed. By contrast, the governments' strategies or objectives take little influence on the equilibrium results.

jurisdictions. In the case of benevolent dictators, the consistency hinges on the income distribution and the openness of the land market. In an economy where the income distribution is highly unequal and the land markets are closed, the migration of citizens is generally not sufficient to equalize land prices across jurisdictions. The economy may head toward a wide range of inefficient equilibria. Finally, in the Leviathan case, tax revenue is misused as long as the local land markets are closed. Otherwise, landowners will not develop their land under a fiscal policy that exploits them.[13]

The idea that interjurisdictional land markets promote the efficiency of local fiscal policy contradicts the classical theory of taxation. This theory recommends to take those tax bases which show less reaction on tax rate changes. Since land appears as extremely inelastic in supply, it is judged as a most preferable tax base. Furthermore, even if interjurisdictional markets for land threatened to raise the elasticity, governments could close these markets, easily. Hoyt (1991), however, found some reason why governments might rather tax property. The main assumption of his model is that public goods are congestible. Hence, a tax should not only ensure a certain amount of public revenues with the smallest amount of distortions, but also regulate the use of the public goods. It seems obvious that congestability strengthens the influence of the relative size of a jurisdiction on the efficiency of a tax. - Hoyt made two further crucial assumptions: first, land areas are fixed; second, governments seek to maximize their residents' welfare.[14] He examined two cases:

a) If each jurisdiction has just a small share of the total population in the economy, then a change in its fiscal policy does not affect prices in other jurisdictions. But internally, a change in its property tax rate affects the net price of housing and the gross rent of land. Residents adapt their demand for housing, and housing producers adapt the land intensity of housing. These responses engender entries or exits. - In contrast, a change in the land tax neither affects the gross price of housing, nor the net rent of land. Migration will not take place. Hence, in the given setting, the capitalization rate of the

[13]Henderson tried to support his assumption that land markets can be flexible even in the short-run with some data about the development of communities in the U.S.A. from 1910 to 1970.

[14]The Henry George theorem states that the land tax is neutral and thus should be the only tax in practice. - Berglas and Pines (1981) showed that this theorem may hold in an economy with congestion-prone public goods, if three conditions are satisfied: first, the total population can be divided into optimal consumption groups; second, a price system supports the optimal division; third, land rents equal public expenditure minus marginal congestion cost.

property tax is -1, and the one of the land tax is 0. From this results that each government will fully finance its local public goods by a property tax.

b) In the case where each jurisdiction has a large share of the total population, a change in its fiscal policy does affect the housing prices in other jurisdictions. Now, the governments behave strategically. Thus, welfare maximization is not equivalent to land rent maximization, anymore. Internally, a change in the property tax affects both the housing price and the land rent. Capitalization of property taxes into the housing prices becomes incomplete, because migration follows distorted prices. A change of a property tax rate generates two conflicting effects: on the one hand, a positive response of housing costs per resident, and on the other hand, a negative response of the costs of local public goods per resident. From this, three things can directly be concluded: Firstly, for each jurisdiction, it is optimal to finance at least a fraction of its public expenditures by a property tax. Secondly, the size of the fraction increases with the number of jurisdictions in the economy. Lastly, the property tax may serve as a head tax, which causes, however, distortions on the housing market, if migration shall not lead to fiscal budget imbalances.

Henderson (1995) examined whether homeowners would vote for property taxes to finance local public goods. In his model, the number of homeowners in each jurisdiction is endogenously determined. Ex post, this number corresponds to the set of voter-residents. The homeowners anticipate the capitalization effect of their vote. Following the standard urban economic approach, residents own equal shares of the land in their jurisdiction. From this ownership, they derive their claim on equal shares of the jurisdiction's profit. Henderson removed the Arrow-Debreu separation between shareholder decisions and consumer decisions from his model. Homeowners decide simultaneously on housing, other private goods, public goods, and public revenue instruments. Henderson showed that in an equilibrium among imperfectly competitive jurisdictions, the homeowners will vote for an efficient level of local public goods and a financing with land taxes or lump-sum taxes. The property tax rate will be zero. As he could prove, this result holds for any public good technology. It holds for the case of congestion, given that jurisdictions have the same sizes and external effects are the same acoss all jurisdictions. - The author also analyzed the case in which shareholding is ex ante fixed. Then, owners will vote for a combination of land and property taxes, if those are the only offered instruments. Actually, they would prefer head taxes or user charges, which in addition bypasses the tax incidence

problem.[15]

In the classical view on tax incidence, the burden of a property tax is borne by the local housing consumers. This view bases on a partial equilibrium analysis in which the return on capital is taken as fixed, as the relative size of a jurisdiction is small and capital can costlessly move - at least in the long run. If a local government increases its property tax rate, then the capital portion of the increase is fully shifted forward to the housing price. Hence, the property tax distorts the housing market. - In a second view, the benefit view, the property tax is a charge on the users of local public goods. Every citizen chooses the residential location which offers the best fiscal package to her. If the fiscal package changes, then citizens will costlessly move. Thus, a change of the property tax capitalizes into the housing prices. To avoid that migration distorts housing prices, local governments must stipulate specific rules for housing development - in special zoning ordinances. - In a third view, the capital tax view, the property tax distorts the local use of capital; it causes misallocations of a fixed total capital stock across jurisdictions. This third view is based on a general equilibrium model which takes local fiscal packages as given. In general, capital moves from higher tax to lower tax jurisdictions. Hence, it decreases profits in the first and increases profits in the latter. However, the increase will not fully offset the decrease. The move of capital also affects housing prices, commodity prices, wages, and land rents in the involved jurisdictions. These changes will, in contrast, be largely offsetting. Hence, the property tax burden is primarily borne by the capital owners.[16]

Zodrow (2001) regarded the capital tax view on the incidence of property taxes as the most powerful out of the three. He justified his judgement roughly as follows: On the one side, the classical view treats capital, commodity prices, and wages as exogenous. This view focuses on the responses of housing prices on fiscal policy or on the effects of migration. The elasticity of land supply and the rate of substitution in the consumption of housing and other private goods mainly determine the extent of distortions from the property taxes. The lower the costs of migration are, the more the tax burden shifts from consumers to local land owners. Altogether, the classical view can be regarded as a special case of the capital tax view. - On the other side, the capital tax view allows for a deeper analysis of the production sector than the benefit view does. From the first view, we might, for instance,

[15]Henderson's land tax is a 'value' and not an 'amount' tax.

[16]For a more extensive analysis of the property tax incidence, see: Zodrow and Mieszkowski (1983), Mieszkowski and Zodrow (1989).

draw the conclusion that the burden of the property tax is borne by the local production factors. Such an effect occurs, if a tax-induced outflow of capital causes the returns of less mobile factors in the respective jurisdiction to fall. Furthermore, the relationship between property taxation and income distribution becomes more transparent in the capital tax view.[17]

As Hoyt (1999) pointed out, the distribution of a property tax burden highly depends on the jurisdiction's relative size. In Hoyt's model, the economy consists of a large metropolitan area - with a fixed number of cities and a fixed number of citizens. Since the cities differ in land sizes, the model also allows for different population sizes. Citizens and capital can costlessly move across the cities. Each city is governed by a Leviathan. He decides on the property tax rate and on the amount of local public goods. While Leviathan tries to maximize his very own benefit, he is constrained by both 'exit' and 'voice'. Since the citizens have identical incomes and tastes, the key equilibrium condition for the metropolis is: Every citizen reaches the same utility level. From the total equilibrium conditions, Hoyt derived the following comparative static result: The higher a city's relative population is, the lower will be the degree to which its fiscal variables are capitalized into housing prices. Hoyt examined how this result influences the political process. To do this, he specified Leviathan's objective by a function in which the expected fiscal surplus during his time in office depends on the property tax rate, the local public goods, and the political effort by the residents. A resident chooses her amount of effort such that the net land rent minus the cost of effort becomes maximal. The net land rent is positively related to the internal capitalization rate. Thus, a citizen will invest the more in political effort, the lower the relative size of her city is. Or, a Leviathan will misuse the more property tax revenue, the larger the relative size of his jurisdiction is.[18]

As Caplan (2001) stated, land owners cannot effectively evade a property tax by moving. As a consequence, exit would not be an effective constraint for a Leviathan. Caplan contrived a model in which the total supply of land, the number of jurisdictions, the jurisdictional boundaries, and the price of capital are fixed. The production of housing is described by a Leontief function with constant factor proportions. Citizens and capital can costlessly move. Hence,

[17]Zodrow believed that the explanatory power of the three views can hardly be compared, empirically, although they might lead to diverging forecasts. Diverging forecasts could arise due to many reasons, as for instance: Tiebout sorting, supply elasticities of public goods, zoning effects, fiscal budgets, capital intensities, or capitalization effects.

[18]With his model, Hoyt offers an alternative explanation for the hypothesis by Brennan and Buchanan (1980) about tax misuse and the government structure.

the capitalization rate of property taxes into housing values is -1. There exists a number of citizen types which differ in their tastes for public goods. This number equals, by assumption, the number of jurisdictions. In each jurisdiction, exactly two political parties compete for political power. Each party is characterized by an own utility function. Based on this function, it offers a platform that consists of a fiscal package. One party comes into office, if it reaches a majority of votes in an election. The total economy will be in equilibrium under three conditions:

1. no citizen wants to move to another jurisdiction;
2. no citizen wants to vote for another party;
3. no party wants to change its platform.

The game is played as follows: At first, the citizens sort themselves into groups of the same taste for local public goods. Then, they receive equal shares of the land in the respective jurisdiction. After that, the political parties present their platforms. Although both parties could have platforms that include excessive property taxation, the citizens will not relocate. This is because the tax burden will be totally capitalized into the housing value. If a citizen moved to another jurisdiction, then she would pay the initial tax in the form of a lower sales price for her housing. Caplan concluded that 'exit' is not an effective constraint for a Leviathan. Thus, we rather should continue our search for effective constraints on the 'voice' field.[19]

Wilson and Gordon (2003) set up a model in which residents control the property tax rate and Leviathan's salary via referendum. A Leviathan controls the provision of local public goods. But, he is 'naturally' inclined to use the tax revenue for his personal consumption. The two authors assumed that the citizens have identical tastes and that the total housing stock is exogenously determined. They first analyzed the situation in an economy where residents are immobile. In the first stage, the residents in each jurisdiction choose their optimal tax rate and the optimal expenditure for Leviathan's salary, taking his incentives to use tax revenue for his personal consumption into account. The optimal salary is such that a marginal change does not affect the amount of public goods, anymore. The marginal change simply crowds out tax waste. In the second stage, the Leviathan determines the amount of public goods by maximizing his expected utility. This expectation depends on the probability that he loses his position by election. In such

[19]The capitalization rate of -1 is implied by the Leontief production function.

an election, the residents base their decisions on a comparison between the utility level in the own jurisdiction and a benchmark level. Thus, Leviathan can decrease the probability of being dismissed by decreasing his misuse of tax revenue. In the third stage, the residents decide on how to spend their net incomes. The housing price will adapt to these decisions. As Wilson and Gordon proved, the equilibrium amount of public goods will be below a first-best level. - Next, the two authors analyzed the situation in an open economy. Citizens will move to the jurisdiction that offers the highest utility level to them. An increase of residents in one jurisdiction increases the tax base, there. But, it also may incur congestion. Hence, each Leviathan practices zoning policy. The open economy will be in equilibrium, when the utility level in each jurisdiction is the same. As Wilson and Gordon found out, this level will be higher than the ones in the economy without residential mobility. Nonetheless, it cannot be determined whether the supply of public goods will be higher or lower.[20]

The discussed literature is summarized in the tables 2.1 to 2.4.

2.2 Lessons

In the related literature, we can find at least six different government objective variables: fiscal revenue, fiscal surplus, own utility, votes, profit, and welfare. The given objective variable is one major characteristic of a government type. Another major characteristic is whether the government behaves as a monolithic entity or as a heterogeneous network of individual agents. Thus, we may describe a Leviathan as a monolithic entity which uses its governmental power to maximize its fiscal revenue, its fiscal surplus, or its own utility - given certain constraints. Such constraints can be found in the field of revenue instruments, expenditure measures, citizens' responses (voice, exit), or market imperfections (incomplete knowledge, transaction costs, time lags, etc.). The respective effects of various constraints can be analyzed in a constitutional approach. Such an approach adopts a long-run perspective and checks for the possibilities to impose or change a constraint with unanimous agreement (behind a 'veil of ignorance').[21]

[20]This model supports fiscal decentralization, even if zoning is not possible.

[21]The government objective might also be related to property values. Brueckner (1983) constructed a model in which each local government chooses its packages of public goods to maximize the aggregate property value in their community. As a result, all communities will be internally Pareto efficient in the equilibrium. - There may be many reasons to choose a certain objective for a particular model. Let us just mention four of them:

publication	*government objective*	*public revenue*	*public expenditure*	*housing market*
Tiebout (1956)	profit	equal contributions	specific package of local public goods	none
Hamilton (1975)	profit	property tax	specific package of local public goods	zoning policy
Brennan and Buchanan (1977)	fiscal revenue	income tax; lump-sum tax	fixed proportion of revenue	none
Sonstelie and Portney (1978)	profit	sales of housing; property tax	single quality public services	local public monopolies; stock: fixed in short-run
Brennan and Buchanan (1979)	fiscal surplus	excise tax	proportion of revenue	none
Epple and Zelenitz (1981)	fiscal surplus	property tax	publicly provided private good	supply: firms in competition; demand ← collective good and gross housing price

Table 2.1: Discussed literature: summary I-A

publication	*equilibrium*	*allocation*	*distribution*	*recommendation*
Tiebout (1956)	no migration	local public goods: efficient	benefit principle	reduce costs of mobility
Hamilton (1975)	capitalization rate equals zero	local public goods: efficient	benefit principle	property tax plus zoning as a price system
Brennan and Buchanan (1977)	tax rate follows price elasticity of income	excess burden	regressive	fiscal constitution: restrict tax base, progressive tax rate structure
Sonstelie and Portney (1978)	short-run: private consumption, public goods; long-run: plus housing stock	short-run: efficient; long-run: efficient	in favor of smaller houses	compensate due to growth restriction; benefit taxation
Brennan and Buchanan (1979)	depends on tax limitation	welfare loss	regressive	fiscal constituion: restrict tax base, consider other tax limitations
Epple and Zelenitz (1981)	each citizen: maximal utility and exactly one dwelling	independence of government type	Leviathans exploit citizens ← elasticity of housing supply	raise number of jurisdictions

Table 2.2: Discussed literature: summary I-B

publication	*government objective*	*public revenue*	*public expenditure*	*housing market*
Henderson (1985)	profit, welfare, or fiscal surplus	property tax	publicly provided private good	land: endogenous; active land developers
Hoyt (1991)	welfare	land tax, property tax	publicly provided private good	coordination: gross land rent and gross housing price
Henderson (1995)	profit and votes	property tax versus other fiscal revenue instruments	publicly provided private good	housing production function
Hoyt (1999)	expected aggregate fiscal surplus in office	property tax	publicly provided private good	coordination: land per unit of housing
Wilson and Gordon (2003)	expected own utility	property tax	local public good; official's salary	housing value generates income; zoning in open economy

Table 2.3: Discussed literature: summary I-C

publication	*equilibrium*	*allocation*	*distribution*	*recommendation*
Henderson (1985)	intra- and intercommunity: consistency?	government type, land market, income distribution	extra income for Leviathan	raise flexibility of land markets
Hoyt (1991)	no profits on housing market; equal utility; all land is used; balanced fiscal budget	property tax: congestion fee	mix: land tax and property tax ← relative size of jurisdiction	tax capital to internalize fiscal externalities
Henderson (1995)	capital costs; rental price for housing	'Samuelson condition'	from outside shareholders to inside homeowners	rather use no property tax
Hoyt (1999)	equal utility; sum of cities' populations	fiscal policy and voter's effort	voter's effort is higher in smaller cities	decentralize
Wilson and Gordon (2003)	fiscal budget constraint; no migration	underprovision of public goods	private income, official's salary or 'perks'	open borders; decentralize

Table 2.4: Discussed literature: summary I-D

A central way to constrain government power is to predetermine rules on the allowable fiscal policy. Rules on this policy can be related to three fields: a) the base, b) the rate structure, and c) the amount of revenue. How effective a rule is, depends on the government level. The conditions that a certain rule encounters on a local level may differ from those on a central level. Some major distinctive conditions are related to the Tiebout mechanism. This mechanism itself tends to work more effectively on a local level. Due to that, any rule on the fiscal policy may be affected. a) The amount of revenue that a tax instrument generates negatively depends on the related elasticity. Normally, such elasticities are (in absolute value) higher on a local level; the instruments will affect the market outcomes more strongly. Thus, it seems to be advisable to allow only intrinsically inelastic public revenue bases on a local level. b) A rate structure can be designed in a way to follow certain redistributive purposes. The Tiebout mechanism, however, works counter to governmental redistribution. Citizens who are supposed to pay comparatively high rates might exit. In a Tiebout world, citizens segregate into more homogeneous groups. Therefore, the scope for redistribution is smaller on a local level. It seems to be advisable here to prescribe rather 'neutral' rate structures. c) To limit the absolute amount of public revenue seems not to be advisable in the long-run. Principally, the amount of public revenue should be oriented towards the preferences of the citizens and the technology of the public goods. Unfortunately, the development of these two factors can hardly be predicted. - In the related literature, the local public policy is usually predetermined as follows: a) the base is land (rent), property value, housing sales, or 'heads'; b) the rate structure is flat; c) the fiscal budget must be balanced.[22]

In a constitutional approach, the power of a local government can be justified by its task to provide local public goods. Generally, we denote a public good as local, if individuals that live outside the region can be excluded from its use without specific costs. The local public good is pure, if there is

1) research interest, 2) research context, 3) model consistency, 4) empirical relevance. - Brennan/ Buchanan (1983) asserted that for a model of institutional comparison, a Leviathan objective is more appropriate than others. In essence, they gave the following two reasons: 1) A Leviathan objective fits well the paradigma of a homo economicus. A model of the total economy can thus become more consistent. 2) In an evolutionary perspective, a Leviathan normally dominates other types of government. But, even if this was not so clear, the citizens should take this as an assumption for their constitutional rules. This norm is derived from a precautionary principle.

[22] An 'unusual' way was followed by Bucovetsky and Wilson (1991). They built up a model of local competition with a wage tax and a capital tax. The capital tax can either be source-based or residence-based.

no rivalry in its use, inside this region. However, in the related literature, it is often assumed that there is total rivalry in the use of local public goods. The total cost of such a good is proportional to the number of its users. By this assumption, the good remains private in its character. Thus, we might better speak of a publicly provided private good. But then the question arises: What justifies the power of a government in that case? There seems to be no problem to finance these goods by user charges. Publicly provided private goods could be perfectly allocated by the Tiebout mechanism. However, as Buchanan and Goetz (1972) stressed, Tiebout had failed to consider the fact of location. Due to this fact, publicly provided private goods may generate technological externalities; which might distort market outcomes.[23]

Typically, local public goods are prone to crowding or congestion, because they are connected with a fixed parcel of land. The allocation of land in the production of local public goods becomes a crucial determinant for their use. Other crucial determinants stem from the housing market. We assume that only those agents can use a certain local public good who live in the region of this good. Next, dwellings are also connected with a fixed parcel of land. Both, dwellings and local public goods, are durable. Therefore, land markets, housing markets, and local public goods are typically highly interrelated. Particularly strong externalities may occur between the three. Altogether, free market prices may fail to coordinate the relevant individual decisions in an optimal way. Government intervention seems to be necessary. - One special way of intervention is zoning. Zoning measures specify what decisions someone is allowed to take on a given parcel of land. Some measures, for example, consist of prescribing the size and the form of the land area or of the housing structure. Hamilton (1975) supported such measures in particular. Other ways of intervention are based on the establishment of the local government as housing monopolist. This local monopolist seeks to offer a combination of housing stock, local public goods and taxes which maximizes his profits. Such a setting was analyzed in particular by Sonstelie and Portney (1978). - One rationale behind such interventions could be to strengthen the capitalization of fiscal policy into the housing values. Capitalization is supposed to make a local economy work more efficiently. The degree to which

[23]If the government is benevolent, then all administration costs can be assigned to the costs for public goods. If the government is self-interested, then some administration costs might be additional, as in Wilson and Gordon (2003). - To construct a local public good as a publicly provided private good, helps to keep a model tractable; this is especially important, if the government chooses both: the amount of public goods and the tax rate. - In a Tiebout model which is extended by a perfect market for land, the allocation of land to communities would presumably follow the principle of 'fiscal equivalence'.

this is the case depends on the government's objective function.[24]

Housing markets stabilize the local economy, if the housing prices reflect the total benefit which the respective housing offers. One particular benefit is derived from the respective package of local public goods. Differences in the local packages may citizens cause to move. Thus, the local packages directly influence the demand for housing. How strongly the housing prices adapt, depends on the elasticity of housing supply. The central condition for an equilibrium in the local economy is that each housing market clears. From this, most other conditions can be derived. In sum, we get:

- each citizen lives in one and only one community;
- each community has a positive number of residents;
- no citizen wants to move;
- each citizen gets her optimal consumption bundle;
- there are no profits on the housing market;
- the land market clears;
- the political market clears.

Depending on the model framework, the equilibrium conditions can be more specific. A widely spread assumption in the related literature is, for example, that each citizen gets the same income. In this case, the economy only reaches an equilibrium, if each citizen gets the same maximum utility in each community. In models which include factor markets, we can often find the condition that the price of a factor must be equal to the value of its marginal product. Land, however, is normally a constant factor. Its price therefore becomes a residual value. Finally, the political market usually is characterized by some kind of asymmetry (in power, information, endowment, and

[24]The property tax has also been regarded as a congestion fee which, however, distorts the housing markets. Explanations were given by Hoyt (1991) and Krelove (1993). - Wilson (1997) found a rule which determines the optimum amount of a congestible local public good without property taxation. - The degree of capitalization is determined by: the elasticity of housing demand and the elasticity of housing supply. Generally, the higher (lower) the elasticitiy of demand (supply) is, the higher the degree of capitalization. The two elasticities do not only depend on material facts about the various characteristics of the housing market, but also on respective expectations. Glaeser (1996) analyzed the effects of expectations about future amenity levels.

so on). Such asymmetries tend to generate net losses. Hence, the political market rather destabilizes the total economy.[25]

In the classical theory, the provision of public goods is optimal, if it corresponds to the 'Samuelson rule'. This rule says that the sum of the marginal rates of substitution over all users must equal the marginal rate of transformation between a private and the public good. Basically, the Samuelson rule also applies to congestible local public goods. In this case, however, some potential users have to be excluded. The cost of exclusion does not change the character of the optimum, by itself. But, the type of implementation may distort the total allocation. For a local economy, it seems hardly realistic that each community is able to determine its optimal number of residents, as it is described by the Samuelson rule. Hence, Tiebout (1956) proposed that the citizens decide about the allocation by 'voting with their feet'. But, as Buchanan and Goetz (1972) stressed, Tiebout had neglected the 'fact of location'. In a next step, Hamilton (1975) suggested to extend the Tiebout framework by a property tax and zoning policy. The essential idea is that the zoning policy transforms the property tax into a head tax, then. The amount of local public goods could be optimal. This policy, however, distorts the housing market, which moves the economy away from its total optimum. If it is impossible to finance a local public good by equal contributions, then the alternative revenue instrument will distort the allocation. In the theory of optimal taxation, the extent of the distortion is measured by the 'excess burden'. However, his kind of measurement claims a high degree of knowledge from the social planner. If the social planner is actually self-interested, then he will seek to change the allocation to his own advantage. Constraints on his actions are needed to reduce welfare losses.[26]

In a market economy, distribution primarily arises as a side effect of allocation. Thus, any government intervention influences both, allocation and distribution. However, this does not prevent a government from putting a strong emphasis on one of the two. In a constitutional approach, the citizens try to become aware of the general connections between allocation and distribution. Behind the veil of ignorance, they may be able to reach a

[25]In a local context, it seems well justified to assume that incomes are equal. It excludes some distributional issues from the analysis of a government level where redistribution is rather badly assigned. - A careful and consistent derivation of the conditions for equilibria in a local economy was delivered by Westhoff (1977). Epple, Filimon and Romer (1984, 1993) demonstrated how the assumptions on the individual preferences and technology must be restricted to come to an equilibrium in a local model with both, flexible housing markets and competitive political markets.

[26]Samuelson (1954) derived this rule for pure public goods with lump-sum taxation.

consensus on how the connections should be corrected by the government. However, they also need to fix rules that guide the government towards the citizens' consensus. - Here, we are mainly concerned about the allocational and distributional effects of different public revenue instruments. Public revenue instruments can be fixed into the constitution as constraints to the government. The related literature concentrated a lot on the effects of a property tax. The normal effects of this revenue instrument are still highly controversial. Three major views have appeared with respect to the incidence of this instrument: the classical, the benefit, and the capital tax view. Each of them works with a distinct model framework. In the classical view, the property tax burden is finally borne by the housing users, in the benefit view, by the local public goods users, and in the capital tax view, by the capital owners. Zodrow (2001) compared the three views and sought to reconcile them. Nonetheless, strong discrepancies have remained, as for example: In the classical view, the property tax mainly distorts the demand for local public goods, in the benefit view, the housing supply, and in the capital tax view, the capital market.[27]

In sum, what does the related literature recommend to citizens in the constiutional stage? - First of all, the Tiebout mechanism is a good basis for the provision of local public goods. Hence, a constitution should contain rules that support the mobility of its citizens. Surely, mobility alone does not generate an efficient equilibrium. The central reason is that local public goods are fixed to land. This fixation creates many specific problems. Let us mention just four of them:[28]

1. local public goods tend to congestion;
2. their supply is difficult to adapt;
3. technologies and externalities support strategic behavior;
4. consumption of local public goods and other goods are difficult to optimize, simultaneously.

The related literature recommends various measures to solve these problems. Obviously, these recommendations are derived from models which are partly

[27]The frameworks of the three views have the following assumptions in common: zero transaction costs, transparent markets, and immediate responses. The frameworks especially differ in the equilibrium concept and the supply conditions for housing. From a series of studies, we may draw the conclusion that the empirical relevance of each view is difficult to measure. See: Mieszkowski/ Zodrow (1989) and Zodrow (2001).

[28]The specific problems become more apparent in comparison to club goods.

incompatible with each other. As a consequence, the citizens should be careful when they intend to stipulate a combination of measures into their constitution. It is indispensable to check whether the assumptions of a certain model fit the long-run perspective of their economy. Starting by this, the citizens become able to evaluate the pros and cons of different measures.

Table 2.5 summarizes some specific pros and cons.

public measure	*pro*	*con*
facilitate exit	coordination of preferences for local public goods	production efficiency; crowding
facilitate voice	coordination of preferences for local public goods	strategic behavior; heterogeneity; instability
fiscal decentralization	competition among jurisdictions	economies of scale; spillovers
zoning	coverage of costs for local public goods	distortions on the housing market; government power
public housing monopoly	coverage of costs for local public goods	distortions on the housing market; government power
support private land development	competition among jurisdictions	distortions on market for local public goods; spillovers

Table 2.5: Local policy measures: pros and cons

Chapter 3

Principles for an Optimal Taxation

Any tax other than a lump-sum tax distorts the allocation; it causes some specific deadweight loss. The economy cannot reach a Pareto optimum with such a tax. Hence, when we analyze the effects of a distortionary tax, the best we can find are overall second best solutions. The 'theory of the second best' tells us that it may be expedient to deliberately deviate from a first best condition, if another first best condition cannot be satisfied. - The 'theory of optimal taxation' seeks to contrive second best solutions for economies with distortionary taxes. This theory bases in particular on two contributions: the one by Ramsey (1927), the other by Diamond and Mirrlees (1971).[1]

Ramsey asked how the overall deadweight loss can be minimized, if a certain amount of public revenue must be generated with commodity taxes. He set up a model in which a representative (producer-consumer) household chooses among a finite set of commodities to maximize its net utility. The net price that this household pays for a specific commodity corresponds to the related tax. From this model, Ramsey derived the following rule: To minimize the overall deadweight loss, each commodity tax rate must be fixed in such a way that a marginal change of any single tax rate would lead to the same marginal change in the (compensated) demand for all commodities ('Ramsey rule'). If we exclude cross-price effects from the model, then we can get to the following rule: In the optimum, each commodity tax rate is inversely proportional to the (compensated) price elasticity of demand of the

[1]For an introductory discussion, see Stiglitz (2000), chapter 20; for a more formal treatment, see Auerbach (1985).

related commodity ('inverse-elasticity rule').

According to the theory of the second best, it may be possible that some distortions in the production sector increase the utility level in an economy in which the Ramsey rule or the inverse-elasticity rule is satisfied. Diamond and Mirrlees checked whether this is the case. They came to the result that this is 'normally' not the case. Efficiency in production does support a second-best solution. Furthermore, Diamond and Mirrlees extended Ramsey's model framework, especially for multiple households. Since the households may have different utility functions and different incomes, distributional issues enter the analysis. The essential optimization problem of their model became: Maximize a given social welfare function subject to the condition that the total tax revenue reaches exactly a certain level. From this extended model, the two authors could derive the following rule: In the optimum, a marginal change of a single commodity tax rate leads to a higher marginal change in the (compensated) demand for the related commodity, if its demand is concentrated among: a) households with a lower marginal social utility of income; or b) households with a lower income elasticity of tax payments ('Diamond-Mirrlees rule').

The theory of optimal taxation has been further developed in many respects. New models have integrated topics, as for example: the provision of public goods, externalities, pre-existing distortions, or risk. Altogether, these models offer a multitude of (rather) consistent recommendations. These recommendations in particular deal with: commodity taxation, income taxation, rate structures, and vertical equity. - The theory of optimal taxation bases on the assumption that the government is benevolent and omniscient. The government knows all individual preference and production functions. For any complex network of markets, it is able to exactly predict each transaction. This ability is necessary to compute any potential deadweight loss. In general, the greater the substitution effects from taxation, the greater are the deadweight losses. Nevertheless, the benevolent government might have to weigh up allocational against distributional aspects. Based on its perfect knowledge of preferences and incomes, the government is able to construct the social welfare function in the exact form. Usually, the function is described as a utilitarian one, with specific cardinal distributional weights. This appears as an expedient way to integrate vertical equity norms into the optimization problem.[2]

Altogether, this theory describes the government as able and willing to

[2]For the overview of the different types of social welfare functions, their pros and cons, see Mueller (2003), chapters 23 and 24.

find the second best optimum for the economy. In this optimum, the chosen tax structure leads to a certain public revenue, the lowest possible deadweight loss, and the relatively best vertical distribution. Normally, the tax structure will be such that it treats each object specifically. Thus, the complexity of the tax structure increases with the complexity of the economy. This, however, does not create any problems for the implementation of the optimal tax structure, since the theory of optimal taxation excludes any administration costs.

From a constitutional perspective, it seems inexpedient to assume that the government is benevolent and omniscient. If we regard individuals as self-interested and limited in their knowledge, how could the government be the opposite? - Hence, the constitutional approach assumes that the government behaves as a Leviathan, as a maximizer of its income, having limited knowledge. Now, the central problem becomes that a Leviathan's maximum does not by itself tend to coincide with the social optimum. In order to support some coincidence, a Leviathan has to be constrained. Thus, it becomes the task of a constitutional assembly to fix optimal rules on Leviathan's actions. There are two essential conditions under which the assembly works: first, they stand behind a 'veil of ignorance'; second, they have to take every decision unanimously. These two rules shall help to avoid that a member supports a rule which is not in the common interest.

The optimal tax system highly depends on the government model. Therefore, the constitutional approach tends to take positions which contradict the theory of optimal taxation. First of all, the constitutional approach considers tax avoidance not only as an efficiency loss. Tax avoidance is rather a right in itself. This right helps the citizens to constrain Leviathan and thus to reduce his social power. Furthermore, in the constitutional approach, the optimal amount of public revenue is not predetermined. It depends on other endogenous variables, instead. Typically, a major role is played by the relationship between the public revenue and the types of public goods. The constitutional approach emphasizes that a certain tax system might be optimal only under certain conditions. Such an optimum is the best possible result out of the given trade-offs. Therefore, the optimum might represent a third best solution or less, compared to a model of perfect markets. Since the constitutional approach takes a long-run position, the model conditions should be defined in a general form. This way, the optimal tax system may stay the same, even if some variables change. From the general model conditions, one typically gets to some general and abstract rule. Such a rule can be specified outside but in line with the constitution. The specification is

performed by those who know the relevant specific conditions, best. Since knowledge primarily arises in a dispersed form, the task to specify rules, as tax rules for instance, seems to be best accomplished by some decentralized process.[3]

[3]Hettich and Winer (1985) analyze and compare three (normative) tax approaches: 1) equitable taxation, 2) optimal taxation, 3) fiscal exchange (constitutional). - Brennan and Buchanan (1980) pointed out that the conclusions from a constiutional approach likely contradict those from a theory of optimal taxation. Generally, they favored the first approach. Strangely enough, they based their constitutional conclusions on an analysis of deadweight losses. - Buchanan (1995) examines the way to an optimal taxation in the case where the government is dominated by a majoritarian democracy. - Hayek (1960) in particular stressed the 'irremediable' social fact that knowledge primarily arises in a dispersed form. He analyzed the consequences in a constitutional perspective.

Chapter 4

A General Model of Local Tax Competition

It is the task of a model to describe and explain the essence of its object. Thus, the model needs to prescind from some 'minor' features of its object; it needs to simplify. The central question then becomes: Which simplifications are most expedient? - Sure, the answers to this depend on the specific object and the related research interest.

The object of our model is local tax competition. We are especially interested in the role of housing markets within this object. Thus, which simplifications shall we make?

In the related literature, local tax competition is most often described and explained by a one-period model. The variation of causes and effects over time is neglected. However, this simplification incurs two essential problems: First, the property tax is based on an assessed value. It is charged on the housing owners in every period. It works similarly to a member fee. The sales tax - by contrast - is based on a real price. It is charged on a housing buyer. It works similarly to an entrance fee. But in a one-period model, these differences vanish; property tax and sales tax become identical. Second, housing has two essential characteristics: a) it is immobile, and b) it is durable. a) Housing is connected with a specific parcel of land. Due to this connection, it may easily become subject to externalities. Its value thus crucially depends on its location. b) Housing offers its services for more than one period; whereas these services may vary in quality over time. The qualities do not only depend on the investment of the owner. Thus, the two essential characteristics of housing cannot be considered in a one-period time

framework.

Next, many models in the related literature describe local public goods as publicly provided private goods. There exists perfect rivalry in consumption. These goods can be produced at constant costs per user. However, it seems unclear why such goods should be provided by the government. Problems with exclusion can hardly be relevant. Nobody could free-ride. In fact, local public goods most often show imperfect rivalry and non-constant costs per user, in the real world.

Finally, there exists a broad variety of government specifications in the related literature. Even those models which define the government as a Leviathan use various specifications. The objective variable may be: tax revenue, fiscal surplus, (expected) personal income, or (expected) personal utility. The choice variables may be: tax rate, or local public goods. The choice out of these variables depends on the specific research interest. Such an interest may lie in: voice decisions, exit decisions, tax policy, or overall fiscal policy. Since the models are supposed to be consistent, a certain government specification implicates specific simplifications or technical assumptions in other parts of the model. In the related literature, one can find a tendency to specify the government in a rather narrow manner. Its optimization problem thus becomes rather complicated. This usually leaves little room for the analysis of the households' consumption decisions; though these seem to be the key driver of local tax competition.

Thus, our general model of local tax competition looks as follows:

In this model, we have three different types of agents: Leviathans, households, and housing firms. Each type is homogeneous. The agents make their decisions in two different stages: In stage 1, each household is endowed with a parcel of land. Migration is not possible. Each Leviathan announces his local fiscal package (tax rates and local public goods). Each household demands housing for its on parcel of land. Housing is offered by housing firms in competition. On a global market, they demand capital for the housing production. The housing firms pay the land rents to the respective land owners. Stage 2 is divided into periods. In each of these periods, the households earn a wage and consume. Migration is only possible in the first period. The Leviathans may revise their local fiscal packages. The households consume local public goods where they reside. They consume the same housing in each period. On a global market, they demand a non-durable composite private good in each period.

Let us go into details, now.

Essential parameters for our local economy are set in stage 1. The economy is divided into $o = 1, 2, ..., \bar{J}$ regions, with $\bar{J}$ being large. Each region has the same size of land, $\bar{L}_o$, and the same number of residents, $\bar{N}_o > 1$. Each resident owns an equal share of her region's land:

$$\bar{l}_o = \frac{\bar{L}_o}{\bar{N}_o}. \tag{4.1}$$

For the total economy, it holds that:

$$\bar{L} = \bar{J}\bar{L}_o \quad \text{and} \quad \bar{N} = \bar{J}\bar{N}_o.$$

Based on these parameters, the agents (Leviathans, households, and housing firms) make their decisions.

4.1 Housing Firms

The housing firms merely exist in stage 1. They behave as profit maximizers on a competitive market. In a short form, the profit from a single production contract is described by:

$$\pi_{ho} = \rho_{ho} - c_{ho}. \tag{4.2}$$

The revenue (ρ_{ho}) is simply the internal housing price per unit (p_{ho}) times the individual demand for housing (h_o). The cost (c_{ho}) is determined by: the capital rent ($\bar{r}_k$), the capital input (k_{ho}), the capital rent tax ($\tau_{ko} \in [0, 1]$), the land rent (r_{lo}), the land input ($\bar{l}_o$), and the land rent tax ($\tau_{lo} \in [0, 1]$). Thus:

$$\pi_{ho} = p_{ho}h_o - \bar{r}_k(1 + \tau_{ko})k_{ho} - r_{lo}(1 + \tau_{lo})\bar{l}_{ho}.$$

While the firm can decide on the capital input, the land input is given by the household's share of land. Since the capital comes from a global market, its rent is taken as constant. Furthermore, we assume that its marginal product monotonically decreases. The land rent is determined as a residual value.

4.2 Households

In stage 1, the households get rents for their land. In stage 2, they earn wages and consume. The households seek to maximize their own utility.

They make their decisions in a life-time perspective. There are $t = 1, 2, ..., T$ consumption periods. The households can move across regions only in $t = 1$. The region of residence in stage 2 is described by $j = 1, 2, ..., \bar{J}$. Thus, the utility function of a household looks as follows:

$$u_j = \sum_{t=1}^{T} \beta^{t-1} u_t(x_{tj}, h_j) + u_g(G_j); \tag{4.3}$$

where β denotes the time preference factor with $0 < \beta < 1$, x_{tj} the composite private good, h_j the housing, and G_j the local public good. We assume that the utility from the local public good is independent of the chosen amounts of the other goods. However, the households can use local public goods only where they reside - namely in j. We further assume that every second partial derivative of the given utility function is negative over the whole range.

A household receives incomes from two sources: labor and land ownership. It calculates its discounted life-time income as follows:

$$y_o = \sum_{t} w_t (1 + \bar{r}_y)^{-(t-1)} + r_{lo} \bar{l}_{ho}; \tag{4.4}$$

where w_t is the wage. By transactions on the global capital market, the household can distribute its income over different periods at an interest rate ($\bar{r}_y \in (0, 1)$) without any further restrictions. Its disposable income in period t, thus, becomes:

$$y_{to} = (1 + \bar{r}_y)^{t-1} \gamma_{tj} y_o.$$

The disposable share in period t of the life-time income is $\gamma_{tj} > 0$, with $\sum_t \gamma_{tj} = 1$. Each γ_{tj} has to be chosen in such a way that y_{to} equals the household's expenditure in period t, denoted by b_{tj}. Thus, the discounted life-time expenditure function becomes:

$$b_j = \sum_{t} (1 + \bar{r}_y)^{-(t-1)} \bar{p}_x x_{tj} + p_{hj}(1 + \tau_{sj}) h_j + \sum_{t} (1 + \bar{r}_y)^{-(t-1)} p_{hj} \tau_{vtj} h_j; \tag{4.5}$$

where $\bar{p}_x$ denotes the price of the composite private good, p_{hj} the external net price of housing, $\tau_{sj} \in [0, 1]$ the rate of the sales tax on housing, and $\tau_{vtj} \in [0, 1]$ the rate of the property tax. While $\bar{p}_x$ arises on a global market, p_{hj} arises on a regional market.

4.3 Leviathans

Each region is governed by a Leviathan. A Leviathan seeks to maximize his own fiscal budget surplus. He is allowed to choose the tax rates for four

different bases. In stage 1, he may charge taxes on land rent and on capital rent; in stage 2, on housing sales and on housing property. A Leviathan produces his local public goods, by himself. Thus, he deals with the following budget equation:

$$S_{o=j} = \sum_{\tau} R_{\tau o=\tau j} - C_{go=gj} \quad \text{with} \tag{4.6}$$

$$R_{lo} = \bar{N}_o \tau_{lo} r_{lo} \bar{l}_{ho};$$

$$R_{ko} = \bar{N}_o \tau_{ko} \bar{r}_k k_{ho};$$

$$R_{sj} = N_j \tau_{sj} p_{hj} h_j;$$

$$R_{vj} = N_j \sum_{t} (1 + \bar{r}_y)^{-(t-1)} \tau_{vtj} p_{hj} h_j;$$

$$C_{go=gj} = C_g(G_{o=j}).$$

The fiscal budget surplus in a region o and j ($S_{o=j}$) equals the sum of the local tax revenues from: land rent (R_{lo}), capital rent (R_{ko}), housing sales (R_{sj}), and housing property (R_{vj}). The respective tax rates are denoted by: τ_{lo}, τ_{ko}, τ_{sj}, and τ_{vtj}. The amount of local public goods is exogenously determined. We assume that the related cost function ($C_g(G_{o=j})$) is U-shaped.

4.4 Market Equilibrium Conditions

In our general model, the three types of agents make choices on altogether $3T + 5$ variables: housing firms on k_o; households on x_{jt}, h_j, γ_t; Leviathans on $\tau_{lo}, \tau_{ko}, \tau_{sj}, \tau_{vtj}$. This multitude of choices must essentially be coordinated by the internal prices for housing (p_{ho}) and by the external prices for housing (p_{hj}). A total equilibrium will be reached in the following steps:

In stage 1, the regional boundaries are closed. Every agent is merely informed about her own region. Every Leviathan announces his choice of the tax rates and the amount of local public goods. Every household demands its optimal amount of housing on its own parcel of land. The housing firms make their offerings. A region o will reach an (internal) equilibrium, if:

The individual housing demand equals the individual housing supply for each of the N_o parcels of land.

$$h_o^d = h_o^s. \tag{4.7}$$

In stage 2, two types of agents are still existent: Leviathans and households. In the first period, the regional boundaries are opened. The agents thus become informed about the market conditions in the whole economy. They revise their plans. The Leviathans announce their new fiscal packages. The households first check their exit options, then, they start to consume. The whole economy will reach an (external) equilibrium under three further conditions:

In each region, the total demand for housing equals the total housing stock:

$$H_j^d = H_{o=j}^s. \tag{4.8}$$

Every household lives in one and only one jurisdiction:

$$\sum_j N_j = \bar{J}\bar{N}_o = \bar{N}. \tag{4.9}$$

Every household reaches the same and highest possible utility level:

$$u_j = u^*. \tag{4.10}$$

Table 4.1 gives a summary of the model's variables.

name	*interpretation*
$\bar{J}$	number of regions in the economy
$\bar{N}_o$	number of households from region o (*origin*)
$\bar{N}_j$	number of households in region j (*consumption*)
$\bar{L}_o$	land size of region o
$\bar{l}_o$	land size of parcel in o
u_j	individual utility in region j
β	time preference factor
x_{tj}	individual consumption of composite private good in period t and region j
h_j	individual consumption of housing in region j
G_j	local public good in region j
y_o	individual life-time income from region o
y_{to}	disposable income in period t
w_t	wage in period t
r_{lo}	land rent
$\bar{r}_k$	capital rent
$\bar{r}_y$	interest rate
γ_{tj}	share of disposable income in t in life-time income
b_j	individual life-time expenditure
$\bar{p}_x$	price of the composite private good
p_{ho}	internal net price of housing
p_{hj}	external net price of housing
τ_{sj}	sales tax rate on housing in j
τ_{vtj}	property tax rate in period t and region j
π_{ho}	profit from a single housing production contract
ρ_{ho}	revenue from housing contract
c_{ho}	cost of a housing
k_{ho}	capital input for housing
τ_{ko}	tax on capital rent
τ_{lo}	tax on land rent
$S_{o=j}$	fiscal budget surplus
R_τ	public revenue
C_g	costs of local public good
α_τ	share of specific tax revenue spent on local public goods
H_j^d	total housing demand in region j
H_o^s	total housing supply in o

Table 4.1: Variables of the general model: summary

Chapter 5

Two-Period Tax Models: Optimization and Comparative Statics

Our general model shall describe some major settings for Leviathans, households, and housing firms in local tax competition. But, it is still too complex to reach clear results on the respective optimizations and comparative statics. We therefore need to simplify further. The following additional assumptions are made:

Firstly, the number of periods in stage 2 is restricted to two: $T = 2$. Thus, a household's private consumption is described by only three variables: h_j, x_{1j}, and x_{2j}. Secondly, every household has the same productivity and offers the same amount of labor on a global market such that $w_t = \bar{w}$. We thus obtain our fourth exogenous and constant variable, besides $\bar{p}_x$, $\bar{r}_k$, and $\bar{r}_y$. Thirdly, the Leviathans are only allowed to use one, identical tax base. They have only one, identical choice variable; which is either τ_{lo} or τ_{ko} or τ_{sj} or τ_{vtj}. Lastly, all Leviathans face identical incentives to spend a share of a tax revenue on local public goods. We denote this share by $\bar{\alpha}_\tau$ with $0 < \bar{\alpha}_\tau < 1$. Each α_τ is determined by the tax base specific institutional environment. This environment is exogenous to our model and assumed to be constant.

5.1 Taxation of Land Rent

In stage 1 of our model, each household is endowed with a parcel of land. It uses this as an input for housing. The land thus generates a rent without previous investment. The land rent appears as a gain on housing production. Via the housing price, the extent of this gain is dependent on the provision of local public goods. Since the costs for the local public goods have to be taken by the Leviathans, these goods appear as some positive externalities to the land owners. Therefore, it seems expedient to allow Leviathans to impose a tax on land rents. This way, the positive externalities from the local public goods could be internalized.

5.1.1 Housing Firms

The housing firms are profit maximizers on a competitive market. They choose their input of capital such that their profit can reach zero. These firms take the input of land from the housing demanders. They pay them a land rent, which arises as a residual. This land rent is subject to the tax. The housing firms are identical and disappear after stage 1.

Formally, the optimization problem of a housing firm looks as follows:

$$\max_{k_{ho}} \pi_{ho} = p_{ho}(\tau_{lo}, G_o) h_o(k_{ho}, \bar{l}_{ho}) - \bar{r}_k k_{ho} - r_{lo}(1 + \tau_{lo})\bar{l}_{ho}. \tag{5.1}$$

The first order condition is:

$$p_{ho} \frac{\partial h_o}{\partial k_{ho}} - \bar{r}_k = 0.$$

As a solution for the optimal capital input, we get:

$$\bar{r}_k = p_{ho} \left(\frac{\partial h_o}{\partial k_{ho}} \right)^* . \tag{5.2}$$

This means that a housing firm increases its capital input, until the value of its marginal product equals the capital rent. Since there is a large number of competitors, it holds that: $\pi_o^* = 0$. For the land rent, we can conclude that:

$$r_{lo} = \frac{p_{ho}(\tau_{lo}, G_o) h_o - \bar{r}_k k_{ho}^*}{(1 + \tau_{lo})\bar{l}_{ho}};$$

$$r_{lo} = r_{lo}(p_{ho}(\tau_{lo}, G_o), \tau_{lo}).$$

Our comparative static result of the capital input is the following:

$$\frac{dk_{ho}}{d\tau_{lo}} = -\frac{\frac{\partial p_{ho}}{\partial \tau_{lo}} \frac{\partial h_o}{\partial k_{ho}}}{p_{ho} \frac{\partial^2 h_o}{\partial k_{ho}^2}} < 0. \tag{5.3}$$

In order to get this result, we assume that: a) the partial derivative of the internal housing price with respect to the land rent tax is negative; b) the marginal product of capital input is decreasing. Thus, we can make the following statement: A housing firm decreases (increases) its capital input as a response to a marginal increase (decrease) of the land rent tax.

5.1.2 Households

The households maximize their life-time utility, constrained by their life-time income. They reach utility from one-period composite private goods, housing, and local public goods. The incomes stem from a net land rent in stage 1 and from wages in both periods of stage 2. The households distribute their incomes over both periods. In stage 2, they can choose where to reside between all regions. Thus, the external housing price is a function of the vector of local public goods in the whole economy.

In formal terms, the optimization problem for a household in a local economy with land rent taxes looks as follows:

$$\max_{x_{1j}, x_{2j}, h_j, \gamma_1} u_j = u_1(x_{1j}, h_j) + \beta u_2(x_{2j}, h_j) + u_g(G_j) \tag{5.4}$$

subject to

$$y_{1o} = \gamma_1 y_o = \bar{p}_x x_{1j} + p_{hj}(\vec{G}_j) h_j$$

and

$$y_{2o} = (1 + \bar{r}_y)(1 - \gamma_1) y_o = \bar{p}_x x_{2j};$$

where

$$y_o = \bar{w} \left(1 + \frac{1}{1 + \bar{r}_y}\right) + r_{lo} \bar{l}_{ho}$$

with

$$r_{lo} \bar{l}_{ho} = \frac{p_{ho}(\tau_{lo}, G_o) h_o(k_{ho}(p_{ho}(\tau_{lo}, G_o))) - \bar{r}_k k_{ho}(p_{ho}(\tau_{lo}, G_o))}{1 + \tau_{lo}}.$$

We are able to solve this optimization problem in a Lagrangian approach. Let us denote the Lagrangian function by Z_l, the Lagrangian multipliers by λ_1, λ_2. Then, we get as first order conditions:

$$\frac{\partial Z_l}{\partial x_{1j}} = \frac{\partial u_1}{\partial x_{1j}} - \lambda_1 \bar{p}_x = 0;$$

$$\frac{\partial Z_l}{\partial x_{2j}} = \beta \frac{\partial u_2}{\partial x_{2j}} - \lambda_2 \bar{p}_x = 0;$$

$$\frac{\partial Z_l}{\partial h_j} = \frac{\partial u_1}{\partial h_j} + \beta \frac{\partial u_2}{\partial h_j} - \lambda_1 p_{hj} = 0;$$

$$\frac{\partial Z_l}{\partial \gamma_1} = \lambda_1 - \lambda_2 (1 + \bar{r}_y) = 0;$$

$$\frac{\partial Z_l}{\partial \lambda_1} = \gamma_1 \left(\bar{w} \left(1 + \frac{1}{1 + \bar{r}_y} \right) + \frac{p_{ho} h_o - \bar{r}_k k_{ho}}{1 + \tau_{lo}} \right) - \bar{p}_x x_{1j} - p_{hj} h_j = 0;$$

$$\frac{\partial Z_l}{\partial \lambda_2} = (1 + \bar{r}_y)(1 - \gamma_1) \left(\bar{w} \left(1 + \frac{1}{1 + \bar{r}_y} \right) + \frac{p_{ho} h_o - \bar{r}_k k_{ho}}{1 + \tau_{lo}} \right) - \bar{p}_x x_{2j} = 0.$$

Thus, to completely solve the household's optimization problem, we would need to specify its utility function. But, to derive the related comparative statics, we can do without such a specification. The relevant results are:

$$\frac{dx_{1j}}{d\tau_{lo}} = 0; \tag{5.5}$$

$$\frac{dx_{2j}}{d\tau_{lo}} = 0; \tag{5.6}$$

$$\frac{dh_j}{d\tau_{lo}} = \frac{\bar{r}_k k_{ho} - h_o \left(p_{ho} - (1 + \tau_{lo}) \frac{\partial p_{ho}}{\partial \tau_{lo}} \right)}{p_{hj} (1 + \tau_{lo})^2} < 0 \quad \text{if} \tag{5.7}$$

$$p_{ho} h_o > \bar{r}_k k_{ho} + h_o (1 + \tau_{lo}) \frac{\partial p_{ho}}{\partial \tau_{lo}};$$

$$\frac{d\gamma_1}{d\tau_{lo}} = (1 - \gamma_1) \frac{\bar{r}_k k_{ho} - h_o \left(p_{ho} - (1 + \tau_{lo}) \frac{\partial p_{ho}}{\partial \tau_{lo}} \right)}{y_o (1 + \tau_{lo})^2} < 0 \quad \text{if} \tag{5.8}$$

$$p_{ho} h_o > \bar{r}_k k_{ho} + h_o (1 + \tau_{lo}) \frac{\partial p_{ho}}{\partial \tau_{lo}}.$$

These results say the following: A change of the land rent tax does not lead to a change of a household's consumption of the composite private good. However, the household changes its housing demand and its share of first-period expenditure. These responses are always negative, since the derived conditions must be satisfied in the general logic of our model. The response of the housing demand is the higher, the lower the capital rent is. Additionally, the response of the share of first-period expenditure is the higher, the lower the wages are.

5.1.3 Leviathans

The Leviathans choose the land rent tax rates which maximize their own fiscal budget surplus. They take into account that the land rent is dependent on the internal housing price and the chosen tax rate. The amount of land input is fixed. The land rent tax is charged in stage 1.

The optimization problem of a Leviathan thus looks exactly as follows:

$$\max_{\tau_{lo}} S_{lo} = \tau_{lo} r_{lo}(p_{ho}(\tau_{lo}, G_o), \tau_{lo}) \bar{L}_{ho}(1 - \bar{\alpha}_{lo}). \tag{5.9}$$

The first order condition is:

$$\frac{\partial S_{lo}}{\partial \tau_{lo}} = r_{lo} + \tau_{lo} \left(\frac{\partial r_{lo}}{\partial p_{ho}} \frac{\partial p_{ho}}{\partial \tau_{lo}} + \frac{\partial r_{lo}}{\partial \tau_{lo}} \right) = 0.$$

The solution is:

$$\tau_{lo} = -\frac{r_{lo}}{\frac{\partial r_{lo}}{\partial p_{ho}} \frac{\partial p_{ho}}{\partial \tau_{lo}} + \frac{\partial r_{lo}}{\partial \tau_{lo}}} \quad \Rightarrow \quad \epsilon_{lo} = -1. \tag{5.10}$$

Hence, a Leviathan sets the tax rate at the point where the elasticitiy of the land rent is (minus) unity. The reaction of the land rent to a change of the tax rate comes through two different channels: one is direct and the other goes via the housing price.

5.1.4 Total Equilibrium

In our model of land rent taxes, the total equilibrium can be described by the following two conditions, which combine and specify the four conditions of the general model.

First:

$$\bar{N} = \sum_j \frac{\sum_o h_j^d(y_o(r_{lo}(p_{ho}(\tau_{lo}, G_o), \tau_{lo})), p_{hj}(\vec{G}_j))}{h_{o=j}^s(k_h(p_{ho}(\tau_{lo}, G_o)))}. \tag{5.11}$$

This means that the total number of households in the local economy must equal the sum of all housing consumers. The individual housing demand in region j depends on the household's land rent from region o and the housing price in region j. The number of households in j must equal the total housing demand divided by the individual housing supply. The housing supply is determined by the optimal capital input, as it appears in stage 1.

Second:

$$u^* = v_j(y_o(r_{lo}(p_{ho}(\tau_{lo}, G_o), \tau_{lo})), p_{hj}(\vec{G}_j), G_j). \tag{5.12}$$

Every household in the economy must reach the same, maximum level of utility. The indirect utility depends on the household's land rent from region o, the housing price in j, and the supply of local public goods in j.

Thus, we get the following two comparative static results:

$$\frac{dp_{ho}}{d\tau_{lo}} = -\frac{\partial p_{ho}}{\partial \tau_{lo}} > 0; \tag{5.13}$$

$$\frac{dp_{hj}}{d\tau_{lo}} = \frac{p_{ho}h_o - \bar{r}_k k_{ho}}{(1+\tau_{lo})^2} \frac{\frac{\partial v_j}{\partial y_o}}{\frac{\partial v_j}{\partial p_{hj}}} < 0. \tag{5.14}$$

This means that the total response of the internal housing price on a change of the land rent tax is positive, since we assume that the partial response is negative. The respective total response of the external housing price is, by contrast, negative. The extent of this response negatively depends on the wages and on the capital rent.

5.2 Taxation of Capital Rent

In our model, capital is a variable input for the production of housing. It is traded on a global market. For our local economy, its supply is thus perfectly elastic; which means that housing firms can demand any amount of capital at a fixed price. Because the local supply of land is fixed, the amount of capital input completely determines the supply of housing. The local supply of housing influences the use of local public goods. The optimum supply of local

public goods depends on the capital input for housing. Therefore, it seems to be expedient to impose a tax on the capital rent. With a capital rent tax, the optimal amount of local public goods could be controlled. A functional link between housing supply, local public goods consumption, and public revenue could be formed. We may ask, however: Which are the consequences of such a link, if local fiscal policy is made by Leviathans?

5.2.1 Housing Firms

The housing firms choose the amount of capital input which maximizes their profits. A tax on capital rents makes capital input less profitable. Since capital is the only variable input factor in housing production, there can be no factor substitution. Thus, a capital rent tax affects the housing supply in a direct way.

In formal terms, the optimization problem of a housing firm is described and solved by:

$$\max_{k_{ho}} \pi_{ho} = p_{ho}(\tau_{ko}, G_o) h_o(k_{ho}, \bar{l}_{ho}) - \bar{r}_k(1+\tau_{ko})k_{ho} - r_{lo}\bar{l}_{ho}; \tag{5.15}$$

$$p_{ho}\frac{\partial h_o}{\partial k_{ho}} - \bar{r}_k(1+\tau_{ko}) = 0;$$

$$\bar{r}_k(1+\tau_{ko}) = p_{ho}\left(\frac{\partial h_o}{\partial k_{ho}}\right)^*. \tag{5.16}$$

Hence, a housing firm increases its capital input, until the value of the marginal product equals the gross capital rent. Since there will be no profits on the competitive market, the land rent becomes:

$$r_{lo} = \frac{p_{ho}(\tau_{ko}, G_o)h_o - \bar{r}_k(1+\tau_{ko})k^*_{ho}}{\bar{l}_{ho}};$$

$$r_{lo} = r_{lo}(p_{ho}(\tau_{ko}, G_o), \tau_{ko}).$$

The comparative static result for the housing firms is the following:

$$\frac{dk_{ho}}{d\tau_{ko}} = \frac{\bar{r}_k - \frac{\partial p_{ho}}{\partial \tau_{ko}}\frac{\partial h_o}{\partial k_{ho}}}{p_{ho}\frac{\partial^2 h_o}{\partial k_{ho}^2}} < 0. \tag{5.17}$$

We conclude that a housing firm negatively responds to a change of the capital rent tax. The response will be the stronger, the higher the price level on the global capital market is.

5.2.2 Households

A capital rent tax may affect the households' consumption plans via their income constraints. The reason is that one part of their incomes is a land rent, which does depend on the capital rent tax.

A household optimizes its consumption as follows:

$$\max_{x_{1j},x_{2j},h_j,\gamma_1} u_j = u_1(x_{1j},h_j) + \beta u_2(x_{2j},h_j) + u_g(G_j) \tag{5.18}$$

subject to

$$y_{1o} = \gamma_1 y_o = \bar{p}_x x_{1j} + p_{hj}(\vec{G}_j)h_j$$

and

$$y_{2o} = (1+\bar{r}_y)(1-\gamma_1)y_o = \bar{p}_x x_{2j};$$

where

$$y_o = \bar{w}\left(1+\frac{1}{1+\bar{r}_y}\right) + \left(p_{ho}h_o - \bar{r}_k(1+\tau_{ko})k_{ho}\right).$$

Without specifying the utility function, we are able to derive the comparative statics. The results are as follows:

$$\frac{dx_{1j}}{d\tau_{ko}} = 0; \tag{5.19}$$

$$\frac{dx_{2j}}{d\tau_{ko}} = 0; \tag{5.20}$$

$$\frac{dh_j}{d\tau_{ko}} = -\frac{\bar{r}_k k_{ho} - h_o\frac{\partial p_{ho}}{\partial \tau_{ko}}}{p_{hj}} < 0; \tag{5.21}$$

$$\frac{d\gamma_1}{d\tau_{ko}} = -(1-\gamma_1)\frac{\bar{r}_k k_{ho} - h_o\frac{\partial p_{ho}}{\partial \tau_{ko}}}{y_o} < 0. \tag{5.22}$$

Hence, we find out that a change of the capital rent tax leaves the composite private goods consumption unaffected. But, such a change affects the housing consumption and the share of first-period expenditure negatively. The impact on the housing consumption positively depends on the capital rent level. The impact on the share of first-period expenditure positively depends on the capital rent level, and negatively on the wage level.

5.2.3 Leviathans

If a Leviathan seeks to maximize his budget surplus from a capital rent tax, then he has to consider the responses of the capital input. His optimization problem is:

$$\max_{\tau_{ko}} S_{ko} = \tau_{ko}\bar{r}_{ko}k_{ho}(p_{ho}(\tau_{ko}, G_o), \tau_{ko})N_o(1 - \bar{\alpha}_{ko}). \tag{5.23}$$

In his optimum:

$$\frac{\partial S_{ko}}{\partial \tau_{ko}} = k_{ho} + \tau_{ko}\left(\frac{\partial k_{lo}}{\partial p_{ho}}\frac{\partial p_{ho}}{\partial \tau_{ko}} + \frac{\partial k_{lo}}{\partial \tau_{ko}}\right) = 0;$$

$$\tau_{ko} = -\frac{k_{ho}}{\frac{\partial k_{ho}}{\partial p_{ho}}\frac{\partial p_{ho}}{\partial \tau_{ko}} + \frac{\partial k_{ho}}{\partial \tau_{ko}}} \quad \Rightarrow \quad \epsilon_{ko} = -1. \tag{5.24}$$

Hence, the fiscal budget surplus reaches its maximum at a point where the elasticity of the capital with respect to the capital rent tax rate is (minus) unity. A response to a tax rate change may come from two sides: first, the housing firms adapt the capital input; second, the households adapt their housing demand.

5.2.4 Total Equilibrium

Our local economy with capital rent taxes reaches a total equilibrium, if the following two conditions are satisfied:

$$\bar{N} = \sum_j \frac{\sum_o h_j^d(y_o(r_{lo}(p_{ho}(\tau_{ko}, G_o), \tau_{ko})), p_{hj}(\vec{G}_j))}{h_{o=j}^s(k_h(p_{ho}(\tau_{ko}, G_o)))} \tag{5.25}$$

and

$$u^* = v_j(y_o(r_{lo}(p_{ho}(\tau_{ko}, G_o), \tau_{ko})), p_{hj}(\vec{G}_j), G_j). \tag{5.26}$$

In very few words, the local economy will be in equilibrium, if the households do not have incentives to migrate, because they already reside in the region where they can reach their maximum utility level. Such an equilibrium will be mainly coordinated by the housing prices. They determine the incomes, the housing demand, and the capital demand.

The housing prices respond to a change of the capital rent tax in the following way:

$$\frac{dp_{ho}}{d\tau_{ko}} = -\frac{\partial p_{ho}}{\partial \tau_{ko}} > 0; \tag{5.27}$$

$$\frac{dp_{hj}}{d\tau_{ko}} = \bar{r}_k k_{ho} \frac{\frac{\partial v_j}{\partial y_o}}{\frac{\partial v_j}{\partial p_{hj}}} < 0. \tag{5.28}$$

The internal housing price positively responds to a change of the capital rent tax. The total response just reverses the sign of the partial response. The external housing price, by contrast, negatively responds to such a change. This response will be the stronger, the higher the capital rent and the lower the wage level is.

5.3 Taxation of Housing Sales

In our general model, we assume that the households can use local public goods only in the region where they reside. In stage 1, migration is not possible. The internal housing price in region o depends on the amount of local public goods in o. In stage 2, migration is possible. The external housing price in j depends on the amounts of local public goods in all regions. In both stages, the internal relationship between local public goods and housing demand is positive. To the extent that the housing supply is inelastic, the provision of local public goods may capitalize into the housing prices. While the housing suppliers lose or profit from the capitalization, the providers of local public goods originally stay unaffected. The benefit takers do not correspond to the cost takers. One method to correct this inequality could be to impose a tax on housing sales. Such a tax creates an adaptable wedge between the gross and the net price for housing. It connects the housing demand with the local public goods supply. This tax may serve as a variable entry or exit fee. But, we shall assess this idea for the case that the housing sales tax is used by Leviathans.

5.3.1 Housing Firms

In our models, the housing firms must take the housing prices as given. The price that they operate with is the internal one, arising in stage 1. A sales tax, however, is based on the external housing price, arising in stage 2. This is the one that the households use to make their consumption plans. Let us now check whether this use (in stage 2) refers back to the plannings of the housing firms (in stage 1).

In our sales tax model, we treat the optimization problem of a housing firm in the following way:

$$\max_{k_{ho}} \pi_{so} = p_{ho}(G_o)h_o(k_{ho}, \bar{l}_{ho}) - \bar{r}_k k_{ho} - r_{lo}\bar{l}_{ho}; \tag{5.29}$$

$$p_{ho}\frac{\partial h_o}{\partial k_{ho}} - \bar{r}_k = 0;$$

$$\bar{r}_k = p_{ho}\left(\frac{\partial h_o}{\partial k_{ho}}\right)^*; \tag{5.30}$$

$$r_{lo} = \frac{p_{ho}(G_o)h_o - \bar{r}_k k^*_{ho}}{\bar{l}_{ho}} = r_{lo}(p_{ho}(G_o)).$$

The comparative static result is:

$$\frac{dk_{ho}}{d\tau_{sj}} = 0. \tag{5.31}$$

It turns out that a housing sales tax does not influence the capital input in the housing production and thus not the offered amount of housing.

5.3.2 Households

The households must pay a sales tax when they start to consume housing. It thus arises as a component of their first-period expenditures, in stage 2. A sales tax works as an entry fee. This means that the households have to pay it to use the local public goods. In stage 2, the households can choose among regions. Thus, their decision to migrate is dependent on all tax rates and all amounts of local public goods, in the economy. They remain land owner in

o and become resident of j. The external housing price is now a function of two vectors.

In this model, a household optimizes its consumption as follows:

$$\max_{x_{1j},x_{2j},h_j,\gamma_1} u_j = u_1(x_{1j},h_j) + \beta u_2(x_{2j},h_j) + u_g(G_j) \tag{5.32}$$

subject to

$$y_{1o} = \gamma_1 y_o = \bar{p}_x x_{1j} + p_{hj}(\vec{\tau}_{sj},\vec{G}_j)(1+\tau_{sj})h_j$$

and

$$y_{2o} = (1-\gamma_1)(1+\bar{r}_y)y_o = \bar{p}_x x_{2j};$$

where

$$y_o = \bar{w}\left(1+\frac{1}{1+\bar{r}_y}\right) + p_{ho}h_o - \bar{r}_k k_{ho}.$$

In a Lagrangian approach, the distinctive first order conditions are:

$$\frac{\partial Z_s}{\partial h_j} = \frac{\partial u_1}{\partial h_j} + \beta\frac{\partial u_2}{\partial h_j} - \lambda_1 p_{hj}(1+\tau_{sj}) = 0;$$

$$\frac{\partial Z_s}{\partial \lambda_1} = \gamma_1 y_o - \bar{p}_x x_{1j} - p_{hj}(1+\tau_{sj})h_j = 0;$$

$$\frac{\partial Z_s}{\partial \lambda_2} = (1+\bar{r}_y)(1-\gamma_1)\left(\bar{w}\left(1+\frac{1}{1+\bar{r}_y}\right) + p_{ho}h_o - \bar{r}_k k_{ho}\right) - \bar{p}_x x_{2j} = 0.$$

The relevant results of the comparative statics are:

$$\frac{dx_{1j}}{d\tau_{sj}} = \frac{p_{hj} + (1+\tau_{sj})\frac{\partial p_{hj}}{\partial \tau_{sj}}}{\bar{p}_x \frac{\partial u_{1j}}{\partial h_j}} > 0 \quad \text{if} \tag{5.33}$$

$$p_{hj} > -(1+\tau_{sj})\frac{\partial p_{hj}}{\partial \tau_{sj}};$$

$$\frac{dx_{2j}}{d\tau_{sj}} = (1+\bar{r}_y)\frac{dx_{1j}}{d\tau_{sj}}; \tag{5.34}$$

$$\frac{dh_j}{d\tau_{sj}} = -\frac{2+h_j\frac{\partial u_{1j}}{\partial h_j}}{1+\tau_{sj}}\frac{p_{hj}+(1+\tau_{sj})\frac{\partial p_{hj}}{\partial \tau_{sj}}}{p_{hj}\frac{\partial u_{1j}}{\partial h_j}} < 0 \quad \text{if} \tag{5.35}$$

$$p_{hj} > -(1+\tau_{sj})\frac{\partial p_{hj}}{\partial \tau_{sj}};$$

$$\frac{d\gamma_1}{d\tau_{sj}} = -\frac{p_{hj} + (1+\tau_{sj})\frac{\partial p_{hj}}{\partial \tau_{sj}}}{y_o \frac{\partial u_{1j}}{\partial h_j}} < 0 \quad \text{if} \tag{5.36}$$

$$p_{hj} > -(1+\tau_{sj})\frac{\partial p_{hj}}{\partial \tau_{sj}}.$$

Hence, if the net external housing price is greater than the partial derivative of the gross price with respect to the tax rate, we get to the following essential conclusions: Firstly, the first-period consumption of the composite private good reacts positively on a change of the tax rate. The extent of this reaction negatively depends on the price for this good. Secondly, the second-period consumption of the composite private good positively reacts on a change of the tax rate. The extent of this reaction negatively depends on the price for this good, and positively on the interest rate. Thirdly, the housing consumption is negatively related to the housing sales tax. And lastly, the share of the first-period expenditure is negatively related to this tax. The sensitivity of this relationship negatively depends on the wage level.

5.3.3 Leviathans

The Leviathans revise their announcements of the sales tax rate at the beginning of stage 2. In order to maximize their own budget surplus, they must take into account each tax rate and each amount of local public goods in the whole local economy. Only then, they may be able to correctly predict the relevant housing price.

A Leviathan's optimization calculus with a housing sales tax looks as follows:

$$\max_{\tau_{sj}} S_{sj} = \tau_{sj} p_{hj}(\vec{\tau}_{sj}, \vec{G}_j) H_j (1 - \bar{\alpha}_{sj}); \tag{5.37}$$

$$\frac{\partial S_{sj}}{\partial \tau_{sj}} = p_{hj} + \tau_{sj}\frac{\partial p_{hj}}{\partial \tau_{sj}} = 0;$$

$$\tau_{sj} = -\frac{p_{hj}}{\frac{\partial p_{hj}}{\partial \tau_{sj}}} \quad \Rightarrow \quad \epsilon_{sj} = -1. \tag{5.38}$$

Thus, a Leviathan maximizes his budget surplus at the point where the tax elasticity of the external housing price is minus unity. This elasticity arises from the coordination of all housing markets in the local economy.

5.3.4 Total Equilibrium

Our local economy with housing sales taxes reaches a total equilibrium under two specified conditons. In both conditions, the external housing price appears as a price after taxes. It must be the case that:

$$\bar{N} = \sum_j \frac{\sum_o h_j^d(y_o(r_{lo}(p_{ho}(G_o))), p_{hj}(\vec{\tau}_{sj}, \vec{G}_j)(1+\tau_{sj}))}{h_{o=j}^s(k_h(p_{ho}(G_o)))} \tag{5.39}$$

and

$$u^* = v_j(y_o(r_{lo}(p_{ho}(G_o))), p_{hj}(\vec{\tau}_{sj}, \vec{G}_j)(1+\tau_{sj}), G_j). \tag{5.40}$$

In such an equilibirium, it holds that:

$$\frac{dp_{ho}}{d\tau_{sj}} = 0 \tag{5.41}$$

and

$$\frac{dp_{hj}}{d\tau_{sj}} = -\frac{p_{hj}}{1+\tau_{sj}} - \frac{\partial p_{hj}}{\partial \tau_{sj}} < 0 \quad \text{if} \tag{5.42}$$

$$p_{hj} > -(1+\tau_{sj})\frac{\partial p_{hj}}{\partial \tau_{sj}}.$$

As we can see, a change of the housing sales tax does not refer back to the internal housing price. The respective response of the external housing price depends on a condition that we already have known. Thus, if the net external housing price is greater than the partial derivative of the gross price with respect to the tax rate, then the net price responds negatively.

5.4 Taxation of Housing Property

In our general model, the consumption of local public goods is independent of the time. The households, however, make their consumption plans in a life-time perspective. Therefore, it could be expedient to finance local public goods on a multi-period schedule. Such a schedule might improve the

allocation of capital over time; it might strengthen the link between what agents get and what they pay for. One way to establish a multi-period fiscal schedule is to impose a (housing) property tax. A property tax is charged in each period on each local housing consumer. It thus may work as a member fee. Its base is the asset value of a housing. However, we shall keep in mind that the housing market and the market for local public goods still have different ways of functioning. The property tax appears as a powerful instrument. Thus, we shall analyze its effects for the case that it is used by Leviathans in local tax competition.

In order to optimize their housing consumption, the households have to set up multi-period financial plans. These plans have to consider future values of variables, such as: income, interest, prices of other goods, or taxes. The citizens will bind themselves to their financial plans, only if they can rely on certain rules. One salient domain for such rules is fiscal policy. If a government may, for example, introduce or change taxes arbitrarily, then the households will be reluctant to invest in an object that can be used as a tax base. Losses could be particularly high for investments in housing. Hence, we assume that Leviathans commit themselves: the tax rate must stay the same over all periods:

$$\tau_{v1j} = \tau_{v2j}.$$

5.4.1 Housing Firms

In this model, we conceive the property tax as a periodical charge on the external housing price. However, the housing firms calculate only with the internal price. Hence, the housing production is not directly affected by the property tax. The housing firms follow the same optimization logic as in the case of a housing sales tax; and the results of the comparative static analysis will be the same.

5.4.2 Households

In a local economy with property taxes, the households have to integrate future tax payments into their consumption plans. In our model, they can migrate only in the first period. The recipients of their tax payments will thus remain the same. Anyway, in order to optimize their consumption, the households have to consider the tax rates of every region j.

Given our specifications, $T = 2$ and $\tau_{v1j} = \tau_{v2j}$, a household's optimization calculus gets the following form:

$$\max_{x_{1j},x_{2j},h_j,\gamma_1} u_j = u_1(x_{1j}, h_j) + \beta u_2(x_{2j}, h_j) + u_g(G_j) \tag{5.43}$$

subject to

$$y_{1o} = \gamma_1 y_o = \bar{p}_x x_{1j} + p_{hj}(\vec{\tau}_{vj}, \vec{G}_j)(1 + \tau_{vj})h_j$$

and

$$y_{2o} = (1 - \gamma_1)(1 + \bar{r}_y)y_o = \bar{p}_x x_{2j} + p_{hj}(\vec{\tau}_{vj}, \vec{G}_j)\tau_{vj}h_j;$$

where

$$y_o = \bar{w}\left(1 + \frac{1}{1 + \bar{r}_y}\right) + p_{ho}h_o - \bar{r}_k k^*_{ho}.$$

From a Lagrangian function, Z_v, we can derive the following distinctive first order conditions:

$$\frac{\partial Z_v}{\partial h_j} = \frac{\partial u_1}{\partial h_j} + \beta\frac{\partial u_2}{\partial h_j} - \lambda_1 p_{hj}(1 + \tau_{vj}) - \lambda_2 p_{hj}\tau_{vj} = 0;$$

$$\frac{\partial Z_v}{\partial \lambda_1} = \gamma_1 y_o - \bar{p}_x x_{1j} - p_{hj}(1 + \tau_{vj})h_j = 0;$$

$$\frac{\partial Z_v}{\partial \lambda_2} = (1 + \bar{r}_y)(1 - \gamma_1)y_o - \bar{p}_x x_{2j} - p_{hj}\tau_{vj}h_j = 0.$$

From the derivations of the first order conditions, we get to the comparative static results:

$$\frac{dx_{1j}}{d\tau_{vj}} = \frac{\left(\left(\frac{2+\bar{r}_y}{1+\bar{r}_y}p_{hj}\right) + \left(1 + \tau_{vj} + \frac{\tau_{vj}}{1+\bar{r}_y}\right)\frac{\partial p_{hj}}{\partial \tau_{vj}}\right)\Omega_{v1}}{\bar{p}_x\frac{\partial u_1}{\partial h_j}} > 0 \quad \text{if} \tag{5.44}$$

$$p_{hj} > -\frac{1 + \bar{r}_y}{2 + \bar{r}_y}\left(1 + \tau_{vj} + \frac{\tau_{vj}}{1 + \bar{r}_y}\right)\frac{\partial p_{hj}}{\partial \tau_{vj}};$$

$$\frac{dx_{2j}}{d\tau_{vj}} = (1 + \bar{r}_y)\frac{dx_{1j}}{d\tau_{vj}}; \tag{5.45}$$

$$\frac{dh_j}{d\tau_{vj}} = -\frac{\left(\left(\frac{2+\bar{r}_y}{1+\bar{r}_y}p_{hj}\right) + \left(1 + \tau_{vj} + \frac{\tau_{vj}}{1+\bar{r}_y}\right)\frac{\partial p_{hj}}{\partial \tau_{vj}}\right)\Omega_{v2}}{p_{hj}\frac{\partial u_1}{\partial h_j}} < 0 \quad \text{if} \tag{5.46}$$

$$p_{hj} > -\frac{1+\bar{r}_y}{2+\bar{r}_y}\left(1+\tau_{vj}+\frac{\tau_{vj}}{1+\bar{r}_y}\right)\frac{\partial p_{hj}}{\partial \tau_{vj}};$$

$$\frac{d\gamma_1}{d\tau_{vj}} = -\frac{\Omega_{v3}p_{hj}+\Omega_{v4}\frac{\partial p_{hj}}{\partial \tau_{vj}}+\Omega_{v5}}{y_o\frac{\partial u_{1j}}{\partial h_j}}. \tag{5.47}$$

As we can see, a property tax implies more complicated responses by the households. In terms of quality, the households seem to respond similarly to this tax as to a sales tax. Under the condition that the net external price of housing is greater than the time-weighted partial derivative of the gross price with respect to the tax rate, a change of the tax rate leads to a positive response of the composite private goods consumption and to a negative response of the housing consumption. However, the 'quantity' of such a response is hardly predictable. As a consequence, the relationship between the property tax and the share of first-period consumption cannot even be qualitatively predicted.

5.4.3 Leviathans

In this model, the Leviathans make their fiscal plans in a two-period perspective. They make their plans in present value terms. We make the assumption that the share of revenue which is spent on local public goods is constant over time. Since the tax rates must also be constant over time, the Leviathans merely need to account for the first-period tax rates in order to predict the relevant housing price.

A Leviathan maximizes his fiscal surplus from property taxation in the following formal way:

$$\max_{\tau_{vj}} S_{vj} = \left(\tau_{vj}+\frac{\tau_{vj}}{1+\bar{r}_y}\right)p_{hj}(\vec{\tau}_{vj},\vec{G}_j)H_j(1-\bar{\alpha}_{vj}); \tag{5.48}$$

$$\frac{\partial S_{vj}}{\partial \tau_{vj}} = p_{hj}+\tau_{vj}\frac{\partial p_{hj}}{\partial \tau_{vj}} = 0;$$

$$\tau_{vj} = -\frac{p_{hj}}{\frac{\partial p_{ho}}{\partial \tau_{vj}}} \quad \Rightarrow \quad \epsilon_{vj} = -1.$$

Once again, a Leviathan must find the point where the tax elasticity of the external housing price is -1. However, the partial derivative of the housing price will depend on the time perspective.

5.4.4 Total Equilibrium

In this model, the property tax rates are announced in the first period. The tax is payed in both periods; but it refers to a price which arises only in the first. Thus, the coordination of all markets within our local economy takes place in that period. The total equilibrium can be described as follows:

$$\bar{N} = \sum_j \frac{\sum_o h_j^d \left(y_o(r_{lo}(p_{ho}(G_o))), p_{hj}(\vec{\tau}_{vj}, \vec{G}_j) \left(1 + \tau_{vj} + \frac{\tau_{vj}}{1+\bar{r}_y}\right)\right)}{h^s_{o=j}(k_h(p_{ho}(G_o)))}; \quad (5.49)$$

$$u^* = v_j \left(y_o(r_{lo}(p_{ho}(G_o))), p_{hj}(\vec{\tau}_{vj}, \vec{G}_j) \left(1 + \tau_{vj} + \frac{\tau_{vj}}{1+\bar{r}_y}\right), G_j \right); \quad (5.50)$$

with the comparative statics result:

$$\frac{dp_{hj}}{d\tau_{vj}} = -\frac{2+\bar{r}_y}{1+\bar{r}_y} \frac{p_{hj}}{1+\tau_{vj}+\frac{\tau_{vj}}{1+\bar{r}_y}} - \frac{\partial p_{hj}}{\partial \tau_{vj}} < 0 \quad \text{if} \quad (5.51)$$

$$p_{hj} > -\frac{1+\bar{r}_y}{2+\bar{r}_y} \left(1 + \tau_{vj} + \frac{\tau_{vj}}{1+\bar{r}_y}\right) \frac{\partial p_{hj}}{\partial \tau_{vj}}.$$

As it turns out, the net external housing price negatively responds to the property tax rate, under the condition that it is greater than the time-weighted partial derivative of the gross price with respect to the tax rate. This is the same condition which the responses of the households depend on.

Chapter 6

The Choice of Local Tax Bases

The theory of optimal taxation takes the deadweight loss as a unique yardstick for tax bases. According to this theory, one tax base is better than another, if it allows to raise a given amount of revenue with a lower deadweight loss. A deadweight loss is caused by the agents' responses on the tax. In general, the more the agents respond on a tax by substitution, the higher will be the deadweight loss. In order to be able to measure a deadweight loss, every function in the economy must be known. Thus, the theory of optimal taxation assumes that the economy is governed by a benevolent and omniscient dictator. This social dictator is able to exactly predict any substitution that is caused by a tax. There is nothing that prevents him from choosing the socially optimal tax base. And there is no doubt that he will use the tax revenue in the agents' best interest.

By contrast, the constitutional approach assumes that the governments are self-interested. Typically, Leviathan follows his own interest by maximizing his fiscal budget surplus. The maximum surplus is dependent on the used tax base. Leviathan thus would choose the tax base which offers the highest budget surplus maximum to him. The involved agents, however, may stipulate some rules into the constitution which constrain Leviathan's policy options. There are two principle ways to constrain his options: a) a direct, and b) an indirect one. a) In a direct way, a rule defines the fiscal policy which Leviathan is or is not allowed to make. Such a rule may be related to three fields: the tax base, the rate structure, and the amount of revenue. b) In an indirect way, a rule defines the types of responses which the agents are or are not allowed to give. There are two major types of responses: voice and exit. - However, the basic problem is how to get to the best rules, to the best constraints.

The constitutional approach assumes that the agents form an assembly. In this assembly, they stand behind a veil of ignorance. This means that none of the agents knows her future social position. Thus, they all expect to be treated by Leviathan in the same manner. Based on this assumption, the agents could reach a consensus on what are the best rules. Moreover, it seems consistent to assume that the agents have no specific knowledge about the future technology in society, while they stand behind the veil of ignorance. However, as we found out, the effects of a tax base do depend on the relevant technology. The effects cannot be measured without specific knowledge. Therefore, the constitutional assembly seems to be unable to make the best choice out of the potential tax bases. It may stipulate general rules rather than specific ones; indirect rules rather than direct ones.

The constitutional assembly derives its general or indirect rules on the choice of local tax bases from a common theory. The common theory should describe and explain the logic of local taxation in a consistent and reliable way. Thus, it typically deals with issues like: objectives, incentives, (information) asymmetries, trade-offs, equilibrium types, responses, externalities, transaction costs, and so on. These issues might look differently for every local tax base. Many of the aspects might be incomparable. As a consequence, the theory will fail to create a unique yardstick for the evaluation of every tax base. It seems impossible to derive and calculate a certain welfare measure (as the deadweight loss, for instance) for each partial aspect, and to aggregate, if necessary. Hence, the common theory may offer nothing more than some partial results. These results may suggest to stipulate certain general rules on the future local taxation. Some of these rules may prescribe the way how to specify other general rules, in particular, how to choose the tax bases.

The choice of a local tax base should serve the overall objective to reach efficiency in the provision of local public goods. In the constitutional approach, this objective contains two central aspects: a) the coordination between demand and supply on the market for local public goods; b) the potential for the misuse of tax revenue.

a) On the market for local public goods, we encounter a specific problem: The demanders have incentives to hide their preferences; they behave strategically. The constitutional assembly thus searches for some rules which change these incentives. At first sight, it may look more promising to tackle the problem via exit rules than via voice rules. When citizens move to another region, they definitely reveal some of their real preferences. The Tiebout mechanism seems to be superior to other demand-revealing mechanisms.

But, the quality of the Tiebout results depends on various conditions, as for example: information costs, mobility costs, structure of regions, sources of income, and production technologies. Constiutional rules can only improve some of these conditions in a general way. Some special problems arise due to the narrow link between the local public goods market and the housing market. Altogether, the coordination tends to remain imperfect.[1]

b) As long as the coordination of local public goods and of housing remains imperfect, there exists some potential to misuse tax revenue. In general, each imperfect market constellation offers a different potential for each tax base. The quality of the choice of a tax base thus depends on the given market constellation. A tax base ranking only holds under the ceteris paribus assumption. If we make this assumption, then we may assess and compare different tax bases by the potential to misuse tax revenue. To start from a common point, we may set this potential in relation to the potential to generate tax revenue.

Thus, in a constitutional approach, a tax base is supposed to be assessed by the following fraction:

$$\frac{S_z(\tau_z)}{R_z(\tau_z)} = (1 - \alpha_z).$$

We can briefly illustrate the assessment of a tax base, as is done in figure 6.1. The figure contains two graphs: a standard Laffer curve ($R_z(\tau_z)$), and a modified Laffer curve ($S_z(\tau_z)$). A Leviathan will search for τ_z^* in order to get S_z^*. In this figure (unlike in our models), we assume that α_z is not constant. Hence: $\tau_z^* \neq \tau_z^{**}$. - For each tax base (z), the two Laffer curves have a specific shape. Each specific pair may strongly diverge from another. Before the Leviathans start their search, the constitutional assembly has the opportunity to influence the shapes of the Laffer curves. It may stipulate some general rules which help to make α_z as high as possible.

[1]Nowadays, we can find a great variety of alternative demand-revealing mechanisms which base on voice rules. Early and important contributions to the related discussion were made by Clarke (1971) and by Groves (1973). Nonetheless, some serious objections could not be removed. See Mueller (2003), 160-8.

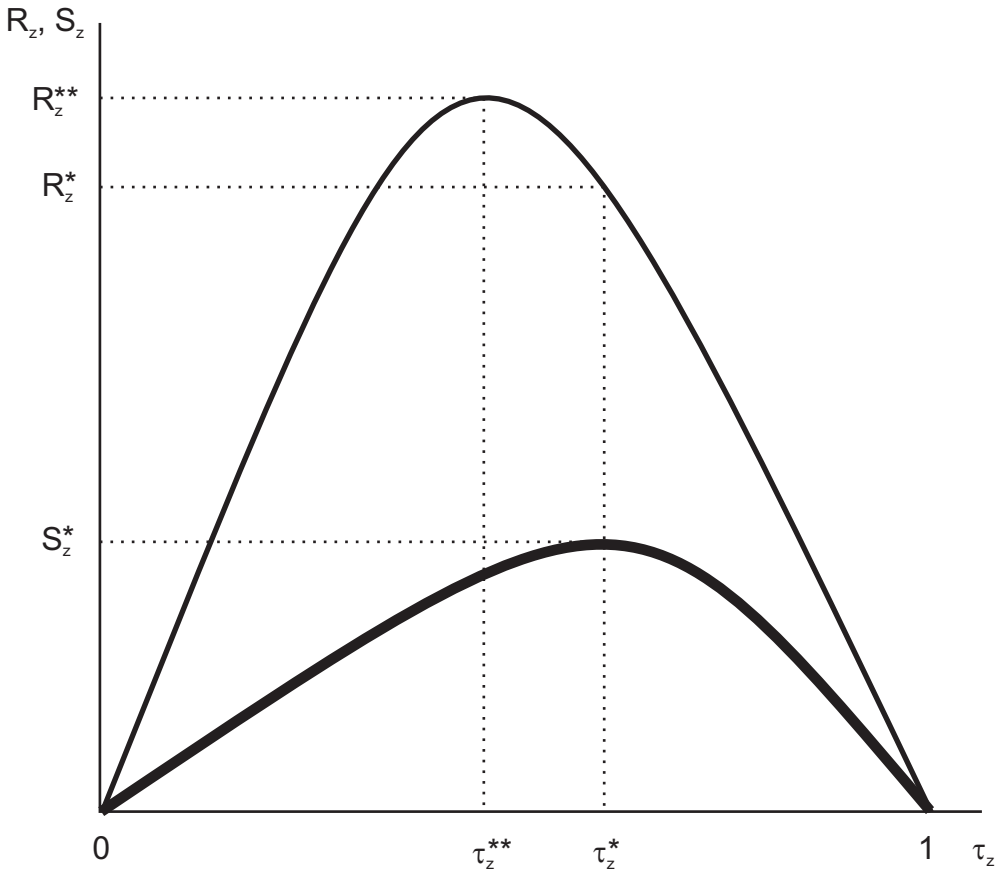

Figure 6.1: Assessment of a Tax Base

Chapter 7

Local Tax Competition and Intergovernmental Grants

A Leviathan in tax competition may not encounter the right incentives to raise the socially optimal amount of local public revenue. As a consequence, the offered amount of local public goods may become too high or too low. Basically, there exists one central way to tackle this problem, which is to install a system of intergovernmental grants. A system of intergovernmental grants can be organized according to two basic principles: horizontal or vertical. Horizontal organization means that all relevant decisions on grants are taken on one unique government level. If a Leviathan sees a reason to charge some grants, then he may enter into negotiations with other Leviathans of the same level. They negotiate on common specific rules on issues like: taxation, public offerings, regional structures and financial transfers. Such kinds of negotiations tend to be complicated, especially if the Leviathans behave in a strategic way. Then, it might become expedient to involve a third party, an umpire into the negotiations. But, such a solution tends to engender the vertical principle of organization. According to this principle, Leviathans transfer decisions to a higher-level Leviathan. This Leviathan will be allowed to define specific rules on the others' local fiscal policy.

There are four major phenomena which may justify the payment of intergovernment grants:

1. spillovers;
2. economies of scale;
3. income disparities;

4. economic shocks.

First, spillovers run counter to the benefit principle. The set of beneficiaries gets greater than the set of contributors. Local public goods are underprovided. The lack of supply is the greater, the greater the number of non-contributors and the more extensive congestion is. Second, economies of scale can possibly be reached on both sides of the fiscal budget. On the revenue side, economies of scale typically stem from administration costs; on the expenditure side, typically from production technology. Third, the Tiebout mechanism promotes the local segregation of income groups. Consequently, intergovernmental grants become more effective in reducing income disparities. A reduction of income disparities can be justified by many arguments, such as: a decreasing marginal utility from income, a decreasing marginal product of local public goods, or some instability of the Tiebout equilibrium. Fourth, taxes are rather inflexible. They are narrowly restricted by legal procedures. Their effects strongly depend on the citizens' expectations and behavioral patterns. Hence, grants appear to be more suitable to react on economic shocks.[1]

Four major types of intergovernmental grants can be defined:

1. unconditional;
2. lump-sum conditional;
3. open-ended matching;
4. closed-ended matching.

First, an unconditional grant is a lump-sum grant without any restrictions on how it must be spent. The receiving government thus may choose among three general options: to increase its supply of any public good; to balance tax cuts; to withhold the money from its citizens. The choice implies a very high degree of power. Second, a conditional grant must be spent on a specific public program. The specification is made by the paying government. But, this does not necessarily make the paying government more powerful. If the receiving government is also able to finance the public program from other sources, then a conditional lump-sum grant might only serve as a substitution or lead to an increase of the general budget. Third, under a matching grant, the paying government contributes a fixed proportion to the receiving

[1] See Brennan/ Buchanan (1980), 181-3.

government's costs for a specific program. If the grant is open-ended, then the receiving government completely determines the absolute size. The paying government takes a financial risk. Fourth, a closed-ended matching grant limits the financial risk. However, such a limit might reduce the efficiency of the public programs. Anyway, matching grants tend to expand public budgets. They tend to raise governmental power as a whole.[2]

In a constitutional approach, it can be a hazardous way to tackle the problems of local tax competition by a system of intergovernmental grants. Such a system may offer to Leviathans a superior platform to make collusive arrangements which do contradict the principles of an efficient market for local public goods. On this platform, Leviathans can coordinate their policies to the detriment of the citizens. To avoid such negative kind of coordination, a constitutional assembly searches for the best possible constraints. These have to work inside the system of intergovernmental grants. Like other constraints, they depend on given resources and technologies. As a consequence, the respective constitutional rules also have to remain rather general and indirect. Again, the constitution can only provide a general framework for the specification of the best possible constraints. This general framework defines the conditions under which the citizens can make their specific choices. The choices can be by voice or by exit. In general, a system of governmental grants tends to reduce the impact of both types.

[2]See: Henderson (1985a), 191-8; Mueller (2003), 215-27; O'Sullivan (2003), 545-54.

Chapter 8

Summary

The power to tax can be justified by the task to provide local public goods. However, in a constitutional approach, we conceive the governments as Leviathans. A Leviathan will try to misuse the power to tax for his own purposes. Therefore, he should be constrained. The citizens can react on fiscal policy by voice or by exit. Both modes of reaction may thus adopt two tasks: first, to support the coordination on the market for local public goods; second, to constrain the tax misuse. For a local economy, we initially regard exit as the more fundamental mode of reaction. The citizens choose the package of local public goods which offers them the highest utility, by migration. But, migration also implies a shift of the housing demand. The local public goods market and the housing market are interrelated. This interrelationship may affect the way in which exit performs its two tasks.

Another basic method to constrain the power to tax is to stipulate (direct) rules for fiscal policy. Such rules can be found on three fields: the tax base, the rate structure, and the amount of revenue. From a constitutional perspective, we consider the first field as the most fruitful one. We ask: Which tax bases should Leviathans be allowed to use in a local economy? - Thus, we intend to analyze and to assess the effects of different tax bases in line with the principles of a constitutional approach. For this purpose, a new model framework has been needed.

Our general model describes a local economy in which three types of agents interact. The housing firms try to maximize their profits from housing production. The households try to maximize their utility levels from the consumption of composite private goods, housing, and local public goods. The Leviathans try to maximize their local fiscal budget surpluses from the

taxation of land rents, capital rents, housing sales, or housing property. The interaction of the agents takes place in two stages: In stage 1, migration is not possible; the land is distributed to the households; local fiscal packages are announced; housing is produced; the land owners are paid their rents. In stage 2, migration is possible, but only in the first period; local fiscal packages are offered; the households earn wages; and they make their decisions on residence, consumption, and the distribution of expenditures over time. The local economy will be in equilibrium, when the housing markets clear and each household reaches its maximum utility level.

Our general model is still very complex. To make a comparative static analysis tractable, we need further simplifications. This need has been met by the two-period tax models. We set up one two-period model for each of the four tax bases. In the comparative statics, we analyze how the specific tax base affects economic plans and housing prices in the local economy. Particularly, we find the following:

1. A change of the land rent tax rate negatively affects capital input, housing demand, first-period expenditure, and external housing prices; it positively affects internal housing prices. The composite private goods consumption remains unaffected.

2. Qualitatively, a change of the capital rent tax rate generates the same effects as a change of the land rent tax rate.

3. A change of the housing sales tax rate affects each of a household's choices and the external housing prices. The quality of the effects depends on a condition for the external housing price function.

4. A change of the property tax rate affects the same variables as a change of the sales tax rate. But, the condition for the external housing price function is different. Due to the higher complexity of this tax, the condition cannot be specified with respect to the first-period expenditure.

Hence, our comparative static analysis allows us to make some qualitative statements on the effects of a certain local tax base. Moreover, we learn what these effects depend on. But, we do not get a (common) yardstick which helps us to assess tax bases in a quantitative manner. It remains impossible to conclude whether one tax base might be more favorable than another. Nevertheless, we can draw some conclusions on the general rules under which the tax bases should be chosen. First of all, the quantitative effects of a tax base depend on the related preferences, the resources, and technologies.

The values of these parameters cannot be known behind a veil of ignorance. Hence, the choice of a tax base should be made in the postconstitutional stage. However, a constitutional assembly should stipulate general rules on the choice, before. The constitutional rules may define who, how, and when. Furthermore, the assembly can predict where market imperfections tend to appear and how they affect the choice of a tax base. Information costs and transaction costs seem to play major roles in this context. Hence, the assembly may stipulate rules which help to diminish these imperfections. Finally, the Leviathans are typically not interested in an efficient choice of the tax base. They seek to distort this choice to their own favor. To avoid this, the constitution may set (institutional) incentives which promote the reduction of tax misuse.

We find several reasons why a local economy where the Leviathans compete for higher tax base values may not reach an optimum in the provision of local public goods; even if this type of competition takes place under optimal tax rules. One major way to reduce tax inefficiencies could be to install a system of intergovernmental grants. However, by looking at the basic structure of such a system, we realize that it eases the constraints for Leviathans. The voice and exit options of the citizens become weaker. Thus, we may suspect that a system of intergovernmental grants rather raises than lowers the inefficiencies in the provision of local public goods.

Part II

Leviathans and their Relative Influence on Housing Prices

Chapter 9

Introduction

How effectively can the citizens constrain Leviathans by migration? - We briefly define Leviathans as monolithic and self-interested governments. The citizens may respond to their policies in two major ways: 'voice' and 'exit'. By voice, the citizens seek to adapt internal rules to their preferences. By exit, they leave the domain of the internal rules. Both ways of response tend to be more effective on a decentralized policy level. On a local level, a Leviathan's main task is to provide local public goods. By definition, a citizen can consume those goods only where she resides. Thus, there exists a tight link between the provision of local public goods and the housing market. A change of the local policy might affect the housing prices via migration. Typically, a citizen seeks to reside where her public contribution is lower or the supply of local public goods is higher than anywhere else. Hence, local public revenue variables are supposed to capitalize negatively into the housing prices; and local public expenditure variables positively. It is this type of capitalization which may constrain Leviathans, in the end.

However, housing markets tend to be extremely imperfect. Due to the 'fact of location', each housing unit represents a quasi-monopoly. On such a monopoly market, the overall transaction costs tend to be extremely high. We may ask now how the imperfections of the housing market affect the provision of local public goods. - Sure, there are many different ways in which a (local) government can attempt to reduce the imperfections of the housing market. Each related intervention changes the choice set of the citizens in a specific manner; each incurs its specific benefits and costs. A part of these benefits and costs materializes into the local fiscal budget. This is the part to which a Leviathan gives his main attention. He typically seeks to maximize the fiscal budget surplus from his housing market interventions.

Thus, he is interested in how a certain intervention changes his revenue and his expenditure. He will ask for instance: What are the effects on my tax bases? - What are the effects on my provision of local public goods? - How are these effects related to the local policy in other regions?

One special instrument to strengthen the connection between the housing market and the local fiscal budget is the property tax. This tax takes the housing value as its base. The tax is charged in every period of housing ownership. It treats housing as an asset. One part of the asset's value may be derived from the consumption of local public goods. Under perfect conditions, the supply of local public goods increases the total local housing value to the point where the property tax revenue covers the implied costs. One special problem however is that the amount of housing consumption may not depend on the total costs for local public goods. In order to solve this problem, it has been suggested to combine the property tax with zoning policy. But, such a policy tends to distort the housing market, at least if it is oriented towards tax revenue and not towards externalities. Another special problem is that the tax burden may not finally fall on those who consume the local public goods. It depends on the market conditions to which degree a housing owner can shift the burden to a respective renter or buyer.

The imperfections of the housing market make it, in general, more difficult to empirically estimate a respective price function. First, we need to think of how to delimit our relevant market. Each housing unit represents a quasi-monopoly. How can we best define groups of such quasi-monopolies? - One key criterion for a delimitation is the governmental structure. Each government tends to influence housing in a specific way. Another key criterion is the user status. Rental users usually have different preferences and means than owner occupiers. Anyway, our relevant market will keep some degree of heterogeneity. In order to capture the respective price, we thus need a statistical measure, as the median or the mean for example. Altogether, we particularly encounter the following methodological problems when we seek to empirically estimate a housing price function: first, unclear causal directions between the explained variable and explaining variables; second, interrelations between explaining variables; and third, impact of hidden variables.

The empirical estimation of a housing price function demands high quality of the used data. A first major demand is that the data set cover all the theoretically relevants variables. A second major demand is that the data set base on a consistent market concept. - In this study, we use data sets which meet these demands to a high degree. The data is taken from two sur-

vey programs by the U.S. Bureau of the Census: the American Community Survey and the Census of Governments. The first program covers most of the relevant housing market variables; the latter most of the relevant fiscal budget variables. Both programs take (among others) the county regions as a market concept. This concept seems highly consistent with our theoretical approach. There are 234 larger counties in our sample. The data stems from the years 2002 and 2003. In sum, the data set offers an extraordinarily good basis in order to estimate housing price functions with a focus on the impact of local fiscal policy.

Chapter 10

Related Literature

10.1 Models and Estimations

According to the 'traditional' theory of public finance, the incidence of a property tax is mainly determined by its division into a tax on land and a tax on improvements. This theory bases on a partial equilibrium analysis which ignores the effects of a property tax on other jurisdictions. It assumes that land is perfectly inelastic in supply, whereas the supply of improvements is perfectly elastic - at least in the long run. In this local economy, capital moves until its net return is everywhere the same. As a result, the part of the property tax burden which stems from the taxation of land falls on the land owners in the form of a lower land rent or a lower land value; and the part of the burden which stems from the taxation of improvements falls on the occupants, due to a fall of the capital return. The lower capital return leads to an investment level below the initial optimum. The market price of capital increases by the full amount of the tax, which results in a complete forward shifting of the burden from the improvements.[1]

Orr (1968), however, doubted that the supply of improvements is perfectly elastic. Hence, he wanted to assess the incidence of a property tax, empirically. Orr intended to test whether residential rents differ systematically with the differentials in the property tax rates. He assumed that insofar as this was not the case, the tax burden would be borne by the property owners. His sample consisted of 31 communities in the Boston area in 1959. As dependent variable, he could use the median monthly gross rent per room in

[1]For a more extensive treatment of the 'traditional' theory on property tax incidence, see Netzer (1966).

the taxing jurisdiction. As independent variables, the sample provided: the average price of land per acre; a dummy for sewerage and water supply; an index for accessibility to employment opportunities; an index for housing conditions; the annual public expenditure on education per pupil; the equalized property tax rate on all property. In order to estimate his equation, Orr used the OLS method. He got the following results: Each regression coefficient has its expected sign. Merely one regression coefficient is not significant: the one of the property tax rate. The regression has a high explanatory power. Hence, Orr concluded that a substantial part of the property tax burden must be borne by the property owners, and not by the renters.

Heinberg and Oates (1970) expressed two major objections against Orr's approach: First, they criticized his operational definitions. In particular, Orr had taken the median gross rent divided by the median number of rooms in all (!) housing units as the dependent variable. The correct denominator, however, would be the median number of rooms in the renter-occupied housing units. As the two authors claimed, in order to clarify the issue of property tax incidence, empirically, data would be needed that strictly separate the housing owners from the renters - with respect to any relevant variable. As long as such data is not available, effort should rather be directed towards the issue of whether property taxes are capitalized into housing values. - Second, the two authors criticized that several of Orr's independent variables are strongly influenced by his dependent variable. Thus, his regression equation likely suffers from some simultaneous equation bias. To avoid such bias, he would have to use a different estimation technique. - Based on their criticism, Heinberg and Oates modified Orr's approach. They used his data in order to test whether property taxes are capitalized into housing values. The two authors constructed an estimation equation with the median value of owner-occupied dwellings as the dependent variable. As independent variables, they deleted four of his control variables and added three new ones. By using the two stage least squares method (2SLS), they got to the following results: The equalized property tax rate has a negative and significant coefficient. Hence, there is evidence that property taxes are capitalized into housing values.[2]

In 1969, Oates presented an own study on the relationship between property values and fiscal variables. Oates set up an estimation equation in which

[2]Orr (1970) responded to the criticism by Heinberg and Oates (1970). In response to the first point, he remarked that the denominator in question increases the regression's explanatory power, considerably. However, the reasons for that remain unclear. In response to the second point, Orr claimed that the simultaneous equation bias has little relevance for his case. As he already had checked, regressions via 2SLS showed very similar results.

the median home value depends on two fiscal variables: the effective property tax rate and the annual expenditures on education per pupil. As control variables, he included: the linear distance from the business center, the median number of rooms per owner-occupied house, the percentage of houses built since 1950, the median family income, the percentage of families with an annual income below a certain level. To run his estimations, Oates took a sample of 53 municipalities in New Jersey of the period 1959-61. To exclude any simultaneous equation bias, he used the 2SLS method. He thus got the following results: Property taxes and property values have a significantly negative relationship, while expeditures per pupil and property values have a significantly positive relationship. Hence, both fiscal variables are capitalized. From the absolute values of the two coefficients, he concluded that the positive effects from the expenditures on education could nearly compensate for the large negative effects from the property taxes. Oates regarded these results as quite robust. - Curiously, an OLS regression delivered very similar coefficient values.

Oates' study from 1969 has become a milestone in its field. It triggered a wide and fruitful discussion. One early and important contribution was made by Pollakowski (1973). He argued, above all, that Oates had incorrectly chosen his right-hand variables. Firstly, from the broad range of public services, Oates had merely included expenditures on education into his estimating equation. But other public services determine the households' locational decisions, as well, and thus the value of residential property. Consequently, he would have to check the relationships among the expenditures for public services in order to correctly interpret his results. - Secondly, Oates had taken the median family income as a control variable. Pollakowski thought this to be inappropriate. He stressed that there probably exists a close relationship between family incomes and fiscal variables. Due to this, it seems as we should not hold the one side constant, if we let the other side vary. Moreover, he reminded that the property values are determined by the income of all potential renters or buyers, and not as much by the income of the actually residing families. Unfortunately, the groups of potential renters and buyers are difficult to discern. It therefore seems we rather should focus on the characteristics of the supply side.[3]

[3]In order to empirically assess the specification errors, Pollakowski replicated Oates' approach with a different sample. It turned out that Oates' specification yielded quite unsatisfactory results, then. - Oates (1973) replied to Pollakowski's criticism. He admitted that it seems problematic not to include the whole public expenditure into the estimating equation. Therefore, he revised his equation by including a variable on all other local public expenditure. This inclusion caused two major effects: the estimated coefficient for the property taxes became somewhat higher in absolute value; and the estimated

Edel and Sclar (1974) argued that Oates had partially brought the Tiebout model into a wrong perspective, since he had neglected to consider the supply adjustment on the market for local public goods. Oates had dealt with the issue how different preferences for packages of local public goods affect the housing market. From this perspective, capitalization indicates the adjustment of the housing market to the demand for local public goods. By contrast, Edel and Sclar assumed that the supply of local public goods also adjusts to the demand - at least in the long run; and such adjustments lead to reductions in capitalization. Hence, Edel and Sclar extended the Oates model to consider changes on the supply side. They searched for capitalization effects in the Boston metropolitan area in five decades: 1930-79. They set up an estimating equation in which the house prices depend on: the (nominal) property tax rate, the expenditures on schools, the expenditures on highway maintenance, and some control variables. The regressions show the following:

1. The property tax rate was negatively and significantly related to the house price in the years 1940, 1950, and 1970. The relationship was not significant in 1930 and 1960.

2. Expenditures on schools had the expected positive and significant relationship with house prices merely in 1950.

3. Expenditures on highway maintenance got insignificant coefficients for each year.

Taking a closer look at the insignificant coefficients and some descriptive statistics, Edel and Sclar presumed that the supply of school services adjusted towards an equilibrium, while the supply of highways did not. In general, the adjustment highly depends on the production function of the respective good. Therefore, the two authors advised to be very careful when making a judgement on the functioning of the Tiebout mechanism as a whole.

Church (1974) estimated a tax capitalization model which includes two simultaneous equations with two endogenous unknowns: the present value of residential property, and the effective property tax rate. The present value of residential property is defined as: the sum of all the discounted rental prices net of taxes and maintenance costs. It is described as a function of ninety (!) residential property characteristics and of the effective property tax rate. This tax rate, in reverse, depends on the property value. Due to

coefficient for the expenditures on education, too.

this simultaneity, Church chose the 2SLS method to estimate his model. He found out that the property tax was over-capitalized in Martinez, California, from 1967 to 1970. Church depicted several plausible explanations for this result. Let us remind four of them:

1. Assumptions on the discount rate or the deduction period for housing are mistaken.

2. The housing market is in disequilibrium.

3. The deadweight loss of the property tax is additionally capitalized.

4. Property owners expect assessment methods or nominal tax rates to change.

As Wales and Wiens (1974) asserted, Oates (1969) and other studies on the capitalization of property taxes suffer from two major shortcomings: First, these studies fail to isolate the effects of different fiscal variables. Residential choices might depend on several fiscal variables. These fiscal variables are supposed to be interrelated. As a consequence, the authors used some more specific estimation techniques to control for simultaneity, as the 2SLS in particular. Nevertheless, it remains difficult to interpret these results. Are they caused by some real effects or rather by the tautological nature of the problem? - To the extent that the model reflects the tautological nature, it biases the regressions towards a higher evidence for capitalization effects. - Second, Oates and some other authors, later on, chose the effective property tax rate as an explanatory variable. However, the effective tax rate also contains the explained variable. Hence, there exists some spurious correlation which supports the evidence of capitalization effects in an inadmissible manner. It does not appear as a great alternative to choose the absolute property tax level. The reason is that the absolute tax level tends to engender the omitted variable problem. Some of the omitted variables might be positively correlated with both, the absolute tax level and the property values. Thus, they suppress the evidence of capitalization effects in an inadmissible manner. - Now, the question arises: Is there any proper way out of these two problems? - Wales and Wiens intended to circumvent the first problem by using a particular sample. This sample stems from a single municipality, Greater Vancouver (Canada), where the citizens were offered the same package of local public goods, while they had to pay different property tax rates, since the constitution allowed to deviate in the assessments of basically identical properties. - Wales and Wiens tried to solve the second

problem as follows: They estimated the bias of the effective tax rate; and then corrected the respective coefficient for this bias. - Finally, by strictly following their own approach, the two authors did not find evidence for capitalization. Without the correction for spurious correlation, however, there appeared a highly significant capitalization effect.

As King (1977) emphasized, the capitalization of a tax depends on what the potential payers perceive and expect. Generally, they rather calculate with the tax burden than with the tax rate. The relationship between a tax rate and the respective burden can be complicated. In particular, this holds for the property tax. There exists, for instance, a huge variety of assessment methods. Governments do have the power to change these methods or the rate, even though it might be difficult for the owners to react on such changes. Hence, it seems to be rational for a potential tax payer to base her calculation on the current tax burden. - King claimed that tax capitalization effects be measured by the tax burden. He reestimated Oates' studies from 1969 and 1973. Instead of the effective rate, he integrated the average current tax burden into the estimation equation. Thus, he found out that the capitalization effects of the property tax had been overestimated by around 40%.[4]

Rosen and Fullerton (1977) supported the principle that capitalization should be primarily analyzed from a demand side perspective. Citizens do not ultimatively assess public goods according to what the governments spend on them but to the benefit they produce. Surely, it seems easier in most cases to measure the government spending. Oates had chosen this way by taking the annual expenditures on education per pupil to estimate capitalization of a local public good. Rosen and Fullerton demonstrated that Oates' approach can be improved by taking an 'actual' output measure to estimate capitalization. They first reestimated Oates' model with a more recent data set. Then, they replaced the expenditure variable by the test scores that the different communities had reached in a competition. Finally, they estimated their own model. Rosen and Fullerton got the result that about 90% of the property tax differentials are capitalized.

[4]According to Hamilton (1976), there exist only three factors which generate a significant correlation between fiscal variables and property values: 1) a lack of 'fiscal havens'; 2) systematic differences in the conditions to raise public revenue; 3) systematic differences in the production functions for local public goods. - Generally, Reinhard (1981) supported King's approach. However, he also found an econometric mistake in it. By correcting this mistake, he came to the conclusion that former approaches understimated, and not overestimated capitalization.

Biases in the estimation of capitalization might occur due to the theoretical concept, the econometric specification, or the data. Richardson and Thalheimer (1981) used data that seem particularly fit for an estimation of property tax capitalization. The data stems from Fayette County, Kentucky, and contains many details on physical and locational attributes of housing units sold in 1973-74. In Fayette County, there existed two geographically intermixed taxing districts, having substantially different property tax rates but essentially the same offering of public goods. The data set thus removes the necessity to isolate the public revenue effects from the public expenditure effects by the econometric specification. Since the assessment methods were the same in both taxing districts, the nominal property tax rate is equivalent to the effective rate. It thus seems plausible to attribute a deviation of the property tax burdens of two identical houses from two districts to government inefficiency. Richardson and Thalheimer estimated the capitalization with two different specifications: a linear and a multiplicative one. In the former, capitalization does not depend on the market value of the compared houses; in the latter, it does. With both specifications, the authors found strong evidence that the property taxes are capitalized into the housing sales prices. Under the multiplicative specification, the degree of capitalization was a bit higher.

There are two major classes of government action which might take influence on the housing prices. On the one side, we have the budget variables; on the other side, we have 'zoning'. Goodman (1983) constructed an estimation model which integrates both classes of government action. This model is based on the idea of hedonic prices, adapts techniques by Box and Cox (1962), and includes structural, neighborhood, fiscal budget, and zoning variables. Goodman used a data set of 1,835 single-family houses in the New Haven SMSA, sold in 1967-69. He examined variations within and among municipalities. This means: In the former perspective, differentials of tax bases are not considered, in the latter perspective, they are. - The author came to the following results: The property tax is capitalized into the housing prices, with statistic significance. In the 'within' perspective, the degrees of capitalization range from 97.9% to 113.6%. In the 'among' perspective, they reach on average 60%.

Palmon and Smith (1998a) assigned former approaches on the relationship between house values and (property) taxes to two major groups: amenity models and capitalization models. They described 'amenity models' as those in which a tax is considered as one among several attributes of houses. They identified three serious shortcomings of these models: First, the degree of

tax capitalization cannot be fully determined without certain assumptions on the discount rates and the investment horizon. Second, public goods variables, which are highly correlated with the tax, are hardly controllable. Third, house values may, in reverse, take influence on the tax. There is a substantial risk that the results suffer from simultaneity bias. - Palmon and Simth described 'capitalization models' as those in which a housing value is considered as the capitalized value of future housing services net of costs. As they stated, those models may, in principle, have the same three shortcomings. But, there exist also two rather specific ones. First, the estimated coefficient for the tax crucially depends on the conjectured proportion of net user costs within the selected group of regressors. Second, net user costs are usually kept constant across observations. This, however, may induce standard measurement error bias, if the unobserved net user costs are correlated with the tax.

Thus, Palmon and Smith sought to improve the capitalization model by several innovations. In particular, they replaced the net user cost by the rental value. In this context, the rental value is by itself a function of the rent-to-price ratio. By this innovation, the two authors intended to mitigate the problem of omitted variables. They worked with a micro data set on property characteristics in 45 suburbs of Houston, with similar demographics and amenities. Hence, possible variations of the effective property tax rate are not related to the provision of local public goods, which mitigates the problem of spurious correlations. Palmon and Smith thus estimated degrees of property tax capitalization which were around 100%. They concluded that the housing market agents rationally deduct property tax burdens from the house values. Only unexpected tax changes can be passed on to new home buyers.[5]

There are two standard approaches to estimate housing prices: the hedonic approach and the discrete choice approach. The hedonic price model considers housing as a bundle of utility generating characteristics. A consumer buys this bundle of characteristics rather than the product itself. The price of this product is a function of its diverse characteristics. The discrete choice model, in contrast, considers the characteristics of the choice. A consumer attaches a certain level of indirect utility to each housing option. The model analyzes the effects of the choice characteristics on the choice proba-

[5]In another study, Palmon and Smith (1998b) extended their empirical analysis in the following directions: more suburbs in the data set, more control variables in the regressions, and more variation in the specifications. Again, the estimated capitalization rates were around 1. They concluded that the Tiebout hypothesis and the Ricardian equivalence principle cannot be rejected.

bilities. These choice probabilites determine the housing prices. - Nechyba and Strauss (1998) judged the latter approach as more expedient for their particular issue. They estimated the impact of local fiscal and other variables on home values in six school districts in Camden County, New Jersey. Thus, the two authors specified two distinct models within the discrete choice approach: the one they called 'random utility' model, the other 'polytomous choice' model. In the first one, a consumer, by assumption, chooses her housing size prior to the choice of her community. In the second model, this assumption is relaxed. Community choice is regressed on personal, housing, and regional variables. These regressions also help to assess the robustness of the results from the random utilty model. Nechyba and Strauss found out that local crime rates, commercial activity, distance from a metropolitan area, and expenditures per pupil on public education play major roles in the consumers' community choices. The authors concluded that local governments should put more emphasis on public safety and educational quality.[6]

In general, discrete choice models of consumer community choices assumed that local fiscal variables are the same within a given jurisdiction. Uyar and Brown (2005) asserted that this assumption might oversimplify the actual choice situation. Thus, they constructed a discrete choice model which takes variations of the tax burdens and of the qualities of public goods within a given jurisdiction into account. The authors tested their model with data for 710 dwellings sold during a two year period in a mid-size city in the U.S.A. The city is a single taxing jurisdiction and a single school district. The data set also contains information on rejected offers. Uyar and Brown computed the probability of a sale. They chose three local fiscal, ten dwelling, nine neighborhood, and four personal characteristics as independent variables. The regressions delivered, in particular, the following results:

1. The effective property tax rate is the single most important proxy for a household's contribution to the local public expenditures within a given jurisdiction.

2. The condition of the streets is the best indicator for the quality of local public goods.

3. Both variables are significant determinants of the consumers' dwelling choices.

4. Omitting these two internal variables may likely lead to biased estimations.

[6] A former, salient contribution to the discrete choice approach is Quigley (1985).

Bayoh, Irwin and Haab (2006) intended to measure the impact of local fiscal variables on the consumers' community choices relative to the impact of household-level characteristics. They modified the previous discrete choice models in such a way that local fiscal effects due to school quality, crime level, taxes or income level can be separated from 'natural evolution' effects due to job location, residential filtering, or lifecycles. - To estimate their model, the authors used a data set on 2,074 homeowners living in Franklin County, Columbus, in 1995. They calculated the probability that a homeowner moves within that county. Their regressions show, above all, significance for the following variables:

1. school quality index;
2. total crime;
3. local property tax rate;
4. school district property tax burden;
5. per capita income;
6. percentage of housing stock built before 1970.

All of these variables got their expected coefficient sign. Moreover, Bayoh, Irwin and Haab contrived an equalization scenario for those variables. The scenario predicts, for instance, that an increase of the school quality index by 1% raises the probabilty that a homeowner moves to the respective community by 3.75%. From all of the included regressors, school quality shows the strongest impact on community choice. In general, the local fiscal effects appear to be stronger than the 'natural evolution' effects.

10.2 Lessons

The main question of the related literature could be put as follows: What are the effects of local fiscal policy on housing demand and housing prices? - A common base for answering this question was laid by Tiebout (1956). His central idea was that citizens can react on local fiscal policy by 'voting with their feet'. Tiebout wanted to show that citizens reveal their 'true' preferences for local fiscal policy by 'voting with their feet'. Due to this type of reaction, the whole economy may reach a Pareto optimum. - However,

study	*subject*	*model*	*sample*	*method*
Orr (1968)	incidence of property tax	traditional theory of public finance	31 communities, Boston area, MA, 1959	OLS
Oates (1969)	fiscal variables and property values	Tiebout, hedonic	53 municipalities, New Jersey, 1959-61	OLS → 2SLS
Edel/ Sclar (1974)	fiscal variables, property values, and supply adjustment	Tiebout	Boston area, MA, 1930, 1940, 1950, 1960, 1970	OLS
Church (1974)	capitalization of the effective property tax rate	hedonic, capitalization equations	957 single family houses in Martinez, CA, 1967-70	OLS → 2SLS
Wales/ Wiens (1974)	capitalization of property taxes	hedonic, market value equations	1800 sales of residential property, Greater Vancouver area, 1972	OLS, correction for spurious correlation

Table 10.1: Discussed literature: summary II-A

study	*explained variable*	*explaining variable*	*control variable*	*result*
Orr (1968)	median monthly gross housig rent	equalized property tax rate	5 variables on: land, local public goods, housing, employment	large part of property tax burden: on property owners
Oates (1969)	median home value	effective property tax rate, public expenditures on education per pupil	5 variables on: geography, housing structure, income	expenditures on education nearly compensate for property tax
Edel/ Sclar (1974)	house prices	equalized property tax rate, specific public expenditures	population density, owner occupation rate	public expenditures on schools: adjust towards equilibrium; highway maintenance: not
Church (1974)	property value, sales price	effective property tax rate	90 variables on housing conditions	over-capitalization of property tax rate
Wales/ Wiens (1974)	(log of) market value of improved property	property tax rate	set of house, land and location characteristics	capitalization is insignificant if corrected for spurious correlation

Table 10.2: Discussed literature: summary II-B

study	*subject*	*model*	*sample*	*method*
Richardson/ Thalheimer (1981)	tax capitalization	adopted from other empirical studies	sales of residences, Fayette County, KT, 1973-74	linear and multiplicative specification
Goodman (1983)	capitalization and differentials in tax bases	hedonic, restatement of Hamilton (1975)	sales of 1,835 houses, New Haven SMSA, CT, 1967-69	maximum likelihood
Palmon/ Smith (1998)	tax capitalization	hedonic, amenity versus capitalization	sales of 449 homes, 45 suburbs of Houston, TX, 1989	estimation of housing service values from rental data
Nechyba/ Strauss (1998)	local public services and community choice	community choice: random versus indirect utility	6 school districts in New Jersey, 1987	system of equations
Uyar/ Brown (2005)	local fiscal variables and dwelling choice	dwelling choice	sales of 710 dwellings, Midwest city	maximum likelihood
Bayoh/ Irwin/ Haab (2006)	local public goods and community choice	hybrid conditional logit choice	2,074 homeowners, 17 school districts in Franklin County, OH, 1995	maximum likelihood

Table 10.3: Discussed literature: summary II-C

study	*explained variable*	*explaining variable*	*control variable*	*result*
Richardson/ Thalheimer (1981)	sales price of single-family houses	dummy: tax district	32 variables on house and neighborhood attributes	capitalization is significant: multiplicative > linear specification
Goodman (1983)	sales price of single-family houses	deviation of property tax rate	21 variables on: population, housing, housing policy	capitalization: 'within' > 'among' communities
Palmon/ Smith (1998a)	rent-to-price ratio	property tax rate	living area in square feet, age of home, distance from CBD	capitalization rate is close to 1
Nechyba/ Strauss (1998)	probability: choice of a certain community	public expenditure on schools per pupil, other local fiscal variables	variables on community characteristics	expenditure on education and on police protection → attractiveness
Uyar/ Brown (2005)	probability: choice of a certain dwelling	effective property tax rate, dummy for street quality, school test scores	23 variables on: dwelling, neighborhood, income	effective property tax rate and street quality: significant
Bayoh/ Irwin/ Haab (2006)	probability: choice of a certain community	fiscal variables	community characteristics	school quality has strongest impact

Table 10.4: Discussed literature: summary II-D

depending on the tasks of local fiscal policy, the citizens' voting with their feet implies shifts of the demand for housing. The shifts may change the prices for housing. Here are the points where the related literature started its analysis.

In the related literature, we can find three major subjects:

1. local fiscal variables and the community choice;
2. the capitalization of local fiscal variables;
3. the incidence of local taxes.

According to the logic of the Tiebout model, the three subjects arise in that sequence: 1) In the real world, citizens have to account for mobility costs when they seek to optimize their consumption of local public goods. Moreover, income and the consumption of other goods might depend on the location. Thus, the community choice does not depend on the local fiscal variables, alone. We may ask how strong their real impact is. 2) When citizens choose a different community to optimize their consumption of local public goods, the demand for housing shifts. Depending on the elasticity of the housing supply, the demand shift leads to a change of the housing price. We say that the local fiscal variables 'capitalize'. In reverse, the 'capitalization' can also have an impact on the local fiscal variables. Hence, we may want to know how strong capitalization is in order to predict the equilibrium outcomes in a local economy. 3) In order to evaluate an equilibrium outcome, we may not only refer to its efficiency, but also to its distribution. In the original Tiebout model, the costs of local public goods are equally shared among the users. The user charges are neutral. However, in the real world, it might sometimes not be possible or desirable to use this revenue instrument. In the related literature, the most intensively discussed alternative is the property tax. The property tax puts its burden on two factors: land or dwelling. We may be interested in how this burden is shared between the land owners and the housing users.

The standard Tiebout model gives little advice on how to measure the effects of local fiscal policy on housing markets, empirically. In the related literature, we encounter two standard approaches for such a measurement, which are: a) the hedonic approach; b) the discrete choice approach. While the first focuses on the housing price, the latter does so on the housing demand. - a) The hedonic approach describes the housing price as a function of the utility generating housing attributes. The attributes can be assigned to

various groups, as for example: land, house, neigborhood, and community. Since housing is a durable good, a correct price function reflects the utility generating attributes over the whole consumption period. It covers all discounted net utility flows from the housing over time. Deductions from the gross flows may come from taxes, property depreciation, maintenance costs, or else. Hence, the housing price functions may differ in how they calculate the net utility flows and how they sum them up. - The discrete choice approach typically starts with a function in which a citizen's utility depends on housing attributes and other consumption factors. The explaining variables may be direct or indirect, deterministic or stochastic. The utility function is transformed into a discrete, probabilistic choice function. This function describes a (quantitative) connection between certain housing attributes and the probability that a citizen chooses to live in a respective house. Generally, it is assumed that the choice probability is independent of the attributes of all other available alternatives. The discrete choice models may differ in how they describe the sequence of choices, especially with respect to the housing size and the community.[7]

Many aspects of local fiscal policy and housing markets can hardly be measured. Local fiscal policy is usually combined with regulation. In our context, zoning policy might be the most important instance. In principle, there exists an infinite spectrum of how regulation is formulated and practiced. Dummy variables can merely give a rough idea about its extent and effects. Housing markets always have some monopolistic elements. Land cannot be replicated. Housing itself can be an extremely heterogeneous good. Market transactions take place in a relatively low frequency. Thus, real housing values are difficult to measure. Altogether, it seems that any specification of an estimation model on the effects of local fiscal policy on housing markets will remain clearly imperfect. One has to be content with an apparently best option out of a set which is highly open to attack.

In the related literature, there exists a strong variety of specifications. This variety can only partially be explained by the differences in the underlying models. In particular, each specification seems to be strongly influenced by the limitations of the used data. All these data sets have in common that they are taken from small, densely populated, North American geographical units. But they differ a lot in the choice of the measured variables. Some data sets stem from general surveys, others from internally related housing sales. Each data set transfers its limits to the estimating equation. -

[7]The assumption of 'independence of irrelevant alternatives (i.i.a.)' has widely been used in evolutionary game theory.

The related literature often specifies the dependent variable of the estimating equation as: median housing rent, median housing value, housing sales price, or probability of choosing a certain dwelling. A serious problem with the first three specifications is that they tend to exclude a large part of the total housing stock. By contrast, the last one, the probability, implies serious problems with its calculation. Here, we need to clarify what the right time framework for the choice of a dwelling is. - It is the main task of these estimating equations to explain the variation of their dependent variable by some specific local fiscal variables. As explaining variables have in particular been chosen: the property tax rate (nominal or effective), the property tax revenue, and the public expenditure on education. A general problem with local fiscal variables is that they tend to be interrelated. Because of this problem, it may become difficult to assess the real importance of a single local fiscal variable for the housing market. - Anyway, housing demand and housing prices are not only influenced by local fiscal variables. Hence, one needs to include some control variables to increase the explanatory power and the reliability of the estimations. As important control variables, we often find in the related literature: age of housing, owner occupation rate, distance from the CBD, household income, poverty rate, and some more.

There are many plausible reasons why the causal relationship between local fiscal policy and housing markets may not be uni-directional, as for instance: One local government raises its expenditures on education. This measure causes some households to move into this community. Then, the tax base and the usage of the infrastructure increase, there. The local government takes the additional tax revenue to spend more on parks and streets. Hence, when we seek to estimate the effects of local fiscal variables on housing markets, we have to deal with the problem of simultaneous equations bias. In the related literature, this problem has been intensively discussed. Unfortunately, this discussion has not yet reached a consensus on how to minimize the risk to get some simultaneous equations bias. Still, four different estimation methods are proposed:

1. OLS: justification: Monte Carlo studies show that OLS estimators are in general less sensitive to violations of assumptions than other estimators.

2. 2SLS: justification: this method selects the 'best' instrumental variables for the estimation; the estimator is consistent and quite robust.

3. Maximum likelihood/ limited information: justification: with normally distributed disturbances, this method is efficient among single-equation

estimators.

4. Systems methods: justification: these methods incorporate all available information; they have a smaller variance-covariance matrix than single-equation estimators.

Which method should be preferred, depends on the estimation model and on the data set. Thus, there exists merely a case-wise best method. Probably, the major way to find this one, is to test, to control, to vary and to compare each of them.[8]

The related literature has responded to the high complexity of the real relationship between local fiscal policy and housing markets with various models, various specifications, various sample structures, and various econometric methods. This variety has not yet led to a broad consensus about the correctness of the results. Let us now look at some of the controversial results, assigned to their specific subject:

1. Local fiscal variables and the community choice: In the literature, property taxes, education, security, and transportation turn out to be important criteria for why a citizen chooses to live in a certain community. A local government can influence these criteria and change the probability to attract citizens. However, it remains unclear how relevant such a change of the probability is for the local government.

2. The capitalization of local fiscal variables: Property taxes and the expenditures on education are strong candidates for capitalization. The regressional results are transferred into a (standardized) nominal scale. The related studies present property tax capitalization rates in a range from 0 to greater than 1. But in any case, it seems more suitable to use an ordinal scale for such a complex issue.

3. The incidence of local taxes: Here, the key question is: How elastic is the housing supply in comparison to the housing demand? - As the discussion has shown, it is extremely difficult to measure these elasticities. Therefore, it seems more expedient to develop some indirect indicator for the tax incidence. One possible way is to compare housing rents with housing values. A housing value should appear as the discounted

[8]For a discussion of the problem in the specific context, see: Heinberg/ Oates (1970); Orr (1970); Pollakowski (1973); King (1977); Gronberg (1979). For a general discussion of the simultaneity problem, see: Kennedy (1998), chapter 10; Green (2000), chapter 16.

sum of its (potential) rent. Unfortunately, it also can be difficult to measure the potential rent for an owner occupied house.

All these three special subjects are closely related to the issue of how efficiently local governments work in reality. Nevertheless, the related studies hardly present any explicit conclusions about this issue. In the following, we shall take up this task.

Chapter 11

Local Governments and Housing Markets

The need for housing plays a salient role in a typical household's economic plannings. On the one hand, the housing consumption may by itself contribute a salient part to the household's total utility, on the other hand, it may highly affect other options in the total consumption plan. The consumption of housing has three central dimensions: dwelling, site, and financing. Firstly, a housing offers certain conditions to dwell; and a dwelling has multiple features, like: size, layout, design, utilities, or structural integrity. Based thereon, the household searches for the combination of dwelling features that fits closest to its preferences. Secondly, a housing is connected with a certain site; and a site has also multiple features. These can be divided into four categories: natural, social, political, and economic environment. As some salient features, we shall mention: business structure, climate, demography, income, jobs, local public goods, political power, public rules, neighborhood, shopping, and social status. In contrast to the dwelling, each combination of these features must be unique, because each site has its own specific environment. Therefore, two households with identical preferences cannot reach the same optimum. Finally, housing causes particular challenges to finance it. Housing is durable. It claims a salient portion of a typical household's life-time income. The household may choose between renting and buying. The first option implies less financial responsability. However, it also gives less power to decide on special features of the dwelling. As an owner, a household may profit from the housing as an asset. It can integrate this asset into the financing of its housing. A housing loan that is backed by the related housing asset is called a mortgage. A mortgage tends to incur

a lower financial burden than an alternative loan construction. A mortgage can be standardized and traded on a secondary market. Both, debtors and creditors, have an interest in a positive development of the housing market.[1]

When a household demands housing, it normally must take the site dimension as given. The only possibility to coordinate its preferences with the site features is to move. Thus, households with similar preferences tend to move to the same location. The totality of households sorts itself into local groups of more homogenous housing preferences. The basic logic behind this type of sorting has been explained by Tiebout (1956). However, he referred to merely one site feature, namely to local public goods. In his model, Tiebout made three important assumptions about the demand for local public goods. First, households are perfectly mobile. Second, they have perfect knowledge of all community characteristics. Third, a household's income does not depend on where it resides. Furthermore, Tiebout made several assumptions on the supply of local public goods. The model shows the following: In an equilibrium, the number of locations has to be equal to the number of preference groups. Tiebout admitted that his assumptions were rather strict. Nevertheless, he believed that the sorting mechanism could be strong enough to determine the demand for local public goods in a real world local economy. However, let us recall that local public goods are just one out of many possible site features. It thus seems necessary that there exist as many communities as there exist households in order to reach a Tiebout equilibrium. Nevertheless, we can widely observe phenomena of sorting in real local economies. For instance, households are locally concentrated with respect to: income, education, ethnicity, size, age structure, or else. It seems plausible that these characteristics are closely related to the preferences for site features.[2]

A dwelling is a durable good which normally declines in value over time. The reason for the decline is that the amounts of services which a dwelling offers get smaller over time due to factors like physical deterioration, changes in technology, or changes in fashion. For some parts, a fall in value can be avoided by maintenance work. Such work, however, incurs costs. From a certain point on, it is more profitable for a household to invest into a new

[1]For more details on housing finance, especially on the relationships between housing ownership, mortgages and housing markets, see Mills/ Hamilton (1994), chapter 11.

[2]When a household has chosen its housing, it may have some options to influence the site features. These can be described as 'voice' options. Typically, the voice options are less costly but weaker than the exit options. - In the real world, snob effects tend to be important for the housing choice. Such effects rather weaken the efficiency of the Tiebout mechanism.

dwelling than to invest into the maintenance of an old dwelling. The position of this point crucially depends on the household's income. Generally, the higher its income is, the higher are its opportunity costs, the more it invest into a new dwelling. After a shorter time of usage, a household moves into a new dwelling and sells the old one to a household with a lower income. This way, dwellings are 'handed down' and the maintenance work reduced. It arises a kind of filtering process. The filtering model helps to explain some widely spread phenomena on real world housing markets. One of these phenomena is that higher income households live in lower age dwellings. Another one is that higher income households tend to live in greater distance to the city center. Typically, cities are built outwardly in circles, over time. Thus, the closer one moves to a city center, the older the housing stock is. Very often, the filtering model appears as a powerful tool to analyze the interaction of different segments on a market for housing.[3]

There are at least five reasons why housing markets work in a special way: First, housing is immobile; it is fixed to its own site. Therefore, a demander needs to adapt more strongly to the supply than on other markets. Second, housing has particularly many features; the number of possible combinations is particularly high. Therefore, the supply of housing is more heterogeneous than the supply of other goods. Each supplier has some monopoly power. Third, housing is durable. It involves long investment horizons. The investment risk becomes typically high. The changes in the housing stock are slow; new investments are made in a low frequency. Fourth, housing tends to be highly affected by externalities. Negative externalities arise in the form of: pollution, noise, crime, disease infection, or visual aspects. There are various ways how to internalize externalities. But these ways have to be found commonly by the whole affected group. Organizational problems may appear. Fifth, housing is costly. A typical household pays a large part of its income on housing. As a side effect of the consumption, the household may develop some personal attachment to it. Such attachment can be interpreted as a type of capital which gets lost when the household moves. But, moving also incurs monetary costs which are mainly related to transportation. To find an optimal housing, a household needs to invest in information. Due to various asymmetries, the information costs on the housing market tend to be very high.

Due to all of these reasons, a free housing market tends to generate sub-

[3]The filtering model also explains why lower-income households rather tend to rent than to own a housing. Renting incurs a moral hazard problem. Due to this, renters have less incentives to invest in the maintenance of a dwelling. For an older dwelling, maintenance is usually less profitable.

optimal outcomes; the price for housing by itself might coordinate demand and supply in an inefficient manner. The 'fair' value of a certain housing can only be assessed. There are three different valuation approaches: sales comparison, cost, and income capitalization. Each approach has its specific limits and drawbacks. Very often, they lead to highly deviating results for one and the same object. Hence, the 'fair' value remains quite uncertain. Moreover, its real determinants may change rather quickly and strongly. As a result, housing prices tend to fluctuate a lot. Such fluctuations destabilize the market. They may give wrong signals to the decisions on housing investment. This can lead to problems such as: abandonment, forming of ghettos, homelessness, discrimination, or congestion. Hence, it seems to be necessary that the government intervenes into the housing market. Four types of respective interventions have been widely practiced:

1. Housing assistance: The government offers financial aid to the demanders for housing. This can be in the form of: rent grants, ownership grants, mortgage programs, tax deductions, etc.

2. Housing development programs: The government subsidizes housing construction under certain conditions. The conditions can be put on: location, size, structure, inputs, etc.

3. Rent control policy: The government dictates the level or the development of a rent.

4. Public housing: The government itself enters the market as a supplier. It thus puts downward pressure on the rents. Furthermore, it can guarantee some affordable dwelling to a specific group of citizens.

All these four types of interventions have specific drawbacks. In general, it is difficult to judge whether their net welfare effect is positive or negative. But, it should be possible to measure their effects on the housing prices.[4]

[4]For more on housing valuation methods, see Lusht (1997). - For more on housing policies, see O'Sullivan (2003), chapter 18.

Chapter 12

The Data

Based on the theoretical concept of the three central dimensions of housing (dwelling, site, financing), one can derive a huge range of potentially important determinants of the housing prices. Therefore, if one estimates a housing price function empirically, the quality of the results highly depends on how well the used data set covers the range of all theoretically important determinants. Moreover, it is essential that the data set follows the same market concept. Every empirical variable should be defined on the same distinctions of geographical areas, population groups, or governmental units. Our data set seems to fulfill both criteria (coverage of theoretical range of variables, same market concept) to a very high degree. The data set is constructed from two distinctive survey programs: the 'American Community Survey (ACS)' and the 'Census of Governments (CoG)'. Both programs are run by the U.S. Bureau of the Census.

The U.S. Census Bureau has fully implemented the ACS as a part of the '2010 Decennial Census Program' since 2005. There are three main intentions behind the ACS: a) to deepen the results from the Decennial Census; b) to keep pace with developments of population and housing inside the U.S.A.; and c) to guide scientific effort towards lower level objects. The Bureau has planned to collect a 'full' list of data for each area in the U.S.A. with a population of 65,000 or more, starting in 2006. For the years 1999 to 2004, the Census Bureau already offers data for most areas in the U.S.A. with a population of 250,000 or more, plus several selected areas between 65,000 and 250,000. The earlier data, however, partly base on extrapolations. Nonetheless, they can be regarded as highly reliable.

The U.S. Census Bureau has guided a CoG since 1957 at five-year inter-

vals. The CoG from 2002 covers the whole range of state and local government financial activities in the fiscal year 2001-02. In 2002, there were in total 87,525 local governments in the U.S.A., namely on five distinct levels: 3,043 on counties, 19,429 on municipalities, 16,504 on townships, 13,506 on school districts, and 35,052 on special districts. These governments received in total a revenue of USD 1,083,129 millions; of which the highest share went to the school districts (32.4%), the second to the municipalities (31.2%) and the third to the counties (24.0%). The local governments differ quite strongly in the functions that they perform, even those on the same level. The legal 'constitution' of a local unit, its degree of autonomy, crucially depends on the state law. Under its given constitution, however, each unit may specify the government actions by itself, with respect to the specific local conditions. Hence, it often turns out to be difficult to compare data from single local governments. - Anyway, the U.S. Census Bureau aggregated the budget figures of all local governments in the respective county area. County areas are spread over nearly the entire U.S.A., and they are mutually exclusive. This aggregation makes local policy easier to compare. It offers to us a common base for the ACS data.[1]

[1]The U.S. Bureau of the Census distinguishes between: 'general-purpose governments' (counties, municipalities and townships) and 'limited-purpose governments' (school districts and special districts). This (rough) distinction, however, seems to distort the 'real picture' quite strongly.

Chapter 13

Descriptive Statistics

A housing price is the price which an economic entity pays for the right to consume services from a certain housing object. Since housing objects may offer very different services, each object basically has its own price. However, the services from different objects may also be related to each other; especially via the site dimension. Under a given perception of such a relationship, we can define a housing market. Nonetheless, a certain housing market does not need to have a unique price. Thus, we generally use certain statistical measures in order to describe the price situation on a housing market. There are two principle ways to obtain the right to consume services from a certain housing object: either purchase or rent. Only under very restrictive conditions, the purchasing price is the present value of all arising rental payments. For various reasons, such as information asymmetry, risk inclination, taxation, or regulation, the purchasing price and the rent price usually are not equivalent. Therefore, a housing market may split into two sub-markets: one for ownership, the other for renting.

In our sample, the housing markets are delimited by county areas. There are five distinctive statistical measures for the housing prices. Three of these measures refer to the ownership sub-markets (the lower value quartile, the median value, the upper value quartile); and the other two to the renting sub-markets (the median contract rent, the median gross rent). The tables 13.1 to 13.3 give some detailed information about these five housing price variables in 2002 and 2003. As we can see, the housing value variables have highly different properties than the housing rent variables. The housing value variables are more dispersed and less symmetric. Thus, the standard deviation of a housing value variable is more than 50% of its mean; for a rent variable, it is less than 30%. - The joined range of the second and the third

quartile of the median housing values in 2002 (HSVALM02) is about 75% of its median; for the gross median rent in 2002 (RENTGM02), the range is about 42%. - All the five variables are skewed to the right and non-normally distributed; but the housing values are clearly more so. From 2002 to 2003, the housing values grew on average by around 10%, the rents by just around 4%. Each of the five variables became more symmetric distribution. In sum, housing values seem to be less stable and more dispersed than housing rents.

variable	**mean**	**std. dev.**	**skewness**	**J.-Bera**
HSVALL02	126767	66591	1.878	370
HSVALM02	172595	91255	1.913	343
HSVALU02	244671	130008	1.813	249
RENTCM02	623.85	173.44	0.943	51.0
RENTGM02	711.85	163.36	0.976	56.2
HSVALL03	140797	79273	1.705	235
HSVALM03	191668	106134	1.707	213
HSVALU03	270519	146860	1.643	177
RENTCM03	642.98	174.70	0.721	21.0
RENTGM03	737.25	169.12	0.714	20.4

Table 13.1: Housing prices in 2002 and 2003

Fiscal budgets may reflect the essence of public policies, but they hardly reveal everything about the power of the respective governments. The power of a government also depends on the rules which define its allowed connections to the citizens or to the other governments. Such rules may be various, extensive, and complicated, which makes it difficult to extract their effects from the budget figures. Nevertheless, the local fiscal budget is supposed to be the principal base in order to analyze the effects of local policy on housing prices. Some selected local fiscal variables for the U.S.A. in 2002 are presented by the tables 13.4 to 13.6. The two major sources of local public revenue were intergovernmental transfers (IGMREV) and property taxation (PPTAX). Together, they amount to nearly two thirds of the total revenue. These two sources show comparatively little dispersion and moderate asymmetry, as both, per capita values (c) and budget shares (b). While in the distribution of the intergovernmental revenue per capita, there appears one outlier, District of Columbia, its joined range of the second and the third quartile is a bit smaller than the one of the property tax revenue per capita. Other taxes (OTHTAX) and current charges (CUCHAR) appear as two highly dispersed and asymmetric variables; the first especially as a per capita variable, the latter as a budget share. The distribution of the total

rank	*HSVALM02*	*county*
1	608,833	San Mateo (CA)
2	571,708	Santa Clara (CA)
3	530,662	San Francisco (CA)
...	...	...
23	321,327	Norfolk (MA)
...	...	...
59	198,260	Washtenaw (MI)
...	...	...
117	146,452	Maricopa (AZ)
118	146,303	Lane (OR)
...	...	...
176	114,172	Clayton (GA)
...	...	...
212	90,600	Polk (FL)
...	...	...
232	61,914	Cameron (TX)
233	61,468	Hidalgo (TX)
234	60,854	Jefferson (AK)

Table 13.2: Ranking of the median housing values in 2002

rank	*RENTGM02*	*county*
1	1,398	San Mateo (CA)
2	1,300	Santa Clara (CA)
3	1,185	Fairfax (VA)
...	...	...
23	945	Solano (CA)
...	...	...
59	808	King (WA)
...	...	...
117	690	Orange (NY)
118	689	El Paso (CO)
...	...	...
176	589	Onondaga (NY)
...	...	...
212	531	Oklahoma (OK)
...	...	...
232	442	Cameron (TX)
233	435	Luzerne (PA)
234	378	Schuylkill (PA)

Table 13.3: Ranking of the gross median rents in 2002

expenditure (TLEXPD) resembles the one of the total tax revenue. In sum, local governments do rely more on intergovernmental transfers and property taxes than on other sources of revenue.

variable	**mean**	**std. dev.**	**skewness**	**J.-Bera**
IGMREV02c	1.2938	0.5923	1.961	649
IGMREV02b	0.3451	0.1033	0.244	2.33
TLTAX02c	1.3788	0.5534	2.673	2721
TLTAX02b	0.3779	0.1163	0.203	3.63
PPTAX02c	1.0445	0.4434	1.073	64.7
PPTAX02b	0.2912	0.1207	0.635	15.7
OTHTAX02c	0.3344	0.3684	5.781	31769
OTHTAX02b	0.0867	0.0680	1.225	83.1
CUCHAR02c	0.5331	0.4273	4.063	7021
CUCHAR02b	0.1380	0.0822	3.719	4760
TLEXPD02c	3.9112	1.2758	2.7710	2790

Table 13.4: Local fiscal variables: 2002

Housing prices and fiscal variables may form various impact structures (over time). This is mainly because both, housing markets and fiscal budgets, are subject to complexity increasing forces. Some complexity increasing forces of housing markets are: technological progress, population growth, environmental change, and regulation. A higher complexity also leads to a higher differentiation of prices. Housing values become more volatile and more difficult to assess. Thus, the relationships between different prices become less determinate. Some complexity increasing forces of fiscal budgets are: political party competition, bureaucracy, rent seeking, and information asymmetry. A higher complexity of a fiscal budget also means that a single fiscal variable becomes more interrelated with other fiscal variables. It therefore gets more difficult to predict how a change of one variable will affect the others. Since budgets have to be balanced, we first suppose that a fiscal revenue variable is positively related to the public expenditure. But, this revenue variable can be negatively related to other revenue variables. Thus, the total impact on the public expenditure will not be clear. Such an increase in uncertainty carries over to the impact on housing prices. In general, we suppose that the fiscal revenue is negatively related to housing prices, and that the fiscal expenditure is positively related to housing prices. But, such a general rule may find some narrow limits at the balanced budget rule and the various interdependencies of single fiscal variables.

Table 13.7 gives some first indications for the common dependency struc-

rank	*IGMREV02c*	*county*
1	5.030	District of Columbia (DC)
2	3.438	Suffolk (MA)
3	3.221	Tulare (CA)
...	...	...
23	1.946	Santa Cruz (CA)
...	...	...
59	1.531	Washoe (NV)
...	...	...
117	1.172	Guilford (NA)
118	1.170	Polk (IO)
...	...	...
176	0.909	Ada (ID)
...	...	...
212	0.723	DuPage (IL)
...	...	...
232	0.333	Denton (TX)
233	0.312	Collin (TX)
234	0.199	Honolulu (HW)

Table 13.5: Ranking of intergovernmental revenue per capita in 2002

rank	*PPTAX02c*	*county*
1	2.767	Nassau (NY)
2	2.523	Westchester (NY)
3	2.425	Morris (NJ)
...	...	...
23	1.603	Essex (NJ)
...	...	...
59	1.267	Cuyahoga (OH)
...	...	...
117	0.953	Dauphin (PA)
118	0.949	Contra Costa (CA)
...	...	...
176	0.740	Seminole (FL)
...	...	...
212	0.547	Hidalgo (TX)
...	...	...
232	0.316	Mobile (AL)
233	0.313	Madison (AL)
234	0.186	Jefferson (AR)

Table 13.6: Ranking of property tax revenue per capita in 2002

ture of housing prices and fiscal variables in US-counties in 2002. A correlation coefficient of nearly 0.9 indicates a narrow relationship between the median housing value (HSVALM02) and the median gross rent (RENTGM02). Thus, these counties seem to define housing markets which hardly segregate between ownership and renting. From the figures in that table, we may adopt the following indications for the dependencies between the fiscal variables: a) Intergovernmental revenue (IGMREV02) has a high correlation (0.71) with total expenditure (TLEXPD). It thus looks as if intergovernmental transfers are rarely used as substitutes for other sources of revenue. b) The property taxes (PPTAX02) have a high impact on the total tax revenue (TLTAX02). This impact surely results from being the largest part of it. But, these taxes do not show a high influence on other sources of revenue, neither on total expenditure. c) In contrast to property taxes, other taxes (OTHTAX02) show a significant influence on the intergovernmental revenue. The respective coefficient is 0.33. Their influence on the total expenditure even seems much stronger, with a coeffiencent of 0.61. - In our sample, some of the correlations between fiscal variables and housing prices do not correspond to what we would expect, based on our general theoretical rule. Especially, the property tax revenue is positively correlated with the housing prices; and the respective coefficients are higher than those of other fiscal variables, total expenditure included.

	HSVALM	*RENTGM*	IGMREV	TLTAX	PPTAX	OTHTAX	TLEXPD
HSVALM02	1.0						
RENTGM02	0.883	1.0					
IGMREV02c	0.149	0.018	1.0				
TLTAX02c	0.398	0.441	0.146	1.0			
PPTAX02c	0.436	0.516	-0.090	0.749	1.0		
OTHTAX02c	0.073	0.042	0.329	0.602	-0.079	1.0	
TLEXPD02c	0.309	0.236	0.710	0.579	0.212	0.611	1.0

Table 13.7: Correlations: housing prices and fiscal variables: 2002

Chapter 14

Regressions

Housing consumption has three key dimensions, namely: dwelling, site, and financing. A local government may be allowed and also able to intervene into all of these dimensions by various measures. Let us mention some important types of intervention: a) A local government stipulates specific rules on the site and the structure of a house by zoning policy. Thus, the stock of housing becomes more homogeneous. b) A local government stipulates certain taxes or certain fees: A property tax influences the prices for housing. A sales tax changes the households' consumption structures. An income tax lowers the households' consumption levels. Finally, a fee determines the demand for the local public goods and thus their degrees of congestion. c) A local government decides on the provision of local public goods. Thus, it determines one site feature, directly, but also other features, indirectly, as for instance: the business structure, demography, employment, or political power. - In sum, there are various public measures to influence the housing market. Each of them might have its own specific influence. Each of them might somehow be related to the fiscal budget variables. Hence, let us ask at first: What influence does one specific fiscal variable take by itself on the housing prices?

Table 14.1 presents five simple regressions of the median housing value, and table 14.2 five of the median gross rent. Each of the five fiscal variables was logarithmized when this could improve its performance as a single regressor. Regarding both dependent variables, the fiscal variables performed as follows: The property tax revenue (PPTAX02c) gets the highest explanatory power. Its regression coefficients have the highest significance. Furthermore, Ramsey's RESET test does not indicate misspecification. But, this variable also creates the residuals with the highest skewness. The (logit) total tax revenue (TLTAX02c) is nearly as strong in explanatory power and in the sig-

nificance of its regression coefficients. Its residuals are rather weakly skewed. In the logit form, the variable does not show clear evidence for misspecification, anymore. The total expenditure (TLEXPD02c) seems to have moderate relevance for the housing prices. While its residuals show highly symmetrical distributions, it generates the least significant constant values. However, this weakness seems not to stem from the chosen specification. The two remaining local fiscal variables, intergovernmental revenue (IGMREV02c) and other tax revenue (OTHTAX02c), finally turn out to have little relevance for the housing prices.

	(1)	(2)	(3)	(4)	(5)
c	152035	159903	79735	185192	32382
	(9.22)	(20.4)	(5.0)	(19.75)	(1.01)
IGMREV02c	30633				
	(2.64)				
ln		123899			
TLTAX02c		(6.91)			
PPTAX02c			107169		
			(7.15)		
OTHTAX02c				19366	
				(1.03)	
ln					120474
TLEXPD02c					(5.09)
R-squ.	0.029	0.171	0.20	0.005	0.10
J.-Bera	168	195	344	197	122
RESET	0.025	1.525	0.278	0.001	0.474

Table 14.1: Simple regressions: median housing value in 2003 on fiscal variables

There are five key reasons why housing markets work in a particular way, namely: immobility, heterogeneity, durability, high costs, and externalities. The first four of them are rather independent of each other. However, each of them invigorates the fifth reason. Consequently, externalities normally play a central role on housing markets. The problems which they cause tend to be more difficult to solve than those on other local markets. Typical instances for externalities on housing markets stem from: the housing size, its layout, its design, its structural integrity, the social status of the dwellers, and the local public goods. All of these factors may be interrelated. They all may affect the prices of other, nearby housing. Unfortunately, some of them could do this in a negative and distortionary way. Immobility, heterogeneity, durability, and high costs on housing markets make it more difficult for the

involved agents to assess and to correct the given externalities. In general, the government might be able to reduce such externality problems by fiscal policy or regulation (zoning in particular). The government will be the more successful with its interventions, the more it considers the given interrelations on the housing market.

The particular features of a housing market may cause severe methodological problems for the estimation of a hedonic housing price function. Such problems may generally appear in three distinct forms:

1. some explaining variables are interrelated;
2. the causal link between an explaining and the explained variable is unclear;
3. the function is decisively influenced by some hidden variables.

In order to tackle these problems, we will follow a special methodological approach. This approach shall help to analyze the role of fiscal variables in the determination of housing prices in relation to other determinants. The central issue in this context is how to avoid distortions from simultaneity or endogeneity. Our approach is divided into four steps:

1. We select all non-fiscal variables which have a higher correlation with the housing prices than the fiscal variables. Then, we regress the housing prices on the whole set of the selected variables.
2. We remove all redundant non-fiscal variables by a redundancy test. The gives us a presumably reliable non-fiscal control function.
3. We integrate each fiscal variable separately into the control functions; we estimate these new equations with the OLS method.
4. We estimate the new equations with the 2SLS method.

What we seek to evaluate is the relative influence of local fiscal variables on the housing prices. Our methodological approach can thus be justified by the following reasons: Step 1 and step 2 jointly offer a simple but also effective way to select the most important non-fiscal determinants of the housing prices, out of all available variables. This type of selection supports the degree of determination for the related regressions. Furthermore, it suppresses the appearance of biasing regressors. Step 3 offers some preliminary and

exploratory insights on the specific roles of the fiscal variables. Surely, there are many (strong) theoretical indications that some endogeneity is involved in such estimations. Thus, the endogenous variables may become random, such that a change in any disturbance term changes all the endogenous variables, simultaneously. The OLS estimator becomes (even) asymptotically biased. However, the real endogeneity structure can hardly be identified. There remains some doubt. Moreover, alternative estimators may perform worse under specific conditions. Step 4 uses a specific simultaneous equations estimator. The 2SLS is a instrumental variable technique. It estimates a function via a set of instrument variables. In general, one such variable is the more expedient, the higher it is correlated with its regressor for which it acts. Hence, the determination of the regressions also depends on the available exogenous variables. Nevertheless, the 2SLS estimator is consistent and quite robust.[1]

In table 14.3, we can see some results of step 1. Out of 27 non-fiscal variables, there are 8 which have a higher correlation with the housing prices than the fiscal variables. 6 of them belong to the income category; 2 to the mobility category. Together, the 8 variables reach more explanatory power for the median gross rent (RENTMG03) than for the median housing value (HSVALM03). This corresponds to the observation that the regression of RENTMG03 is more likely to be linear.

Some results of step 2 are shown by the tables 14.4 (1) and 14.5 (1). By removing the redundant variables, we keep three non-fiscal variables in both cases. These three reach an explanatory power which is nearly as high as the one of the eight. By far the biggest contribution comes from PCINC03 or HHMINC03, respectively. The removal of the redundant variables changes little with respect to the linearity of the regressions.

The columns (2) to (5) in the tables 14.4 and 14.5 present some results derived by step 3. Now, the four most important fiscal variables are separately integrated into the two control regressions. The OLS method is (still) used. As it turns out, ln TLEXPD02c is the only fiscal variable which reaches significance in the regression of HSVALM03. It is the only variable which gives a positive contribution to the explanatory power. The integration of the fiscal variables shows little impact on the RESET values. The specification problem remains evident. In the regressions of RENTGM03, the two fiscal variables ln TLTAX02c and ln TLEXPD02c reach significance on a 1%-level; ln PPTAX02c on a 5%-level. By each fiscal variable, the explanatory power

[1] For a more extensive discussion of the simultaneity problem and various related treatments, see Kennedy (1998), chapter 10.

becomes somewhat higher. In two cases, there arises stronger evidence for misspecification.

In step 4, we estimate our housing price functions with the 2SLS method. Some of the results are shown in table 14.6 and 14.7. In the 2SLS regressions of HSVALM03, the local public expenditure for education per capita (EDUCAT02c) is used as the instrument variable for each of the four fiscal regressors. Thus, each fiscal regressor becomes significant. But, the gain in significance for the first three variables is accompanied by a loss in significance for PCINC03. As a result, the explanatory power of each respective regression falls. In the 2SLS regressions of RENTGM03, the fraction of workers that use public transportation (WKPBTRP03) is used as the instrument variable for each fiscal regressor. Thus, each fiscal regressor becomes more significant such that it reaches a level of 1%. In particular, it holds for the regressions (2) and (3) that the gain in significance for the fiscal variable comes along with a loss in significance for HHMINC03 and a loss in explanatory power. The coefficient for the constant c becomes insignificant in regression (2).[2]

[2]As already mentioned, there are two criteria for the choice of an instrument variable: first, it must be correlated with the explanatory variable in the regression; second, it must be uncorrelated with the disturbances in the regression. EDUCAT02c and WKPBTRP03 appear as the best respective choices from our data; although their limitations as instruments are quite obvious.

	(1)	(2)	(3)	(4)	(5)
c	738.8	676.2	523.3	732.2	547.2
	(61.9)	(57.0)	(21.8)	(48.9)	(10.5)
ln	-9.212				
IGMREV02	(-0.35)				
ln		129.9			
TLTAX02c		(8.76)			
PPTAX02c			204.8		
			(9.70)		
OTHTAX02c				15.24	
				(0.51)	
ln					143.7
TLEXPD02					(3.72)
R-squ.	0.001	0.248	0.288	0.001	0.056
J.-Bera	21.2	11.9	41.7	19.3	15.6
RESET	2.494	0.069	0.444	0.296	0.573

Table 14.2: Simple regressions: median gross rent in 2003 on fiscal variables

	HSVALM03	RENTGM03
c	-406594	-33.579
	(-8.30)	(-0.51)
FGBORN03	463710	604.36
	(8.78)	(8.52)
BACHPL03	-375597	-55.894
	(-4.80)	(-0.53)
AVTRTM03	820.22	6.8748
	(0.66)	(4.14)
SFEMPL03	1099974	948.06
	(8.27)	(5.31)
INTRST03	204239	159.90
	(2.43)	(1.42)
BELPOV03	413306	-116.64
	(3.22)	(-0.68)
PCINC03	13.31	0.0059
	(6.55)	(2.18)
HHMDINC03	1.5427	0.0054
	(2.15)	(5.58)
adj. R-squ.	0.758	0.828
RESET	45.6	0.916

Table 14.3: Multiple regressions: housing prices in 2003 on non-fiscal variables: OLS

	(1)	(2)	(3)	(4)	(5)
c	-236646	-244289	-237031	-248358	-269315
	(-11.54)	(-10.75)	(-11.49)	(-9.90)	(-10.53)
ln		-11106			
TLTAX02c		(-0.78)			
PPTAX02c			-2421.1		
			(-0.20)		
ln				-9782.5	
PPTAX02c				(-0.81)	
ln					29612
TLEXPD02c					(2.11)
FGBORN03	518239	524065	520236	524996	484248
	(11.21)	(11.19)	(11.0)	(11.18)	(9.96)
SFEMPL03	1016567	990522	1008519	988632	1022859
	(7.60)	(7.18)	(7.22)	(7.15)	(7.70)
PCINC03	10.101	10.610	10.244	10.646	9.971
	(13.37)	(10.63)	(9.93)	(10.52)	(13.25)
adj. R-squ.	0.720	0.720	0.719	0.720	0.724
RESET	32.8	31.8	32.8	31.4	35.5

Table 14.4: Multiple regressions: median housing value in 2003 on fiscal variables and on control variables: OLS

	(1)	(2)	(3)	(4)	(5)
c	93.655	109.31	89.420	115.79	10.307
	(3.81)	(4.44)	(3.63)	(4.24)	(0.31)
ln		49.756			
TLTAX02c		(3.15)			
PPTAX02c			21.447		
			(1.52)		
ln				26.011	
PPTAX02c				(1.81)	
ln					66.261
TLEXPD02c					(3.62)
FGBORN03	636.63	607.23	619.95	619.52	551.84
	(10.30)	(9.90)	(9.90)	(9.96)	(8.54)
SFEMPL03	830.44	918.01	893.47	894.47	817.63
	(4.69)	(5.22)	(4.93)	(4.98)	(4.74)
HHMINC03	0.0097	0.0090	0.0092	0.0091	0.0098
	(22.30)	(18.61)	(17.24)	(17.48)	(23.12)
adj. R-squ.	0.807	0.817	0.808	0.809	0.817
RESET	0.90	0.751	0.868	1.412	1.458

Table 14.5: Multiple regressions: median gross rent in 2003 on fiscal variables and on control variables: OLS

	(1)	(2)	(3)	(4)
c	-170571	-229492	-172291	-320832
	(-3.75)	(-10.62)	(-4.08)	(-6.42)
ln	96009			
TLTAX02c	(1.68)			
PPTAX02c		44996		
		(1.82)		
ln			53753	
PPTAX02c			(1.78)	
ln				76309
TLEXPD02c				(1.85)
FGBORN03	467875	481128	481107	430648
	(7.84)	(9.24)	(9.04)	(6.46)
SFEMPL03	1241723	1166132	1170065	1032780
	(6.19)	(7.23)	(7.05)	(7.58)
PCINC03	5.695	7.434	7.102	9.767
	(2.07)	(4.47)	(3.80)	(12.38)
adj. R-squ.	0.650	0.699	0.686	0.711

Table 14.6: Multiple regressions: median housing value in 2003 on fiscal variables and on control variables: 2SLS

	(1)	(2)	(3)	(4)
c	135.27	54.119	295.51	-131.64
	(4.86)	(1.56)	(3.68)	(-1.97)
ln	132.27			
TLTAX02c	(3.71)			
PPTAX02c		200.21		
		(2.96)		
ln			237.22	
PPTAX02c			(2.77)	
ln				175.70
TLEXPD02c				(3.86)
FGBORN03	558.47	480.94	480.60	407.45
	(8.27)	(5.0)	(4.69)	(4.51)
SFEMPL03	1063.2	1418.8	1414.4	795.81
	(5.48)	(4.66)	(4.37)	(4.27)
HHMDINC03	0.0078	0.0052	0.0048	0.0101
	(11.45)	(3.27)	(2.58)	(21.47)
adj. R-squ.	0.792	0.673	0.628	0.786

Table 14.7: Multiple regressions: median gross rent in 2003 on fiscal variables and on control variables: 2SLS

Chapter 15

Summary

Which role do housing markets play in local fiscal competition? - The citizens may respond to local fiscal policy by migration. Migration implies shifts of the housing demand. Local fiscal policy capitalizes into housing prices. Basically, one presumes that fiscal revenue variables get negative capitalization rates; and fiscal expenditure variables positive ones. However, housing markets have special features; some of which could impair capitalization. We thus ask: How effectively do the citizens constrain Leviathans by migration?

A citizen optimizes her housing demand in three dimensions: dwelling, site, financing. Local fiscal policy is just one feature of the site dimension. In sum, there are many features and thus many reasons why a citizen may adapt her housing demand. Anyway, she will face a market which has the following special features: immobility, heterogeneity, durability, proneness to externalities, cost extensiveness. On a free market, these special features altogether tend to create coordination problems. To solve these problems, one can consider various types of local government intervention, as for instance: housing assistance, housing development programs, rent control, public housing. But, if a local government behaves as a Leviathan, then it might misuse its interventions in order to ease its constraints which are generated by migration.

In general, a Leviathan profits from high housing prices in his region. Therefore, he has an interest that the (internal) capitalization rates of his local fiscal variables are high (in absolute terms). One variable which normally forms a particularly strong connection with the housing prices is the property tax. Under perfect market conditions, the property tax would capitalize into the housing prices at a rate of -1. Then, every Leviathan would be forced

to choose the socially efficient tax rate. Migration would work as a perfect constraint. - However, as long as there are imperfections on the housing markets, the Leviathans have some chances to raise the capitalization rate of the property taxes, and of all the other fiscal variables.

Thus, we empirically analyze a Leviathan's relative influence on the housing prices. We work with data on 234 US-counties in the years 2002 and 2003. The samples consistently take the counties as the relevant markets; each of them contains 46 theoretically relevant variables, which can be assigned to the following eight categories: housing prices, local fiscal budget, dwelling, demography, income level, income status, employment, geography. The category of housing prices distinguishes between two sub-markets: the ownership and the rental market. A descriptive analysis shows that the prices on the first sub-market are more dispersed and less symmetric than those on the latter. A descriptive analysis of the fiscal budget variables shows in particular the following: The local governments have two major sources of revenue: first, intergovernmental transfers, second, property taxes. As budget shares, both variables reveal nearly normal distributions. As per capita values, they have somewhat higher degrees of dispersion and of asymmetry. But, these degrees are still below those of the respective other fiscal variables.

When we empirically estimate a housing price function, we may encounter three methodological problems: first, some explaining variables are interrelated; second, the causal link between an explaining and the explained variable is unclear; and third, the function is decisively influenced by some hidden variable. To tackle these problems, we follow a four-step approach:

In the first step, we select eight non-fiscal variables which are highly correlated with the housing prices. We regress the housing prices on those variables. Thus, the variation of the median housing value in 2003 is explained by around 76%; and the variation of the median gross rent in 2003 by around 83%. In the second step, we construct the respective non-fiscal control equations by removing the redundant independent variables. Now, the regression of the median housing value reaches an explanatory power of 72%; the regression of the median gross rent of 80.7%. In the third step, we integrate every fiscal variable which has a significant correlation coefficient with the housing prices separately into the control equations. We first estimate these new equations with the OLS method. As a result, the property tax revenue gets mostly insignificant. The total tax revenue gets significant in the regression of the median gross rent, but not in the regression of the median housing value. The total expenditure reaches significance in both regressions; which somewhat increases their explanatory power. In the fourth

step, we estimate the new equations with the 2SLS method; which is specifically constructed for simultaneous systems. Now, the regression coefficients of all those fiscal variables get significant. However, the t-values of the controlling income variables decrease; in particular where they meet with the property tax revenue. The 2SLS regressions of the housing prices on the property tax revenue reveal much lower explanatory power.

We may interpret the results of our empirical analysis as follows: The highest impact on the housing prices comes from the personal income; the second from the personal mobility. The impact from the fiscal policy is quite diverse. Out of the fiscal variables, the property tax revenue has the strongest connection with the housing prices. In contradiction to the 'traditional' theory, this connection is positive. Moreover, it remains quite unclear whether the first determines the latter, or the other way round. Anyway, this connection seems highly related to the average income. In addition, we observe that the property tax is more strongly connected with the housing rent than with the housing value. This suggests that the tax burden rather falls on the housing owners. The total public expenditure has a lower but more reliable impact on the housing prices. In agreement with the traditional theory, this impact is positive. Hence, the citizens do care about local public goods, when they make their housing decisions. However, we cannot say in detail which types of local public good they prefer.

Overall, a Leviathan might take a 'medium' influence on the housing prices. The form of this influence is rather complex. He faces strong incentives to promote the average income in his region. The citizens' exit option is rather weak as a constraint for his power to tax.

Part III

Leviathans, Income Deviations, and the Sources of Local Public Revenue

Chapter 16

Introduction

How can governments be best characterized? - A constitutional approach characterizes governments as monolithic, self-interested entities. They call such an entity 'Leviathan'. This type of characterization can be justified by four reasons: First, this type is rather simple. It reduces complexity for the analysis of its interaction with elements of its environment. Second, this type is rather consistent. In general, economic theory assumes that firms, households, or other agents are monolithic and self-interested. To treat governments with different basic tools is at odds with this general approach. Third, Leviathan is rather counterproductive. Thus, the predictions that we can make on his actions tend to be pessimistic. The conclusions match with a risk-averse political attitude. And finally, Leviathan is rather dominant. In an evolutionary approach, we can derive many plausible conditions under which a Leviathan will reach higher payoffs than other types of government.

If governments are assumed to be Leviathans, how can we best specify their self-interests? - The constitutional theory usually describes a Leviathan as a maximizer of his fiscal budget revenue or his fiscal budget surplus. If there exists a constant relationship between both objectives, then they lead to the same (overall) results. A key task of the constitutional theory is to search for the best constraints on Leviathan's revenue or surplus maximization. The theory can treat any possible constraint in isolation; there is no doubt about the government's objective. In the real world, however, we encounter a given multitude of (interrelated) constraints on governments. Here, we do not a priori know what a government's objective is. Typically, if a government behaves as a fiscal revenue or surplus maximizer, then it will seek to hide this. Therefore, to find out to what degree governments really behave as Leviathans, we need some special method.

In the related literature, most authors sought to test or to measure the 'real existence' of Leviathans via a particular hypothesis by Brennan and Buchanan (1980). This hypothesis states that fiscal power is negatively related to fiscal decentralization. According to this, fiscal decentralization works as a steady and dominant constraint on the Leviathans. The more decentralized a government structure is, the more Leviathans stand in competition to each other, the less fiscal power they have. Hence, a government's objective becomes revealed due to the market structure. However, government structures tend to be complex. Thus, it may become difficult to find an expedient measure for fiscal decentralization. Moreover, there are good reasons why a higher degree of centralization may also be in the interest of the citizens. Due to these two and some further problems, the related tests or measurements came to rather contradictory results.

This study develops a new method to measure the 'real existence' of Leviathans. We specify a Leviathan's objective as the maximization of his personal income. We make the assumption that under perfect conditions, a government agent's personal income stands in a constant relation to the average income of all citizens in his jurisdiction. The deviation of his income from the average income is an expression of his social power. We can conclude that the higher the relative deviation is, the more social power the agent has. In a next step, we examine what a Leviathan's social power depends on. Here, we focus on the sources of public revenue. We will ask: How much social power can a Leviathan derive from a certain source of public revenue?

To perform our empirical examination on Leviathans, social power, and the sources of public revenue, we use county data from the U.S. Bureau of the Census. In the U.S.A., local governments are relatively independent in their policies. They thus can take a rather strong influence on the social conditions in their jurisdictions. The Bureau of Census provides a broad range of high-quality data on the local policy and the social conditions. In particular, it runs a survey program on public employment at a 5-year interval. This program covers detailed information on the earnings of public employees. Thus, for our empirical examination, we work with samples of 234 US-counties in the periods 1989/ 1992 and 1999/ 2002. Each of the two samples contains 56 variables. Our empirical examination will be divided into five major steps: first, derivation and description of the relative deviations of local officals' earnings; second, description of the local fiscal policy; third, correlation analysis of income deviations and fiscal policy; fourth, regressions of income deviations with full samples; and fifth, regressions of income deviations with stratified samples.

Chapter 17

Related Literature

17.1 Ideas and Estimations

Brennan and Buchanan (1980) introduced Leviathan as an essential element of a constitutional approach. They explained why Leviathan may serve as the right tool in the analysis of social rules, even if government agents do not show perfectly rational and self-interested behavior. Major reasons stem from ideas of social evolution and of the precautionary principle. The two authors conceived Leviathan as a monolithic entity which seeks to maximize its fiscal budget surplus. They assumed that there exists a positive and strong relationship between the fiscal budget surplus on the one side and a government agent's power, income or utility on the other side. In the basic constitutional model, the fiscal budget surplus is defined as tax revenue minus expenditure for public goods. In practice, however, this surplus does not openly appear on the fiscal balance sheet. Since Leviathan is not almighty, he has an interest to hide this surplus from the citizens. In order to circumvent this problem, one may assume under special conditions that there exists a constant relationship between budget surplus and tax revenue. Leviathan, thus, becomes a maximizer of tax revenue who can be constrained by constitutional rules on the use of tax instruments.[1]

Brennan and Buchanan asked whether freedom of migration could serve as a substitute for overt constitutional constraints on the power to tax. They

[1] One idea is that rational behavior eliminates non-rational behavior in the social evolutionary process, because the first generates higher payoffs than the latter. Another idea is that a constitution should not be based on any risky assumptions. Instead, its task is to support a higher minimum level of social outcomes in a long-term perspective.

maintained that the classical version of the Tiebout model is not the right starting point to answer this question. They regarded this model as a limiting case of a non-spatial world of clubs. In this sense, if one departs only slightly from the extremely restrictive assumptions of the model, then the club managers will be able to extract some extra rent from the club members. Anyway, it is essential to consider the consequences of various imperfections. It seems likely that imperfections have a strong influence on the total outcome in a spatial world. Brennan and Buchanan introduced four main categories:

1. the costs of mobility;
2. the potentiality for collusion;
3. the ranges of publicness/ spillovers;
4. economies of scale in administration.

All these four categories depend on the federal structure of the respective state. The first two seem to have a monotonically negative relationship to the number of jurisdictions in the state. The last two, in contrast, seem to have a U-shaped relationship. In sum, Brennan and Buchanan presented the following hypothesis (which we shall call 'BBLD'): A Leviathan will reach the more (fiscal) power, ceteris paribus, the more homogeneous are the separate jurisdictions, the higher is the number of jurisdictions, and the more decentralized are the fiscal responsabilities. - Based on this conception, several authors sought to measure the existence of Leviathans.[2]

A path-breaking study was made by Oates (1985). In this study, he examined the relationship between government size and the degree of decentralization of the public sector, using two different samples: the one of the 48 (contiguous) states in the U.S.A., and the other of 43 countries around the world. Using the first sample, he specified the government size by the aggregate state-local tax receipts in each state as a fraction of the personal income. As indicators for the degree of centralization of the public sector, he took the state share of state-local general revenues, the state share of state-local total expenditure, and also the number of government units in the state sector. Each of the three indicators has a negative correlation with the government size variable, but on a low level. In his regressions, Oates included four control variables: percentage of urban residents in each state,

[2]In the related literature, the focus is usually put on the relationship between fiscal power and the fiscal federal structure. They call the respective statement 'Leviathan hypothesis'.

total population size of the state, state personal income per capita, and intergovernmental grants as a percentage of state-local general revenue. - The regressions of the government size find negative coefficients for each decentralization variable. However, these coefficients are not significantly different from zero. The results contradict the 'BBLD' hypothesis.

Using the other sample, Oates specified the government size by the total public revenue as a fraction of GDP. Here, he considered merely two indicators for centralization: the central government share of total government revenue and of the total expenditure. Oates formed two subsamples: one for industrialized, the other for developing countries. While the correlations between the government size variable and each government structure variable are negative for the industrialized countries, both are positive for the developing countries. However, each correlation coefficient is close to zero. Hence, the regression analysis does not reveal any significant relationship between government size and fiscal (de-)centralization. Again, the 'BBLD' hypothesis is not confirmed.[3]

Nelson (1987) reconsidered Oates' (1985) study. He argued, in particular, that Oates had not chosen an expedient concept of government structures to test the given hypothesis. Oates had not taken the different responsibilities of jurisdictions into consideration. Nelson, thus, distinguished between two dimensions of government structure: on the one side, the vertical division of responsibilities between jurisdictions, and on the other side, the horizontal division of responsibilities. Taking these dimensions into account, it may become crucial to separate the general-purpose from the single-function jurisdictions, when investigating the government structure of the U.S.A. Nelson mentioned two reasons why it becomes crucial in the present case: First, mobility typically exerts less constraining power on single-function jurisdictions, because the benefit it offers to residents is less. Second, the two types of jurisdictions face very different cost conditions with respect to administration as well as intrinsic public good production.

Thus, Nelson re-examined the relationship between government size and fiscal centralization, using the same US-sample as Oates. As dependent variable, Nelson alternatively chose Oates' variable, a total expenditure variable, and the local expenditures on fire protection as a fraction of personal income. As indicators for fiscal centralization he chose the number of residents per general-purpose jurisdiction, and the number of residents per single-function

[3]The industrialized countries were characterized by a larger relative government size and a lower degree of centralization. Let us remind, however, that the sample size of these countries was only 18.

jurisdiction. He included the same control variables as Oates did - plus the number of state expenditure mandates to local governments. In his regression analysis, Nelson found that all coefficients for the number of residents per general-purpose jurisdiction were positive, and most of them significantly. By contrast, the coefficients for the number of residents per single-function jurisdiction had non-uniform signs, which were all insignificant. - In sum, Nelson (1987) offers some support to the 'BBLD' hypothesis.[4]

In another study, Nelson (1986) reminded that Brennan and Buchanan had also mentioned some constraints on Leviathan other than fiscal decentralization. Particularly, they had modeled fiscal revenue as a function of: the allowable revenue bases, the allowable rate structures, and the number of competing jurisdictions within the state. Nelson examined this function empirically. He made, above all, the following assignments of empirical variables to the three determinants:

1. Constitutional constraints on the revenue bases: comprehensive personal income tax (dummy); corporate income tax (dummy); inclusion of services in the state's sales tax (dummy).

2. Constitutional constraints on the budget structures: restrictions on property tax rates, total property tax levies, or total expenditures (dummy); limits on state borrowing (dummy).

3. (De-)centralization of fiscal authority: state share of total state and local taxes; average number of state residents per county; average number of state residents per special district.

Nelson chose the state and local taxes per capita as the dependent variable. He worked with cross-sectional US-data (1976-77) and got the following results:

1. While the personal income tax has a significantly positive coefficient sign, the corporate income tax has a significantly negative one.

2. While a restriction on the property tax has no significant influence on the total tax reveneue, a limit on state borrowing has a significantly negative one.

[4]Fire protection is the function that is taken over by the highest number of general-purpose jurisdictions. The regressions of fire protection generate a bit more of significance. But, intergovernmental grants had to be excluded due to data problems.

3. While the average number of state residents per county is positively related to the total tax revenue, the state share of total state and local taxes is negatively related. The average number of state residents per special district shows no significant relationship.

Overall, Nelson's study from 1986 rather gives support to several hypotheses on Leviathan by Brennan and Buchanan.

It has been widely argued that Oates (1985) and Nelson (1986, 1987) did not choose the right government level for their empirical analyses. They both analyzed Leviathan's behavior on a state level. Eberts and Gronberg (1988) regarded this as wrong, because migration costs are (still) very high on this level. Citizens rarely move to sanctionize comparatively bad state government policy. Eberts and Gronberg used a US-sample of 2,900 counties and 280 SMSAs from 1977 to test the 'BBLD' hypothesis. The government performance was specified by the local expenditures on the major public services as percentage of personal income. As indicators for fiscal decentralization, they took the number of general-purpose jurisdictions, the number of single-function jurisdictions. Their main regression delivered a positive and significant coefficient for the first independent variable, and a negative and significant one for the second. Hence, the general conception by Oates and by Nelson could be confirmed on a local level.[5]

Marlow (1988) criticized that Oates and Nelson had not included the federal government level into their analyses. Marlow's main focus was on whether the 'BBLD' hypothesis could help to explain the observed universal growth of the public sector ('Wagner's Law'). This focus also justified three methodological changes: Firstly, the author tested the 'BBLD' hypothesis in a time series approach. He worked with a US-data series, constructed over the period 1946-85. Secondly, he compared the results from two related estimating equation: one consisting of absolute values, the other of the respective growth rates. Finally, as dependent variable, he chose the total government expenditure as a share of GDP instead of the tax revenue, since he intended to emphasize that public sector growth may also stem from other sources of revenue. Based on these three changes, Marlow reached the following result: The share of the state and local expenditure in total government expenditure is negatively related to the share of the total government expenditure in GDP. This holds for both absolute values and growth rates. - Hence, the

[5]Eberts and Gronberg calculated the elasticities from the regression coefficients. They showed that these elasticities are of similar magnitudes for different types of local jurisdictions: single-purpose or multiple-purpose, metro or non-metro.

'BBLD' hypothesis gets also support from a time series perspective.[6]

For an extensive cross-sectional test of the 'BBLD' hypothesis, Zax (1989) stressed that the degree of a Leviathan's monopoly power depends on two dimensions: the first dimension is the size of a jurisdiction relative to a higher or a lower government level ('centralism'); and the second is the number of jurisdictions on a certain government level ('fragmentation'). These two dimensions influence the relationship between Leviathan's power and the gains from scale economies. As Zax explained, the relationship is not always strictly positive. For his empirical analysis, Zax specified the total cost of a local government to its citizens as the aggregate own-source revenue for all (!) governments in the respective county. As a possible determinant of the total cost of a local government, he observed the share of revenue from grants in the total revenue of all (!) governments in the respective county. Clearly, this specification refers to the 'centralism' dimension. Four key determinants that refer to the 'fragmentation' dimension were derived as combinations of government units per capita/ per square mile and general-/ single-purpose government. Moreover, the author integrated a large number of control variables into his estimating equations, which can be assigned to four categories:

1. variations in the citizens' preferences for local public services;
2. dummy variables that capture variations in arrays of local public services;
3. different government functions;
4. citizens' degree of mobility.

Thus, a key result of the regressions is that the county share of total local revenue has a positive and significant relationship with the total cost of the county government. However, the relationship between the relative number of government units and the total cost of the county government is not clearly significant. In the case of general-purpose governments it seems to be rather negative; in the case of single-purpose governments rather positive. Zax thus concluded his empirical study by a strong suspicion that Leviathan does exist in our neighborhoods.

Forbes and Zampelli (1989) gave special attention to the market definition problem in their analysis of competition between governments. As

[6]This approach ignores the idea that citizens may defend themselves against Leviathan by taking the exit option.

they pointed out, not all the jurisdictions within a certain state stand in competition to each other. Jurisdictions may offer different kinds of local public goods, which creates different kinds of markets. Forbes and Zampelli sought to mitigate the market definition problem in their empirical analysis by choosing a sample that includes only such counties which are part of a SMSA. They specified the county government size in three alternative versions:

1. as the logistical transformation of county tax revenue per dollar of income;
2. as the logistical transformation of county own-source revenue per dollar of income;
3. as county taxes per capita.

The key explanatory variable was the total number of counties in the SMSA. In addition, the estimating equation included measures of: geography, population, household income, housing stocks, input costs of local public goods, and fiscal responsibilities. Forbes and Zampelli realized that they could have run into a destructive problem, if they had relied in their empirical analysis on this estimating equation, alone. The problem is that the competition between governments might affect the public sector size through its impact on the wages of public employees. To avoid this problem, the two authors set up a second function where the wages of public employees depend especially on: the wages in the private sector, the rate of unionization, and the total number of counties in the SMSA. - Overall, Forbes and Zampelli found a positive relationship between the competition among jurisdictions and the size of the governments. They concluded that Leviathan might be - after all - a mythical beast.[7]

Leviathans have two possible ways to collude. The first is to choose identical tax bases and rate structures. This way, however, there may exist incentives to deviate. These incentives will be the stronger, the higher the number of jurisdictions on the potential market is. The second is to set up

[7]Oates (1989) commented on the past discussion on the existence of Leviathan, putting a focus on Zax (1989) and on Forbes and Zampelli (1989). Here, Oates emphasized that the competition among jurisdictions has two dimensions: 'intra' and 'inter'. He remarked that Zax had analyzed the effects of intracounty competition, whereas Forbes and Zampelli the effects of intercounty competition. The choice of the subject, intra or inter, was mainly implied by the respective specification of the dependent variable. Oates claimed that the intracounty dimension seems more appropriate to estimate the existence of Leviathans.

a common system of grants. It may serve to equalize the outcomes of different tax systems. As already mentioned, such a system can be justified in our context by the problem of externalities. Leviathans, however, might seek to misuse a system of grants to generate own funds which lie beyond the amount needed to internalize given externalities. - Grossman (1989a) gave two central reasons why a system of grants might tend to inefficiently increase the public sector size. Firstly, grants weaken the bond between taxing and public spending, and thus weaken fiscal transparency and discipline. Secondly, grants strengthen the power of the higher level governments. This concentration of power gets used to expand the public sector's range of activities. To test an extended version of the 'BBLD' hypothesis, Grossman used a US time series data set over 1946 to 1986. As dependent variable, Grossman chose the total government expenditure as share of GDP. As explaining variables, he chose the share of state and local expenditure in total government expenditure, and the share of federal grants to state and local units in the total state and local receipts. Some control variables were also included. Grossman constructed two estimation equations: one in absolute values, the other in growth rates. Both equations showed a negative and significant regression coefficient for the first independent variable. For the second independent variable, the respective coefficients were positive but only partially significant. - Hence, this study by Grossman offered evidence that the structure of the tax system exerts a higher impact on the size of the public sector than the system of grants.[8]

Joulfaian and Marlow (1990) maintained that Grossman's aggregate time series approach has a serious downside: It implicitly assumes that governments do face similar constraints. Then, fiscal variables of individual jurisdictions can simply be summed up. But, as the two authors stressed, in the real world, governments encounter different revenue or spending constraints, especially if they belong to different levels. Therefore, Joulfaian and Marlow used a set of disaggregated cross-sectional data to test a similar version of the 'BBLD' hypothesis. They constructed two estimating equations which differ in how they specify the degree of fiscal (de-)centralization. In the first equation, it is specified as the ratio of state and local public expenditures to

[8]Grossman (1989b) extended his analysis from 1989a. The extension offers similar results; but it also emphasizes the impact of grants on the public sector size. - Grossman (1992) did not find similar evidence for Australia in the period 1950-84. He offered three explanations for this: first, a relatively small number of local governments; second, a relatively low economic weight of local governments; third, relative immobility of the citizens. - Grossman and West (1994) analyzed a sample from Canada in the period 1958-87. The two authors especially accounted for two crucial tax reforms in this period. Overall, the analysis gave support to the 'BBLD' hypothesis.

total public expenditures for each state; in the second, as the total number of state and local governments for each state. Both equations include the ratio of federal grants to state and local public revenue as another independent variable. - Based on this conception, Joulfaian and Marlow came to similar results as Grossman. They offered some further evidence that the structure of the tax system has more influence on the size of the public sector than the system of grants.

17.2 Lessons

In principal, the related literature analyzes empirical relationships between the government size and the government structure. The analysis is mainly based on the BBLD hypothesis which predicts, above all, that fiscal decentralization reduces fiscal power. The related studies follow different ways to specify the terms 'fiscal decentralization' and 'fiscal power'. Furthermore, they follow different ways to control for other empirical effects on the fiscal power. Considered control dimensions are for instance: income level, market for local public goods, other fiscal budget variables, demography, and geography. Working with samples from different jurisdictions and different government levels, the related studies come to quite diverging results. In the course of the discussion, evidence in favor of the BBLD hypothesis might have become a bit stronger. Nonetheless, it still seems difficult to give a reliable statement about the extent to which governments really behave as Leviathans. This is because there are still many shortcomings in the related literature; especially with respect to the specification of 'fiscal power' and of 'fiscal decentralization'.

In the related literature, the fiscal power is usually specified as a fiscal budget value in relation to a general social-economic value. Major examples for a chosen fiscal budget value are: the tax revenue, the fiscal own-source revenue, or the public expenditure. As a general social-economic value, we often find: the population size, the total personal income, or the gross domestic product. Each specification surely depicts one specific aspect of the total fiscal power in the given jurisdiction. However, none of them clearly divides between the different potential representatives of fiscal power. In a federal system, governments on the different levels can be such representatives. Furthermore, fiscal power could remain in the hands of the people due to the democratic process. Generally, power is not a question of who administers, but of who chooses. Power implies that one party is able to impose its choice

study	*sample*	*explained variable*	*explaining variable*	*result*
Oates (1985)	48 states, U.S.A., 1977	state-local tax revenue per GDP	a) state revenue per state-local revenue, b) state expenditure per state-local expenditure c) # governments in state	a) to c) insignificant
	43 countries, world, 1980	total government revenue per GDP	a) federal revenue per total revenue, b) federal expenditure per total expenditure	a) and b) insignificant

Table 17.1: Discussed literature: summary III-A

study	*sample*	*explained variable*	*explaining variable*	*result*
Nelson (1986)	50 states, U.S.A., 1977	state-local tax revenue per population	a) dummies for constitutional constraints, b) state tax revenue per state-local tax revenue, c) state POP per # counties, d) state POP per # single-purpose JD	a) diverse, b) negative, some significant, c) positive, significant, d) insignificant
Nelson (1987)	48 states, U.S.A., 1977	1) state-local tax revenue per GDP, 2) state-local 'adjusted' expenditure per GDP, 3) local expenditure on fire protection per GDP,	a) state POP per # general-purpose JD, b) state POP per # single-purpose JD	a) positive, significant, b) insignificant

Table 17.2: Discussed literature: summary III-B

study	*sample*	*explained variable*	*explaining variable*	*result*
Eberts/ Gronberg (1988)	2,900 counties and 280 SMSAs, U.S.A., 1977	local expenditure per GDP	a) # general-purpose JD in state, b) # single-purpose JD in state	a) negative, significant, b) positive, significant
Marlow (1989)	U.S.A., 1946-85	total expenditure per GDP	state-local expenditure per total expenditure	negative and significant (absolute and growth values)
Zax (1989)	3,022 counties, U.S.A., 1982	local own-source revenue per GDP	a) county revenue per total local revenue, b) # general-purpose JD in county per POP c) # single-purpose JD in county per POP	a) positive and significant, b) insignificant, c) insignificant

Table 17.3: Discussed literature: summary III-C

study	*sample*	*explained variable*	*explaining variable*	*result*
Forbes/ Zampelli (1989)	345 counties inside 157 SMSAs, U.S.A., 1977, 1983	1) county tax revenue per GDP, 2) county own-source revenue per GDP, c) county tax revenue per POP	# counties in SMSA	positive, significant
Grossman (1989a)	U.S.A., 1946-84	total expenditure per GDP	a) state-local expenditure per total expenditure, b) grants to state-local units per total revenue	a) positive, significant, b) positive, some significant
Joulfaian/ Marlow (1990)	50 states, U.S.A., 1981, 1984	total expenditure per GDP	a) federal grants per state-local revenue, b) state-local expenditure per total expenditure, c) # state-local governments	a) insignificant, b) negative, significant, c) negative, significant

Table 17.4: Discussed literature: summary III-D

on another party. Its choice is based on its preferences. However, it might be too difficult to directly treat the involved fiscal preferences, in an empirical study. Nonetheless, it seems possible to find out which party specifically profits from fiscal decisions. What we need is another specification of 'fiscal power', another explained variable.

The related studies usually specify 'fiscal decentralization' in three general ways: a) as the share of public revenue on the lower government level in the total public revenue; b) as the share of public expenditure on the lower government level in the total public expenditure; or c) as the number of government units on the lower government level (per resident). The specifications refer to different dimensions of decentralization: a) and b) refer to the vertical dimension; c) to the horizontal dimension. It seems highly plausible that these two dimensions might not be independent of each other in the real world. Just as one example: An increase in the number of government units could lead to more competition in the horizontal dimension. But, this increase in competition could imply a decrease in competition in the vertical dimension. Tax capacity that is not used by the one government level is now used by another level. The related literature neglected to consider such interdependencies. - Anyhow, each of these specifications of fiscal decentralization rather describes the given administration structure than real responsabilities. But, the administration structure might have less impact on the competition among government units and thus on the fiscal power. The fiscal power might depend more on the decentralization of certain responsabilities. - We therefore shall look for other specifications of 'fiscal decentralization', or for other explaining variables.

The empirical relationship between fiscal power and fiscal decentralization is probably not independent of third variables. This relationship might depend on variables such as: preferences for local public goods, income, demography, or geographical conditions. With respect to a test of the BBLD hypothesis, the question arises how these variables are related to the mobility in the observed area. Generally, it is presumed that the higher the mobility is, the higher, ceteris paribus, will be the impact of fiscal decentralization. The problem, however, is that many of the factors which influence fiscal power via mobility also directly influence fiscal power. The direct and the indirect impact may either strengthen or weaken each other. For example: A higher degree of urbanization leads to a higher mobility. Usually, urbanization is also positively connected with the provision of local public goods. Hence, on an indirect way, urbanization reduces fiscal power, and on a direct way, it raises fiscal power. Due to this problem, a test of the BBLD hypothesis is

usually highly sensitive towards the choice of the control variables. In the related literature, this sensitivity has hardly been discussed. While some studies work with a very small number of strictly selected control variables, other studies apparently try to include the whole range of determinants. Thus, we still search for the best strategy to choose the control variables in a test of the BBLD hypothesis.

The BBLD hypothesis is supposed to serve as a tool for testing whether governments behave as Leviathans. If there exists a positive connection between fiscal decentralization and fiscal power, then the governments do behave as Leviathans. However, we shall remind that a higher degree of fiscal decentralization does not always lead to a higher degree of efficiency. Two central reasons for that are: a) economies of scale, and b) spillovers. a) Economies of scales can be reached where the provision of different (local) public goods implies similar administrational work. Specialization in administration increases the total efficiency, with the basic functions performed by the central government. A crucial problem however is that the agents who decide on the specialization structure are in general not identical with those who bear the administration costs. - b) Spillovers may cause inefficiencies in the provision of local public goods. The principle of fiscal equivalence says the following: The size of each jurisdiction should be such that it exactly includes all the users of its local public goods. This principle, however, does not consider any aspects of fiscal power. It merely describes a technological optimum of the government structure. As an alternative, one could accept spillovers in favor of less fiscal power and install a system of intergovernmental grants which compensates for the costs from spillovers. Here, the crucial problem is that such a system might be a new source of fiscal power. - In sum, as a tool for testing whether governments behave as Leviathans, the BBLD hypothesis reveals some major drawbacks.[9]

[9]We may think of a situation in which economies of scale are reached by raising the number of lower-level governments and reducing their common share in the overall fiscal budget, at the same time.

Chapter 18

The Assignment of Functions to Local Governments

In a constitutional approach, we deal with the issue which functions should be performed by governments. We make the assumption that governments behave as Leviathans. This bases on the concept of rational and self-interested individuals. It seeks for a high consistency in the treatment of the public and the private sector. There are three categories where we can find functions that are in general better performed by governments: allocation, distribution, and stabilization. When we believe to have found such a function, we may ask: Which type of government should be assigned this function? - In a federal system, functions can be performed on various government levels - under various constraints. Here, we mainly deal with two issues: the optimal size of a jurisdiction and the optimal constitutional relationships between the jurisdictions. What we search for, are general principles which specify an optimal federal system. Referring to the allocational functions, one such principle was introduced by Olson (1969). Olson claimed to provide public goods in such a way that there are no more economies of scale and no externalities between jurisdictions. Basically, this implies that there needs to be an own, separate government unit for each public good. Thus, the citizens who benefit from the public good do match with those who pay for it. There exists 'fiscal equivalence'. As Olson emphasized, this principle could lead to a very complex system of overlapping jurisdictions. However, we should note that the governments need not be independent. They may be allowed to create some (constitutional) relationships which lower administrational costs.

There are three major criteria for the assignment of governmental func-

tions:

1. diversity in demand,
2. economies of scale, and
3. externalities.

Let us briefly look at these criteria with regard to the provision of local public goods.

1) Normally, the citizens have different preferences for local public goods. If a citizen is asked to pay a fair contribution to the provision of public goods, she will seek to hide her true preferences, because there is an option to free-ride. Tiebout (1956) suggested to solve this problem in the following way: There exists a multitude of jurisdictions. Each offers a specific, fixed package of public goods. Each citizen moves to the jurisdiction which offers the package that fits her specific preferences best. By moving, she reveals her true preferences. Each government can cover its costs by charging each of its residents an equal contribution. Since the governments compete with each other for residents, the total economy reaches a Pareto equilibrium. - But, in the extreme case where the preferences of each citizen differ from those of all the others, there have to be as many jurisdictions as there are citizens. Moreover, the Pareto optimal outcome hinges on several strict assumptions, out of which two are: no economies of scale and no externalities between jurisdictions.

2) Each public good has a specific cost function. Normally, this function will not be linear. Marginal costs may vary between rising and falling sections. A cost function may change over time, due to technological change. Basically, we can divide between three cost factors: the initial production, maintenance, and administration. The respective marginal cost functions could highly diverge. Administration, in particular, tends to be connected with economies of scope. Usually, the three factors do depend on each other. Therefore, economies should be realized, only if they outweigh diseconomies from the other factors. In practice, major problems may stem from the different transparency and the different flexibility of the three factors.

3) Externalities change partial equilibria. In order to assess such changes, we consider two distinctions for the types of externalities:

a) Pecuniary versus technological externalities: A pecuniary externality directly influences market prices. This type is the key force of an interdependent price system. If the standard neo-classical assumptions are fulfilled,

this type of externalities leads an economy into a Pareto optimal equilibrium. A pecuniary externality arises for example, when a citizen moves from one jurisdiction (A) to another (B). The price for the local public goods will, ceteris paribus, decrease in A and increase in B. - A technological externality generates its impact without directly referring to the prices. Normally, this type pushes an economy away from a Pareto optimal outcome. If the externality is positive (negative), then it tends to cause an underprovision (overprovision) of the affected good. For instance: We consider a congestible public good. Here, the use by one citizen could negatively affect the utility for all other citizens. There is no price reaction. The public good will be underprovided.

b) Intrajurisdictional versus interjurisdictional externalities: If an externality takes its influence in only one jurisdiction, then we call it 'intrajurisdictional'. A solution can be found under a unified legal framework. For instance: The residents of one jurisdiction cause congestion on their own local public good. To solve this problem, the local government could autonomously increase the amount of this local public good. - If an externality affects more than one jurisdiction, then we call it 'interjurisdictional'. In order to get a solution, it could be necessary to coordinate different legal frameworks. For instance: Some residents of jurisdiction A use a public good in jurisdiction B, which raises congestion. Then, the local government of B has no means to force the 'foreign' citizens to pay.

A technological externality distorts the market allocation, because it leads to a divergence between the private and the social costs of the affected goods. Coase (1960) maintained that such market distortions could be corrected by decentral internalization agreements. The main reason is that each affected party has an incentive to come to such an agreement, because a correction of the market outcome generates a welfare gain. How this welfare gain is divided between the parties depends on the prior assignment of the property rights. By contrast, the corrected market allocation will be independent of the prior assignment. - We shall recall, however, four key assumptions underlying the Coasian approach:

1. There are no transaction costs.

2. Every party's preferences over the bargaining outcomes are common knowledge.

3. There is a perfect correspondence between the interests of the bargaining agents and those of their principals.

4. Agreements can be enforced without costs.

Hence, we can see that the underlying assumptions are very demanding. In the real world, the chances to come to a decentral internalization agreement will be the smaller, the larger the number of affected parties is. If this number is critically large, then a rather central and non-voluntary approach will do better. Let us note that this holds for any type of affected party: households, firms, or governments.

Thus, there are three major criteria for an assignment of governmental functions. The three criteria may stand in conflict with each other in various ways. Such conflicts can hardly be solved by changing the sizes of the jurisdictions. Some imperfections in the combinations of sizes and functions may justify compensations. Compensations can possibly be determined in voluntary bargains between the affected parties. But, as we saw, agreements are difficult to reach under certain conditions. An umpire might be needed to get a solution. If the affected parties are governments, then the best umpire most likely will be a higher-level government. Which government exactly this will be, can be stipulated in the constitution. Altogether, it seems expedient to set up a constitutional framework for compensations, in general, and for intergovernmental grants, in particular. In the particular case, one can choose between four methods to pay compensation: an unconditional, a conditional, an open-ended matching, and a closed-ended matching. Which type of grant is best, depends on the type of conflict which is supposed to be solved.

But, a system of intergovernmental grants is hardly ever a perfect solution for externality problems. It might bring some own distortions into the economy. Such distortions tend to be particularly strong, when governments do behave as Leviathans. There are many ways in which Leviathans can use a system of intergovernmental grants to push their own interests to the detriment of the citizens. Leviathans can hide their special interests not only behind some common goals of allocation, but also of distribution and of stabilization. Altogether, they might become able to guide big parts of the domestic product into the system of grants, and misuse some parts of these parts for their special interests. But basically, Leviathans also compete for grants. Thus, they will seek to form cartels. According to a general theory of collective action, small Leviathans will have more relative bargaining power than big ones. Anyway, the outcome of the bargaining will hardly be optimal. In sum, we may state that an unconstrained system of grants offers large rooms to Leviathans to misuse resources.

Thus, how should a system of intergovernmental grants be constrained to avoid the misuse of resources? - First of all, a constitutional assembly may search for some optimal rules on the process and the outcomes of the system. They could suggest, for example, which goals may be followed by the use of grants, or how the decisions must be made, or which relative size the grants may reach. Then, the apparently best rules could be fixed into the constitution. The question however arises: Who should guard these rules? - Respective problems come from two directions. On the one hand, it is not in the Leviathans' specific interest to do this. They would rather newly interpret the rules in favor of expansion. Furthermore, the principle of checks and balances might have little impact, if it involves merely Leviathans. Rather than checking each other, they would be busy with pork-barreling. On the other hand, the citizens have high relative costs of guarding the rules. Due to this cost position, they tend to be rationally ignorant. As a consequence of rational ignorance, they might suffer from 'fiscal illusion'. In our context, this would mean that they systematically underestimate the costs which the system of grants generates. Another consequence of rational ignorance is that the citizens are reluctant to revise their decisions. This paves the way for the often observed 'flypaper effect'. Grants stick where they land (even if their rationale fades). We conclude that a system of intergovernmental grants remains to some degree open for misuse, even if the system is (constitutionally) constrained.[1]

[1]For more details, see Mueller (2003), 215-27.

Chapter 19

The Data

In general, a Leviathan chooses those sources of public revenue which generate his highest possible budget surplus. He can use this surplus for his own personal income. However, the effectiveness of a source of public revenue depends on specific market conditions, which may change over time. On the search for an optimal tax constitution, we need to account for the relevant changes of market conditions. In an empirical study, the capacity to do this highly depends on the sustainability of the data concept. For our purposes, a most sustainable data concept was contrived by the U.S. Bureau of the Census. The Bureau developed, in particular, three groups of data sets that we base our study on. These are:

1. Census of Government: Public Employment;

2. Census of Government: Government Finances;

3. Decennial Census: Population and Housing.

In the U.S.A., a 'Census of Government' has been taken since 1957, at 5-year intervals. Each census covers the following main subjects: government organization, public employment, and government finances. The local governments under observation are of five different types: counties, municipalities, townships, school districts, and special districts. In the more recent censuses, the highest attention was given to the first type. Overall, the Census Bureau provides a broad range of data on county governments. In 2002, they were 3,043 counties. Few of them did not have an own government. The number of county governments in a given state ranged from 1 (District

of Columbia) to 254 (Texas). The average population size of such a county was around 83,000.

In its 'Compendium of Public Employment', the U.S. Bureau of the Census shows data on local government employment and payrolls in each county. It defines local government employees as persons who regularly perform a local public service, including persons paid from federally funded programs. In order to make comparisons between employment levels easier, the Bureau calculated the 'full-time equivalent employment'. This term describes the number of employees that would have been employed, if the reported number of hours had been worked by full-time employees, only. Furthermore, the Bureau divided the total number of full-time equivalent employment for each county according to some selected functions, as for instance: education, social sevices, public safety, housing/ environment, and public administration. The payroll numbers refer to gross payments, which include all salaries, wages, fees, etc., paid to the employees during a fixed period. The average monthly earnings represent the quotient of the full-time employee payroll divided by the number of full-time employees.

The 'Compendium of Government Finances' contains information on local government budgets for individual counties in a certain fiscal year. The budgets are structured according to three major categories: revenues, expenditures, and indebtedness. - Revenues are defined as actual receipts of a government and its agencies. Hence, the following amounts are subtracted from gross collections: tax refunds to citizens, receipts from the issuance of debt, the sale of securities, and taxes collected on behalf of other governmental units. The Bureau subdivides total public revenues into four distinct classes: intergovernmental revenue, taxes, charges, and miscellaneous general revenue from own sources. - Expenditures are defined as the actual payments of a government and its agencies. The Bureau distinguishes nine major classes of public expenditure: capital outlay, education services, social services/ income maintenance, transportation, public safety, environment/ housing, government administration, interest on general debt, and non-direct general expenditure. Intergovernmental expenditure shows little relevance on the county level. - Finally, public indebtedness is subdivided into: long-term debt, and cash/ securities. The total long-term debt comprises general obligation bonds.

In the U.S.A., a decennial census on population and housing has been taken since 1790. The Bureau of the Census has been responsible for that since 1975. The latest census (for 2000) comprises above all 171 population items and 56 housing items as 100-percent data, which is information com-

piled from questions asked of all people and about every housing unit. These questions dealt with some main characteristics of people and housing, as for instance: age, origin, on the one hand, and tenure, occupancy, on the other hand. Additionally, the Bureau asked questions on a specific sample of people and housing units. These questions dealt with more specific subjects, as for example: sources of income, family status, labor force status, educational attainment, housing equipment, or housing costs.

The U.S. Bureau of the Census offers three groups of high quality data sets which match well with our purposes. Nonetheless, we also shall recognize the limitations of the data. For our purposes, the limitations seem to be most relevant in the field of intercounty comparisons. Four of them shall be mentioned: First, every monetary value is measured in current US-dollars. They do not consider price differences among counties or among periods. Second, the counties may adopt different functions. Local governments may contract in or out various functions, even within the same state. Third, if a government does not respond to the census, the Bureau estimates the respective values, based on former responses. Clearly, such estimates are more likely to be biased. Fourth, the data partially refer to various periods. Some counties, for example, start their fiscal year in a different month than others. The decennial census measures income for the former year, but most of the other variables for the current year. Generally, the decennial census values lag behind the census of government values by two to three years.

Chapter 20

Descriptive Statistics

We assume that all individuals have the same preferences for income, and that all behave as income maximizers. Then, it holds that an individual with a higher income reaches a higher utility level. There are two main reasons why one individual would get a higher income than another: first, she is more productive; second, she has more social power. Table 20.1 presents some descriptive statistics on income levels in 234 US-counties in the periods 1989 to 1992 and 1999 to 2002. There are three income variables which cover three distinctive groups of income recipients, namely: a) the local government officials, b) the population, and c) the households. a) The officials' average earnings from full-time employment (OFFEARN) refer to merely one specific source of income for one specific population group. This variable shows the lowest relative standard deviation and the highest degree of symmetry, out of the three. Hence, we presume that OFFEARN has some specific determinants. b) The per capita income (PCINC) includes all sources of income and the total population. In many analytical contexts, PCINC is taken as the standard measure for social welfare. In our data, it appears to be far from being normally distributed. c) The household median income (HHMINC) describes the budget of a key economic decision unit. This variable highly depends on the size of that unit and on how many members are employed. In table 20.1, HHMINC has the highest relative standard deviation and the highest skewness.

How much should officials earn? - We may answer: Like anybody else, officials should be paid according to their productivity. However, it seems hardly possible to measure an official's productivity. The central reason is that his product does not have a market price. The costs that he generates are basically covered by taxes. Since taxes are involuntary contributions,

they do not directly reflect the preferences of the contributors. Clearly, it seems wrong to estimate an official's product by the costs. This also would set negative incentives: Each official would seek to maximize his costs. - Therefore, it seems reasonable to estimate an official's productivity by an overall product value. One can argue as follows: Governments have great responsibility for the overall productivity in their jurisdictions. Therefore, each official should be paid according to the respective domestic product. On a disaggregated level, one might consider, for instance, the per capita income or the median household income. Thus, we will base our empirical analysis on the following postulate: The relative deviation between the officials' average earnings and a disaggregated measure of the domestic product should in each jurisdiction be approximately the same. The higher such a deviation is, the greater tends to be the social power of the respective officials. - In this empirical analysis, we will work with four such variables, with four indicators of governments' social power:

- OFFPCI92 = (OFFEARN92 - PCINC89) / PCINC89;
- OFFHHMI92 = (OFFEARN92 - HHMINC89) / HHMINC89;
- OFFPCI02 = (OFFEARN02 - PCINC99) / PCINC99;
- OFFHHMI02 = (OFFEARN02 - HHMINC99) / HHMINC99.

The tables 20.2 to 20.4 present some statistical information on these four indicators: We can see that the relative deviations of local officials' earnings were lower in 2002 than in 1992. The distributions, however, were more asymmetric in 2002. The standard deviations had changed little after ten years. OFFPCI reached higher values than OFFHHMI in each of these statistics. None of the variables revealed strong outliers. - Finally, we may state that none of our indicators for officials' social power shows any problematic particularity. Nonetheless, we need to remind that it actually is problematic to interpret any comparison between different indicators in terms of social power. The reason is that the indicators are constructed out of different components which underly different influences, as in partiuclar: the non-labor income, the population size, and the household size.

Which sources can a local government use to generate fiscal income? - In the theory, we find four major sources of local public revenue, namely: local taxes, intergovernmental grants, user charges, and loans. If the government behaves as a benevolent social welfare dictator, then each of these sources can be justified under fairly broad and clear conditions. But, if the government

variable	**mean**	**std. dev.**	**skewness**	**J.-Bera**
OFFEARN92	2665.51	488.95	0.253	3.78
PCINC89	1303.02	272.48	0.701	30.2
HHMINC89	2814.82	662.11	0.716	20.4
OFFEARN02	3563.67	604.10	0.266	3.99
PCINC99	1946.87	401.93	0.659	24.6
HHMINC99	3946.10	898.47	0.682	18.1

Table 20.1: Income levels of distinctive groups

variable	**mean**	**std. dev.**	**skewness**	**J.-Bera**
OFFPCI92	1.089	0.381	0.453	8.02
OFFHHMI92	-0.027	0.181	0.256	4.41
OFFPCI02	0.879	0.384	0.951	46.0
OFFHHMI02	-0.069	0.188	0.521	13.9

Table 20.2: Relative deviations of local officials' earnings

rank	*OFFPCI02*	*county*
1	2.135	Kern (CA)
2	2.081	Fresno (CA)
3	2.020	Hidalgo (TX)
...	...	...
23	1.418	El Paso (TX)
...	...	...
59	1.083	Lancaster (PA)
...	...	...
117	0.817	St. Joseph (IN)
118	0.814	Douglas (NE)
...	...	...
176	0.620	Dane (WI)
...	...	...
212	0.431	Anoka (MN)
...	...	...
232	0.226	Williamson (TX)
233	0.102	Collin (TX)
234	0.077	Madison (MS)

Table 20.3: Ranking of OFFPCI02

rank	*OFFHHMI02*	*county*
1	0.584	Philadelphia (PA)
2	0.548	St. Louis City (MS)
3	0.448	Baltimore City (MD)
...	...	...
23	0.209	San Bernardino (CA)
...	...	...
59	0.038	Hampden (MA)
...	...	...
117	-0.087	Macomb (MI)
118	-0.088	East Baton R. (LA)
...	...	...
176	-0.183	Tarrant (TX)
...	...	...
212	-0.303	Morris (NJ)
...	...	...
232	-0.462	Madison (MS)
233	-0.481	Collin (TX)
234	-0.504	Williamson (TX)

Table 20.4: Ranking of OFFHHMI02

behaves as a Leviathan, then the justifying conditions shift and get more restrictive. Table 20.5 and table 20.6 offer some information on the sources of local public revenue in the U.S.A. in the years 1992 and 2002: From 1992 to 2002, the total county revenue per capita (TLREV-c) rose on average by 45%. The revenue structure of the local budgets remained roughly the same. Nonetheless, it seems worthwile to highlight some smaller changes: Intergovernmental grants raised their share on the total revenue (IGMREV-b) from 30.4% to 34.5%. By contrast, property taxes (PPTAX-b) lost relative weight; their share fell from 30.3% to 29.1%. The share of current charges (CUCHAR-b) stayed around the same (around 14%); the distribution, however, became even more unequal. Other sources of revenue were generally of little importance for the local fiscal budgets.

variable	**mean**	**std. dev.**	**skewness**	**J.-Bera**
TLREV92c	2.571	0.773	2.247	1708
IGMREV92c	0.779	0.342	1.383	140
TLTAX92c	0.963	0.396	2.535	2208
PPTAX92c	0.756	0.351	1.050	61.2
OTHTAX92c	0.207	0.221	5.120	21746
CUCHAR92c	0.358	0.193	1.767	286
TLREV02c	3.750	1.186	2.638	2607
IGMREV02c	1.294	0.592	1.961	649
TLTAX02c	1.379	0.553	2.673	2721
PPTAX02c	1.045	0.443	1.073	64.7
OTHTAX02c	0.334	0.368	5.781	31790
CUCHAR02c	0.533	0.427	4.063	7021

Table 20.5: Sources of local fiscal revenue: per capita values

variable	**mean**	**std. dev.**	**skewness**	**J.-Bera**
IGMREV92b	0.304	0.097	0.439	8.58
PPTAX92b	0.303	0.129	0.589	13.9
OTHTAX92b	0.080	0.067	1.436	125
CUCHAR92b	0.139	0.060	1.945	472
IGMREV02b	0.345	0.103	0.244	2.33
PPTAX02b	0.291	0.121	0.635	15.7
OTHTAX02b	0.087	0.068	1.225	83.1
CUCHAR02b	0.138	0.082	23.8	4761

Table 20.6: Sources of local fiscal revenue: budget shares

What we deal with, are the relationships between the local governments'

social power and the sources of local public revenue. To measure the social power, we constructed two indicators: OFFPCI and OFFHHMI. As sources of public revenue, our samples offer especially the following variables: IGMREV, PPTAX, OTHTAX, and CUCHAR. Thus, let us now look at the correlation between the six variables in the tables 20.7 and 20.8. The two tables show, first of all, that the two indicators for social power are very highly correlated with each other. This might confirm that they both effectively measure the same theoretical construct. The tables also show that each indicator for social power is highly correlated with IGMREV-c. In contrast, all the other correlations are low. The property tax revenue (PPTAX-c), for instance, seems to be negatively related to the governments' social power; the respective correlation coefficients, however, are hardly significant. In sum, it seems expedient to focus on the relationships between the intergovernmental revenue and the governments' social power.

	OFFPCI	*OFFHHMI*	IGMREV	PPTAX	OTHTAX	CUCHAR
OFFPCI92	1.0					
OFFHHMI92	0.831	1.0				
IGMREV92c	0.610	0.565	1.0			
PPTAX92c	-0.188	-0.185	-0.018	1.0		
OTHTAX92c	-0.023	0.190	0.186	-0.099	1.0	
CUCHAR92c	0.011	0.159	0.220	-0.066	0.128	1.0

Table 20.7: Correlations: deviations of officials' earnings and public revenue: 1992

	OFFPCI	*OFFHHMI*	IGMREV	PPTAX	OTHTAX	CUCHAR
OFFPCI02	1.0					
OFFHHMI02	0.835	1.0				
IGMREV02c	0.641	0.641	1.0			
PPTAX02c	-0.292	-0.265	-0.090	1.0		
OTHTAX02c	0.004	0.218	0.327	-0.080	1.0	
CUCHAR02c	0.061	0.158	0.185	-0.131	0.146	1.0

Table 20.8: Correlations: deviations of officials' earnings and public revenue: 2002

Chapter 21

Regressions

Our regressions shall help us to explain how intergovernmental revenue determines the social power of local governments. As a real determinant, intergovernmental revenue might stand in interaction with other factors. Thus, we shall search for these other factors. We will ask: What does the interaction between the determinants look like? Which explanatory power do the determinants have? - We will proceed as follows: We insert all the potential determinants of a sample, other than IGMREV, into an estimation equation. We sort out all the redundant variables by a redundant variables test. We estimate various non-redundant equations. Then, we can compare these equations by four criteria: the adjusted R-squared, the Akaike information criterion, the Jarque-Bera test on the residuals, and Ramsey's RESET test. The overall most powerful and most reliable one is taken as our 'control equation'. Next, we integrate the (main) explaining variable, IGMREV, into this equation. There are two forms of IGMREV in our samples: IGMREV-c, the intergovernmental revenue per capita, and IGMREV-b, the intergovernmental revenue as a fraction of the total public revenue. Both are considered and compared. Thus, we get the estimation results that we intend to interpret.

Using the full samples, we can compute eight specific estimating equations on the impact of intergovernmental revenue on local governments' social power. The major results are presented in the tables 21.1 to 21.4. They can briefly be described as follows:

IGMREV gets a positive and significant coefficient in each estimating equation. The level of significance reaches 1% in six out of eight equations. The level is higher for the period 1999/ 2002 than for 1989/ 1992; for regressions of OFFPCI higher than for OFFHHMI. IGMREV-c reaches higher

levels in regressions of OFFPCI; IGMREV-b in regression of OFFHHMI. The number of control variables varies between three and four. The only one which appears in each equation is the percentage of people with a public assistance income (PUBASS). The only variable which changes its sign from the correlation to the regression is the percentage of people with an interest, dividends, or rental income (INTRST). The explanatory power of the eight regressions on IGMREV ranges from adjusted R-squared = 0.589 to adjusted R-squared = 0.755. The value of 0.755 is reached by the regression of OFFHHMI02 on ln IGMREV02b. In each of the eight, IGMREV provides some additional explanatory power; which means that the adjusted R-squared value is higher than for the related control equation. Similarly, the AIC indicates a higher goodness of fit due to the integration of IGMREV. The Jarque-Bera test offers high evidence for non-normally distributed residuals in the regression of OFFPCI92. The Ramsey RESET test causes little concern about misspecification of the regressions, except for OFFPCI02 on IGMREV02c.

	(1)	(2)	(3)
c	0.4311	0.4073	0.6819
	(2.95)	(2.95)	(4.16)
IGMREV92c		0.3185	
		(5.38)	
ln			0.1927
IGMREV92b			(3.16)
BACHPL90	-1.7907	-1.8797	-1.4685
	(-6.48)	(-7.19)	(-5.07)
INTRST90	1.2327	1.1314	1.1653
	(4.46)	(4.32)	(4.29)
PUBASS90	8.2628	5.8226	7.3914
	(12.28)	(7.46)	(10.33)
R-squ. adj.	0.5738	0.6199	0.5898
AIC	0.0740	-0.0363	0.040
J.-Bera	49.32	96.92	47.14
RESET	0.0368	0.0539	0.0054

Table 21.1: Regressions of OFFPCI92: full sample

Our dependent variables are constructed distribution variables. Each of them consists of two income variables. Now, it seems expedient to check how the functional relationships of our dependent variables depend on the level of their components. We will do this by a sampling stratification method: We

	(1)	(2)	(3)
c	0.7894	0.8643	0.8772
	(6.53)	(6.86)	(7.0)
ln		0.0462	
IGMREV92c		(1.97)	
ln			0.0554
IGMREV92b			(2.36)
ln	0.1404	0.1084	0.1540
TLEXPD90c	(5.88)	(3.77)	(6.33)
ln	0.2043	0.2082	0.2078
MVSMCT90	(5.66)	(5.79)	(5.81)
WGSAL90	-1.0220	-1.0266	-1.0254
	(-8.13)	(-8.22)	(-8.24)
PUBASS90	2.2726	1.9557	1.9061
	(8.75)	(6.43)	(6.35)
R-squ. adj.	0.7042	0.7079	0.710
AIC	-1.7787	-1.7871	-1.7943
J.-Bera	4.866	8.865	9.847
RESET	0.5139	0.1032	0.0262

Table 21.2: Regressions of OFFHHMI92: full sample

	(1)	(2)	(3)
c	0.8847	0.8007	1.1396
	(11.8)	(11.4)	(13.1)
IGMREV02c		0.1860	
		(6.52)	
ln			0.2544
IGMREV02b			(5.08)
NUSCIT00	2.0043	1.6805	2.0224
	(6.32)	(5.68)	(6.71)
BACHPL00	-1.7019	-1.7690	-1.4140
	(-8.35)	(-9.42)	(-7.01)
PUBASS00	10.942	7.1682	9.2419
	(10.6)	(6.43)	(8.90)
R-squ. adj.	0.6794	0.7285	0.7106
AIC	-0.1986	-0.3604	-0.2967
J.-Bera	1.712	10.79	1.304
RESET	0.1431	3.0416	1.1510

Table 21.3: Regressions of OFFPCI02: full sample

	(1)	(2)	(3)
c	0.4816	0.4636	0.5570
	(4.34)	(4.30)	(5.10)
IGMREV02c		0.0707	
		(3.89)	
ln			0.0876
IGMREV02b			(3.98)
TLEXPD00c	0.0344	0.0154	0.0382
	(6.63)	(2.18)	(7.46)
MVSMCT00	0.8648	0.8927	0.8688
	(5.55)	(5.90)	(5.76)
WGSAL00	-1.3138	-1.2802	-1.2719
	(-10.5)	(-8.22)	(-10.5)
PUBASS00	4.5209	3.4734	3.6555
	(9.82)	(6.66)	(7.36)
R-squ. adj.	0.7391	0.7542	0.7549
AIC	-1.8255	-1.8812	-1.8840
J.-Bera	3.372	8.280	6.267
RESET	0.0493	0.1371	0.4577

Table 21.4: Regressions of OFFHHMI02: full sample

stratify each sample into four quartiles of the dependent variable components (OFFEARN, PCINC, or HHMINC). Then, we estimate our equations with the stratified sub-samples. Finally, we compare the sub-sample results with the total sample results.

The sub-sample results of the regressions of OFFHHMI02 on IGMREV02b are shown in the tables 21.5 and 21.6. This is our regression with the highest R-squared value. Each of the lowest (1) and the highest (4) quartile contains 59 counties, each of the two others, 58. The results can be summarized as follows:

Based on the stratification of the sample by the county officials' average monthly earnings (OFFEARN02), IGMREV02b becomes clearly less significant as a regressor of OFFHHMI02. In (1) and in (3), its coefficient reaches a signficance level of 10%; in (2) and in (4), it is insignificant. The control variables also get lower t-values due to the stratification. The only variable out of these which turns into the status of insignificance, exactly in three cases, is TLEXPD02c. The explanatory power increases from the first to the fourth quartile. Compared to the non-stratified regression, the adjusted R-squared is even higher in (3) and (4). The AIC values are always lower in the stratified regressions. They do not perfectly correspond to the adjusted R-squared values. The Jarque-Bera test provides clear evidence for a non-normal distribution of the residuals in (1) and in (2). The Ramsey RESET test indicates serious specification problems in (4).

Based on the stratification by the household median income (HHMINC99), IGMREV02b gets less significant, but not as much as before. In (1) and in (3), its coefficient reaches a 1% signficance level; in (2) and in (4), it is insignificant. Now, TLEXPD02c remians a strong control variable. Weaknesses are shown by MVSMCT00 in (1) and (2), and by PUBASS00 in (4). Compared to the non-stratified regression, the adjusted R-squared is higher merely in (4). There is no clear relationship between the HHMINC99 and the explanatory power. The AIC does not perfectly correspond to the adjusted R-squared. Furthermore, its values are lower than without stratification in (2) to (4). The Jarque-Bera test indicates non-normality of the residuals for (1) and (2). For none of all four, Ramsey's RESET test indicates misspecification.

The sample stratification by the components of their respective dependent variable leads to similar results for the other regressions from the tables 21.1 to 21.4.

	(1)	(2)	(3)	(4)
c	0.3351	0.5578	0.6794	1.5583
	(1.90)	(3.08)	(2.64)	(5.48)
ln	0.0790	0.0002	0.0870	0.0524
IGMREV02b	(1.70)	(0.004)	(1.88)	(0.95)
TLEXPD02c	0.0311	0.0110	0.0471	0.0105
	(1.33)	(0.64)	(3.62)	(1.58)
MVSMCT00	1.0021	0.8906	0.9227	0.8136
	(3.16)	(2.92)	(2.71)	(2.97)
WGSAL00	-1.0604	-1.3252	-1.4529	-2.3560
	(-5.62)	(-6.45)	(-5.28)	(-6.97)
PUBASS00	3.1070	4.7279	3.4585	3.9618
	(3.71)	(3.26)	(3.59)	(4.59)
R-squ. adj.	0.6917	0.7336	0.8238	0.8326
AIC	-1.8925	-2.0619	-2.0128	-2.1010
J.-Bera	11.80	4.510	1.775	1.277
RESET	1.2486	0.0567	1.2046	4.6349

Table 21.5: Regressions of OFFHHMI02 on ln IGMREV02b: sample stratified by OFFEARN02

	(1)	(2)	(3)	(4)
c	0.4860	0.0417	0.5514	1.0278
	(1.87)	(0.20)	(2.44)	(4.82)
ln	0.2030	0.0686	0.1171	0.0286
IGMREV02b	(3.54)	(1.61)	(2.88)	(0.94)
TLEXPD02c	0.0759	0.0294	0.0417	0.0289
	(5.38)	(3.56)	(3.69)	(3.36)
MVSMCT00	0.0618	0.5711	1.0085	0.7139
	(0.13)	(1.55)	(3.51)	(2.80)
WGSAL00	-0.8459	-0.4844	-1.2626	-1.8134
	(-2.04)	(-1.88)	(-4.65)	(-7.65)
PUBASS00	2.8361	3.7950	2.7161	1.8254
	(2.97)	(3.29)	(2.55)	(1.53)
R-squ. adj.	0.6374	0.5837	0.5788	0.7840
AIC	-1.4220	-1.9640	-2.0215	-2.7505
J.-Bera	2.666	5.577	0.532	0.107
RESET	0.0012	0.9701	0.0552	0.0737

Table 21.6: Regressions of OFFHHMI02 on ln IGMREV02b: sample stratified by HHMINC99

Chapter 22

Summary

In a constitutional approach, a government is considered as a monolithic and self-interested entity, called Leviathan. There are at least four theoretical reasons which justify such a characterization, namely: simplicity, consistency, pessimism, and evolutionary dominance. Now, we ask: Do governments really behave as Leviathans? And how can we check this?

It has been suggested to check the real behavior of governments via the BBLD hypothesis. The BBLD hypothesis asserts that fiscal power is negatively related to fiscal decentralization. Fiscal decentralization promotes competition among governments; such competition works as a steady constraint to fiscal power. Leviathans can be identified by the maximization of their fiscal power. The related empirical model has to specify the two theoretical constructs. Usually, fiscal power is specified as a fiscal budget value in relation to a social-economic value; fiscal decentralization is specified as the share of certain government levels on an aggregate fiscal budget value, or as the number of government units on certain levels. - However, we find severe shortcomings of this approach. In particular, it does not adequately consider the interests of the citizens. Two instances are: Firstly, the citizens could agree to a relative increase of the fiscal budget because of the given preferences and technology. Secondly, they could agree to a less decentralized government structure because of the given diversity in preferences, economies of scale, or externalities.

Thus, we develop a new approach to check the real behavior of governments. Our basic hypothesis is that a government's social power depends on its sources of revenue. Leviathans can be identified by their maximization of social power. We specify social power as the relative deviation of an agent's

personal income from his productivity level. However, since a government agent does not offer his services on a free market, his productivity is hardly measurable. Therefore, we make the assumption that his productivity is constantly related to the average income in his jurisdiction. It follows from this that the more a government agent's income relatively deviates from the respective average income, the higher is his social power. - We deal with two issues: firstly, the extent of such social power; and secondly, how the social power depends on the sources of public revenue.

For our empirical analysis, we use two samples on the local governments in the U.S.A. In the U.S.A., the local governments are comparatively independent in their policies. They take up multiple tasks which are of major importance to the citizens. The two samples are taken from 234 counties in the periods 1989/ 1992 and 1999/ 2002. They follow a consistent and sustainable concept; and comprise 56 variables, out of which the key variable is the local officials' average march/ october full-time earnings.

In our descriptive analysis, we compare the officials' average earnings with the per capita income and the median household income. We can state that the first variable has the lowest relative standard deviation and the highest degree of symmetry, out of the three. Next, we construct the relative deviation variables. It turns out the following: The relative deviation of the officials' average earnings from the per capita income shows a higher mean, a higher standard deviation, and a higher degree of skewness than the relative deviation from the median household income, in both periods. An analysis of the correlation coefficients shows that the relative deviation variables are significantly related to just one public revenue variable, namely intergovernmental grants. Nevertheless, this relationship seems markedly strong and multisided.

We further examine the relationship between social power and intergovernmental grants in our regression analysis. Here, we work with four dependent variables (OFFPCI92, OFFHHMI92, OFFPCI02, OFFHHMI02) and four (main) explaining variables (IGMREV92c, IGMREV92b, IGMREV02c, IGMREV02b). The regression analysis is made in two steps: In step 1, the regressions are run on the full samples. In a first sub-step, we select the control variables according to a specified procedure. The selection is made for each dependent variable. We thus get three or four powerful, reliable regressors. The only variable which belongs in each case to this group is the percentage of households with public assistance income (PUBASS). In a second sub-step, we integrate the explaining variables into the regression analysis. We thus get four plus eight estimating equations. Overall, these equations show the

following results: The variation of the relative income deviation is explained by 57% to 76%. The explanatory power of the regressions is higher for 1999/ 2002 than for 1989/ 1992, higher for OFFHHMI than for OFFPCI. The main explainig variables have positive and significant coefficients. They raise the explanatory power of the regressions. In step 2, we check how the regression results depend on the individual components of the dependent variable. We stratify the samples along these components. Overall, our sub-sample estimates reveal the following: The explaining variable tends to reach higher degrees of significance in lower sub-samples. However, this tendency seems not to be linear. A stratification along OFFEARN is more detrimental to the significance than along the other respective component.

We may interpret the results of our empirical analysis in the following way: A local government can reach a substantial degree of social power, indicated by the relative deviation of its personal earnings. The richest source of its social power is, by far, intergovernmental revenue. While property taxes serve as an important source of public revenue, a local government can hardly derive any social power from them. Thus, property tax competition seems to work as an effective constraint to Leviathans. Now, the key question is: What engenders this competition? - We found evidence that it is rather engendered by voice than by exit options. Here, we assume that voice options are strongly related to the educational level and the citizenship. Furthermore, the misuse of local public revenue is strongly connected with public assistance payments. Overall, a government's social power clearly depends on the citizens' sources of income. The citizens' sources of income determine their ways to respond to local policy. It is more the source itself than the level of income which determines social power. Nonetheless, Leviathans have somewhat better chances to misuse public revenue in low-income jurisdictions than in high-income jurisdictions.

Part IV

Concluding Remarks

This thesis seeks to contribute to an optimal fiscal constitution. Our main task is to find optimal rules for the provision of local public goods. To solve the inherent free-rider problem, the local governments are given the power to tax. However, we assume that governments behave as Leviathans. Hence, we search for some optimal constraints on the power to tax.

In this thesis, we analyze the effects of certain constraints. Generally, we distinguish between direct and indirect ones: Direct constraints define which fiscal measures governments are allowed to take or not. Indirect constraints define which responses citizens are allowed to give or not. In this thesis, we focus on two specific constraints: the stipulation of a tax base (direct); and the exit option (indirect).

In part I, we theoretically analyze the effects of four distinctive tax bases, which are all closely related to the housing market. We construct four distinctive tax models in which the citizens are allowed to migrate. This option generates competition among the Leviathans. In each model, the following assumptions are made: every region has the same size and structure; every citizen gets the same initial endowment; every citizen has the same skills and preference structure; private goods are homogeneous and globally tradeable; housing is homogeneous and regionally tradeable; the capital rent, the interest rate, and the wage are exogenous; the share of a specific tax revenue spent on local public goods is exogenous. We thus find out that the citizens may respond to the changes of the different tax bases in very different ways. In many cases, a response depends even qualitatively on the specific properties of a price function. However, such properties cannot be predicted in a constitutional approach. Moreover, there exists no common yardstick to aggregate and assess the different responses. Hence, we cannot decide which tax base should be stipulated into a constitution.

Based on part I, we may suggest the following issues for future research: First, the regions could be different in size and structure. How does a Leviathan's optimal policy depend on the size and the structure? - Second, the citizens could be different in endowment, skills and preference structure. Which patterns of migration do result from this? - Third, the private goods could be heterogeneous and involve transportation costs. How do the related differences affect housing decisions? - Fourth, there could be regional sub-markets for housing. A salient example is the separation between an ownership and a rental market. Which specific effects does a sub-market create? - Fifth, the housing units could exist for longer than a household generation. How is housing traded between different generations? - Sixth, the local tax competition could also be generated by voice decisions. What

are their distinctive effects? - Seventh, intergovernmental grants could be an internal part of the tax system. How do those affect the incentives of each involved type of agent?

In part II, we empirically analyze the relative influence of local fiscal policy on housing prices. We seek to find out to what extent the citizens might constrain local Leviathans by migration. This is done in view of the special features of housing markets. By estimating housing price functions, we encounter three major problems: unclear causal directions, interrelations, and hidden variables. We try to solve these problems in four preassigned methodological steps. By using data on US-counties in the years 2002 and 2003, we get the following results: The property tax revenue has a positive relationship with the housing prices. However, this relationship is dominated by the impact of income and mobility; its causality works in both directions. The relationship between total public expenditures and the housing prices is positive, less strong, but more robust. Overall, migration appears as a rather weak constraint for Leviathans.

Based on part II, the following issues seem to claim further treatment: First, the role of regulation: One could integrate regulation dummies into the estimating equations. Second, the role of housing market imperfections: One could construct a common index for the degree of imperfection. Third, the role of housing sub-markets: One could strictly delimit each variable for certain relevant sub-markets. Fourth, the determinants of housing demand: One could integrate data from relevant opinion surveys into the samples. Fifth, the role of dynamics: One could use time series data to estimate the equations. Sixth, the role of country specific features: One could use data from other countries.

In part III, we empirically examine to what extent governments really behave as Leviathans. Leviathans are assumed to be maximizers of their own social power. Hence, we develop a new approach to measure social power. In general, social power is specified as the deviation of income from the respective productivity. We make the assumption that the productivity of a government stands in a constant relationship to the average income in its jurisdiction. In addition, we set up the hypothesis that a government's social power is dependent on its sources of revenue. For our empirical analysis, we use samples of 234 US-counties in the periods 1989/ 1992 and 1999/ 2002, which especially comprise a variable on the local officials' average earnings. We thus find the following: A local government can reach a substantial degree of social power. By far the richest source of social power is intergovernmental revenue; especially, if it is conditioned for public assistance. In general, a

Leviathan is somewhat less constrained in lower-income jurisdictions.

Based on part III, the follwing issues seem particularly worthwile for future reseach: First, the choice of income variables: One could take income variables which consist of more similar components. Second, the choice of government levels: One could integrate governments from other levels. Specific differences could be indicated by dummy variables. Third, the choice of government functions: One also could use dummy variables in order to distinguish the effects of different government functions. Fourth, the choice of control variables: One could integrate data from opinion surveys about public policy. Fifth, the choice of specifications: One could use a different specification for the social power of a government, which in particular hinges less on the productivity assumption.

Bibliography

Part I

Auerbach, Alan J. (1985): "The Theory of Excess Burden and Optimal Taxation," in: Auerbach, A. J./ Feldstein, M. (eds): "Handbook of Public Economics," 1, ch. 2, Elsevier Science Publishers.

Bewley, Truman F. (1981): "A Critique of Tiebout's Theory of Local Public Expenditures," Econometrica, 49, 713-40.

Berglas, Eitan (1984): "Quantities, Qualities and Multiple Public Services in the Tiebout Model," Journal of Public Economics, 25, 299-321.

Berglas, Eitan/ Pines, David (1981): "Clubs, local public gooods and transportation models - A synthesis," Journal of Public Economics, 15, 141-62.

Brennan, Geoffrey/ Buchanan, James M. (1977): "Towards a Tax Constitution for Leviathan," Journal of Public Economics, 8, 255-73.

Brennan, Geoffrey/ Buchanan, James M. (1978): "Tax Instruments as Constraints on the Disposition of Public Revenues," Journal of Public Economics, 9, 301-18.

Brennan, Geoffrey/ Buchanan, James M. (1979): "The Logic of Tax Limits: Alternative Constitutional Constraints on the Power to Tax," National Tax Journal, 32, suppl., 11-22.

Brennan, Geoffrey/ Buchanan, James M. (1980): "The Power to Tax - Analytical foundations of a fiscal constitution," Cambridge University Press.

Brennan, Geoffrey/ Buchanan, James M. (1983): "Predictive Power and the Choice among Regimes," The Economic Journal, 93, 89-105.

Brueckner, Jan K. (1979): "Property Values, Local Public Expenditure and Economic Efficiency," Journal of Public Economics, 11, 223-45.

Brueckner, Jan K. (1983): "Property Value Maximization and Public Sector Efficiency," Journal of Urban Economics, 14, 1-15.

Brueckner, Jan K. (2000): "A Tiebout/tax-competition model," Journal of Public Economics, 77, 285-306.

Brueckner, Jan K./ Saavedra, Luz A. (2001): "Do Local Governments Engage in Strategic Property-Tax Competition?" National Tax Journal, 54(2), 203-29.

Buchanan, James M. (1965): "An Economic Theory of Clubs," Economica, 32, 1-14.

Buchanan, James M./ Goetz, Charles J. (1972): "Efficiency Limits of Fiscal Mobility: An Assessment of the Tiebout Model," Journal of Public Economics, 1, 25-43.

Buchanan, James M./ Tullock, Gordon (1965): "The calculus of consent - logical foundations of constitutional democracy," The University of Michigan Press.

Bucovetsky, Sam/ Wilson, John D. (1991): "Tax competition with two tax instruments," Regional Science and Urban Economics," 21, 333-50.

Caplan, Bryan (2001): "Standing Tiebout on his head: Tax capitalization and the monopoly power of local governments," Public Choice, 108, 101-22.

Clarke, Edward H. (1971): "Multipart Pricing of Public Goods," Public Choice, 11, 17-33.

Cornes, Richard/ Sandler, Todd (1996): "The Theory of Externalities, Public Goods and Club Goods," Cambridge University Press.

Diamond, Peter A./ Mirrlees, James A. (1971): "Optimal Taxation and Public Production," American Economic Review, 61, 8-27, 261-78.

Edwards, Jeremy/ Keen, Michael (1996): "Tax competition and Leviathan," European Economic Review, 40, 113-34.

Epple, Dennis/ Filimon, Radu/ Romer, Thomas (1984): Equilibrium among local jurisdictions: Toward an integrated treatment of voting and residential choice," Journal of Public Economics, 24, 281-308.

Epple, Dennis/ Filimon, Radu/ Romer, Thomas (1993): "Existence of Voting and Housing Equilibrium in a System of Communities with Property Taxes," Regional Science and Urban Economics, 23, 585-610.

Epple, Dennis/ Zelenitz, Allan (1981): "The Implications of Competition among Jurisdictions: Does Tiebout Need Politics?" Journal of Political Economy, 89, 1197-217.

Epple, Dennis/ Zelenitz, Allan/ Visscher, Michael (1978): "A Search for Testable Implications of the Tiebout Hypothesis," Journal of Political Economy, 86(3), 405-25.

Findlay, Ronald/ Wilson, John D. (1987): "The Political Economy of Leviathan," in: Razin, A./ Sadka, E. (eds.): Economic Policy in Theory and Practice, London, 289-30.

Glaeser, Edward L. (1996): "The incentive effects of property taxes on local governments," Public Choice, 89, 93-111.

Groves, Theodore (1973): "Incentives in Teams," Econometrica, 41, 617-31.

Hamilton, Bruce W. (1975): "Zoning and Property Taxation in a System of Local Governments," Urban Studies, 12, 205-11.

Hamilton, Bruce W. (1976): "Capitalization of intrajurisdictional differences in local tax prices," American Economic Review, 66, 743-54.

Hayek, Friedrich A. von (1960): "The Constitution of Liberty," London.

Henderson, J. Vernon (1985a): "Economic Theory and the Cities," Academic Press.

Henderson, J. Vernon (1985b): "The Tiebout Model: Bring Back the Entrepreneurs," Journal of Political Economy, 93, 248-64.

Henderson, J. Vernon (1995): "Will homeowners impose property taxes?" Regional Science and Urban Economics, 25, 153-81.

Hettich, Walter/ Winer, Stanley L. (1997): "The political economy of taxation," in: Mueller, D. C. (ed.): Perspectives on Public Choice, ch. 22, Cambridge University Press, 481-505.

Hoyt, William H. (1990): "Local Inefficiency and the Tiebout Hypothesis: Does Competition among Municipalities Limit Local Government Inefficiency?" Southern Economic Journal, 57(2), 481-96.

Hoyt, William H. (1991): "Competitive jurisdictions, congestion, and the Henry George Theorem - When should property be taxed instead of land?" Regional Science and Urban Economics, 21, 351-70.

Hoyt, William H. (1992): "Market power of large cities and policy differences in metropolitan areas," Regional Science and Urban Economics, 22, 539-58.

Hoyt, William H. (1999): "Leviathan, local government expenditures, and capitalization," Regional Science and Urban Economics, 29, 155-71.

Krelove, Russell (1993): "The Persistence and Inefficiency of Property Tax Finance of Local Public Expenditures," Journal of Public Economics, 51, 415-35.

Marlow, Micheal L./ Orzechowski, William (1988): "Controlling Leviathan through tax reduction," Public Choice, 58(3), 237-45.

Mieszkowski, Peter/ Zodrow, George R. (1989): "Taxation and the Tiebout Model: The Differential Effects of Head Taxes, Taxes on Land Rents, and Property Taxes," Journal of Economic Literature, 27(3), 1098-146.

McGuire, Martin (1972): "Private Good Clubs and Public Good Clubs: Economic Models in Group Formation," Swedish Journal of Economics, 4, 85-99.

Mills, David E. (1981): "The Non-Neutrality of Land Value Taxation," National Tax Journal, 34, 125-30.

Mills, Edwin S./ Hamilton, Bruce W. (1994): "Urban Economics," New York.

Mueller, Dennis C. (2003): "Public Choice III," Cambridge University Press.

Oates, Wallace E. (1981): "On Local Finance and the Tiebout Model," American Economic Review, 5, 93-8.

Olson, Mancur (1969): "The Principle of 'Fiscal Equivalence': The Division of Responsibilities amoung Different Levels of Government," American Economic Review, 59, 479-87.

O'Sullivan, Arthur (2003): "Urban Economics," New York.

Pauly, Mark V. (1976): "A Model of Local Government Expenditure and Tax Capitalization," Journal of Public Economics, 6, 231-42.

Ramsey, Frank P. (1927): "A Contribution to the Theory of Taxation," Economic Journal, 37, 47-61.

Rauscher, Michael (1998): "Leviathan and Competition among Jurisdictions: The Case of Benefit Taxation," Journal of Urban Economics, 44, 59-67.

Rubinfeld, Daniel L. (1987): "The Economics of the Local Public Sector," in: Auerbach, A. J./ Feldstein, M. (eds.): "Handbook of Public Economics," Elsevier Science Publishers, ch. 11, 571-645.

Samuelson, Paul A. (1954): "The Pure Theory of Public Expenditures," The Review of Economics and Statistics, 36(4), 387-9.

Silberberg, Eugene (1990): "The Structure of Economics - A Mathematical Analysis," McGraw-Hill.

Sonstelie, Jon C./ Portney, Paul R. (1978): "Profit Maximizing Communities and the Theory of Local Public Expenditures," Journal of Urban Economics, 5, 263-77.

Spicer, Michael W. (1987): "The Effect of Tax Evasion on Tax Rates under Leviathan," National Tax Journal, 40(4), 625-8.

Stiglitz, Joseph E. (2000): "Economics of the Public Sector," New York/ London.

Starrett, David (1980): "On the method of taxation and the provision of local public goods," American Economic Review, 70(3), 380-92.

Tiebout, Charles M. (1956): "A Pure Theory of Local Expenditures," Journal of Political Economy, 64(5), 416-24.

Varian, Hal R. (1992): "Microeconomic Analysis," New York/ London.

Westhoff, Frank (1977): "Existence of equilibria in economies with a local public good," Journal of Economic Theory, 14, 84-112.

Wildasin, David E. (1979): "Local Public Goods, Property Values, and Local Public Choice," Journal of Urban Economics, 6, 521-34.

Wildasin, David E. (1987): "Theoretical Analysis of Local Public Economics," in: Mills, E. S. (ed.): "Handbook of Regional and Urban Economics," 2, ch. 29, Elsevier Science Publishers.

Wilson, John D. (1997): "Property taxation, congestion, and local public goods," Journal of Public Economics, 64, 207-17.

Wilson, John D./ Gordon, Roger H. (2003): "Expenditure Competition," Journal of Public Economic Theory, 5(2), 399-417.

Yinger, John (1982): "Capitalization and the Theory of Local Public Finance," Journal of Political Economy, 90(5), 917-43.

Zodrow, George R. (2001): "The Property Tax as a Capital Tax: A Room with Three Views," National Tax Journal, 54(1), 139-56.

Zodrow, George R./ Mieszkowski, Peter (1983): "The incidence of the property tax: the benfit view versus the new view," in: Zodrow, G. R. (ed.): "Local Provision of Public Services: The Tiebout-Model after Twenty-Five Years," Academic Press, 109-29.

Zodrow, George R./ Mieszkowski, Peter (1986): "Pigou, Tiebout, Property Taxation, and the Underprovision of Local Public Goods," Journal of Urban Economics, 19, 356-70.

Part II

Bayoh, Isaac/ Irwin, Elena G./ Haab, Timothy (2006): "Determinants of Residential Location Choice: How Important are Local Public Goods in Attracting Homeowners to Central City Locations?" Journal of Regional Science, 46(1), 97-120.

Bentick, Brian L. (1979): "The Impact of Taxation and Valuation Practices on the Timing and Efficiency of Land Use," Journal of Political Economy, 87(4), 859-68.

Bloom, Howard S./ Ladd, Helen F./ Yinger, John (1983): "Are Property Taxes Capitalized into House Values?" in: Zodrow, G. R. (ed.): Local Provision of Public Services: The Tiebout-Model after Twenty-Five Years, Academic Press, ch. 7, 145-63.

Box, George E. P./ Cox, David R. (1962): "An Analysis of Transformation," Journal of the Royal Statistical Society, 5, 211-43.

Brueckner, Jan K. (1979): "Property Values, Local Public Expenditure and Economic Efficiency," Journal of Public Economics, 11, 223-45.

Carroll, Robert J./ Yinger, John (1984): "Is the Property Tax a Benefit Tax? The Case of Rental Housing," National Tax Journal, 47(2), 295-316.

Chinloy, Peter (1978): "Effective property taxes and tax capitalization," Canadian Journal of Economics, 11(4), 740-50.

Church, Albert M. (1974): "Capitalization of the Effective Property Tax Rate on Single Family Residences," National Tax Journal, 27(1), 113-22.

Edel, Matthew/ Sclar, Elliott (1974): "Taxes, Spending, and Property Values: Supply Adjustment in a Tiebout-Oates Model," Journal of Political Economy, 82(5), 941-54.

Fischel, William A. (1992): "Property Taxation and the Tiebout Model: Evidence for the Benefit View from Zoning and Voting," Journal of Economic Literature, 30, 171-7.

Goodman, Allen C. (1983): "Capitalization of Property Tax Differentials Within and Among Municipalities," Land Economics, 59(2), 211-9.

Greene, William H. (2000): "Econometric Analysis," Upper Saddle River.

Gronberg, Timothy J. (1979): "The Interaction of Markets in Housing and Local Public Goods: A Simultaneous Equations Approach," Southern Economic Journal, 39(10), 445-59.

Guilfoyle, Jeffrey P. (2000): "The Effect of Property Taxes on Home Values," Journal of Real Estate Literature, 8(2), 111-27.

Gustely, Richard D. (1976): "Local Taxes, Expenditure and Urban Housing: A Reassessment of the Evidence," Southern Economic Journal, 42, 659-65.

Hamilton, Bruce W. (1975): "Zoning and Property Taxation in a System of Local Governments," Urban Studies, 12(2), 205-11.

Hamilton, Bruce W. (1976a): "Capitalization of Intrajurisdictional Differences in Local Tax Prices," American Economic Review, 66(5), 743-53.

Hamilton, Bruce W. (1976b): "The Effects of Property Taxes and Local Public Spending on Property Values: A Theoretical Comment," Journal of Political Economy, 84(3), 647-50.

Hoxby, Caroline M. (1999): "The productivity of schools and other local public goods producers," Journal of Public Economics, 74, 1-30.

Hoyt, William H./ Rosenthal, Stuart S. (1997): "Household Location and Tiebout: Do Families Sort According to Preferences for Locational Amenities?" Journal of Urban Economics, 42, 159-78.

Hwang, Min/ Quigley, John M. (2006): "Economic Fundamentals in Local Housing Markets: Evidence from U.S. Metropolitan Regions," Journal of Regional Science, 46(3), 425-53.

Hyman, David N./ Pasour, E. C. (1973): "Real Property Taxes, Local Public Services and Residential Property Values," Southern Economic Journal, 40, 601-11.

Hyman, David N./ Pasour, E. C. (1974): "Real Property Taxes, Local Public Services and Residential Property Values: A Reply," Southern Economic Journal, 41, 329-31.

Kennedy, Peter (1998): "A Guide to Econometrics," Cambridge.

King, A. Thomas (1977): "Estimating Property Tax Capitalization: A Critical Comment," Journal of Political Economy, 85(2), 425-31.

Kmenta, Jan (1997): "Elements of Econometrics," Ann Arbor.

Lusht, Kenneth M. (1997): "Real estate valuation: principles and applications," Irwin.

McGibany, James M: (1991): "The Effect of Property Tax Rate Differentials on Single-Family Housing Starts in Wisconsin: 1978-1989," Journal of Regional Science, 31(3), 347-59.

Mills, Edwin S./ Hamilton, Bruce W. (1994): "Urban Economics," Harper Collins College Publishers.

Nechyba, Thomas J./ Strauss, Robert P. (1998): "Community choice and local public services: A discrete choice approach," Regional Science and Urban Economics, 28, 51-73.

Netzer, Dick (1966): "Economics of the property tax," Washington, D.C.

Oates, Wallace E. (1969): "The Effects of Property Taxes and Local Public Spending on Property Values: An Empirical Study of Tax Capitalization and the Tiebout Hypothesis," Journal of Political Economy, 77, 957-71.

Oates, Wallace E. (1973): "The Effects of Property Taxes and Local Public Spending on Property Values: A Reply and Yet Further Results," Journal of Political Economy, 81(4), 1004-8.

Oates, Wallace E./ Schwab, Robert M. (1997): "The Impact of Urban Land Taxation: The Pittsburgh Experience," National Tax Journal, 50, 1-21.

Orr, Larry L. (1968): "The Incidence of Differential Property Taxes on Urban Housing," National Tax Journal, 21(3), 253-62.

Orr, Larry L.(1970): "The Incidence of Differential Property Taxes: A Response," National Tax Journal, 23(1), 99-101.

O'Sullivan, Arthur (2003): "Urban Economics," McGraw-Hill.

Palmon, Oded/ Smith, Barton A. (1998a): "A New Approach for Identifying the Parameters of a Tax Capitalization Model," Journal of Urban Economics, 44, 299-316.

Palmon, Oded/ Smith, Barton A. (1998b): "New Evidence on Property Tax Capitalization," Journal of Political Economy, 106(5), 1099-111.

Pollakowski, Henry O. (1973): "The Effects of Property Taxes and Local Public Spending on Property Values: A Comment and Further Results," Journal of Political Economy, 81, 994-1003.

Quigley, John M. (1985): "Consumer choice of dwelling, neighborhood and public services," Regional Science and Urban Economics, 15, 41-63.

Reback, Randall (2005): "House Prices and the Provision of Local Public Services: Capitalization Under School Choice Programs," Journal of Urban Economics, 57, 275-301.

Reinhard, Raymond M. (1981): "Estimating Property Tax Capitalization: A Further Comment," Journal of Political Economy, 89(6), 1251-60.

Richardson, David H./ Thalheimer, Richard (1981): "Measuring the Extent of Property Tax Capitalization for Single Family Residences," Southern Economic Journal, 47(3), 674-89.

Rosen, Harvey S./ Fullerton, David S. (1977): "A Note on Local Tax Rates, Public Benefit Levels, and Property Value," Journal of Political Economy, 85(2), 433-40.

Starrett, David A. (1981): "Land Value Capitalization in Local Public Finance," Journal of Political Economy, 89(2), 306-27.

Stewart, Douglas O. (1978): "The Effect of Differential Property Tax Rates on the Sales Prices of Single Family Residential Properties," Review of Economics and Statistics, 60(1), 150-3.

Tiebout, Charles M. (1956): "A Pure Theory of Local Expenditures," Journal of Political Economy, 64(5), 416-24.

U.S. Bureau of the Census (2004): "Compendium of Public Employment: 2002," 3, Washington, D.C.

U.S. Bureau of the Census (2005): "Compendium of Government Finances: 2002," 4(5), Washington, D.C.

U.S. Bureau of the Census (2006): "2002 American Community Survey," Washington, D.C.

U.S. Bureau of the Census (2006): "2003 American Community Survey," Washington, D.C.

Uyar, Bulent/ Brown, Kenneth H. (2005): "Impact of Local Public Services and Taxes on Dwelling Choice Within a Single Taxing Jurisdiction: A Discrete Choice Model," The Journal of Real Estate Research, 27(4), 427-43.

Wales, T. J./ Wiens, E. G. (1974): "Capitalization of Residential Property Taxes: An Empirical Study," Review of Economics and Statistics, 56(3), 329-333.

Part III

Anderson, John E./ Berg, Hendrik van den (1998): "Fiscal Decentralization and Government Size: An International Test for Leviathan Accounting for Unmeasured Economic Activity," International Tax and Public Finance, 5, 171-86.

Brennan, Geoffrey/ Buchanan, James M. (1980): "The Power to Tax - Analytical foundations of a fiscal constitution," Cambridge University Press.

Brennan, Geoffrey/ Buchanan, James M. (1983): "Predictive power and the choice among regimes," The Economic Journal, 93, 89-105.

Coase, Ronald H. (1960): "The Problem of Social Costs," The Journal of Law and Economics, 3(10), 1-44.

Eberts, Randal W./ Gronberg, Timothy, J. (1988): "Can Competition Amoung Local Governments Constrain Government Spending?" Economic Review (FRB of Cleveland), 24(1), 2-9.

Forbes, Kevin F./ Zampelli, Ernest M. (1989): "Is Leviathan a Mythical Beast?" American Economic Review, 79(3), 568-77.

Grossman, Philip J. (1989a): "Federalism and the Size of Government," Southern Economic Journal, 55(1), 580-93.

Grossman, Philip J. (1989b): "Fiscal decentralization and government size: An extension," Public Choice, 62(1), 63-9.

Grossman, Philip J. (1992): "Fiscal Decentralization and Public Sector Size in Australia," The Economic Record, 68, 240-6.

Grossman, Philip J./ West, Edwin G. (1994): "Federalism and the growth of government revisited," Public Choice, 79(1-2), 19-32.

Henderson, J. Vernon (1985): "Economic Theory and the Cities," Academic Press.

Hoyt, William H. (1990): "Local Inefficiency and the Tiebout Hypothesis: Does Competition among Municipalities Limit Local Government Inefficiency?" Southern Economic Journal, 57 (2), 481-96.

Inman, Robert P. (1979): "The Fiscal Performance of Local Governments: An Interpretative Review," in: Mieszkowski, P./ Straszheim, M. (eds.): "Current Issues in Urban Economics," Baltimore and London.

Inman, Robert P./ Rubinfeld, Daniel L. (1997): "The political economy of federalsim," in: Mueller, D. C. (ed.): "Perspectives on Public Choice," Cambridge University Press, 73-105.

Joulfaian, David/ Marlow, Michael L. (1990): "Government size and decentralization: Evidence from disaggregated data," Southern Economic Journal, 56, 1094-102.

Kennedy; Peter (1998): "A Guide to Econometrics;" Cambridge.

Marlow, Michael L. (1988): "Fiscal Decentralization and Government Size," Public Choice, 56 (3), 159-69.

Mehay, Stephen L./ Gonzalez, Rodolfo A. (1985): "Economic incentives under contract supply of local government services," Public Choice, 46(1), 79-86.

Mueller, Dennis C. (2003): "Public Choice III," Cambridge University Press.

Nelson, Michael, A. (1986): "An empirical analysis of state and local tax structure in the context of the Leviathan model of government," Public Choice, 49(3), 283-94.

Nelson, Michael A. (1987): "Searching for Leviathan: Comment and Extension," American Economic Review, 77(2), 198-204.

Oates, Wallace E. (1977): "An Economist's Perspective on Fiscal Federalism," in: Oates, W. E. (ed.): "The Political Economy of Fiscal Federalism," Lexington, 3-20.

Oates, Wallace E. (1985): "Searching for Leviathan: An Empirical Study," American Economic Review, 75(4), 748-57.

Oates, Wallace E. (1989): "Searching for Leviathan: A Reply and Some Further Reflections," American Economic Review, 79(3), 578-83.

Olson, Mancur (1969): "The Principle of 'Fiscal Equivalence': The Division of Responsabilites among Different Levels of Government," American Economic Review, 59(2), 479-87.

Prud'homme, Rémy (1987): "Financing Urban Public Services," in: Mills, E. S. (ed.): "Handbook of Regional and Urban Economics," 2, ch. 30, Elsevier Science Publishers.

Tiebout, Charles M. (1956): "A Pure Theory of Local Expenditures," Journal of Political Economy, 64(5), 416-24.

U.S. Bureau of the Census (1997): "Compendium of Government Finances: 1992," 4(5), Washington, D.C.

U.S. Bureau of the Census (1997): "Compendium of Public Employment: 1992," 3, Washington, D.C.

U.S. Bureau of the Census (2004): "Compendium of Public Employment: 2002," 3, Washington, D.C.

U.S. Bureau of the Census (2005): "Compendium of Government Finances: 2002," 4(5), Washington, D.C.

U.S. Bureau of the Census (2006): "1990 Census of Population and Housing," Washington, D.C.

U.S. Bureau of the Census (2006): "2000 Census of Population and Housing," Washington, D.C.

Zax, Jeffrey S. (1989): "Is There a Leviathan in Your Neighborhood?" American Economic Review, 79(3), 560-7.

Appendix A

Computations for the Two-Period Tax Models

Section 5.1: Taxation of Land Rent

Subsection 5.1.1: Housing Firms

$$F_{l1} = p_{ho}(\tau_{lo}, G_o)\frac{\partial h_o}{\partial k_{ho}} - \bar{r}_k = 0$$

$$\frac{dk_{ho}}{d\tau_{lo}} = -\frac{\frac{\partial F_{l1}}{\partial \tau_{lo}}}{\frac{\partial F_{l1}}{\partial k_{ho}}}$$

Subsection 5.1.2: Households

$$A_{l1}d_{l1} = z_{l1} \quad \Rightarrow \quad A_{l1}^{-1}z_{l1} = d_{l1}$$

$$A_{l1} = \begin{pmatrix} \frac{\partial^2 u_1}{\partial x_{1j}^2} & 0 & \frac{\partial^2 u_1}{\partial x_{1j}\partial h_j} & 0 \\ -\bar{p}_x & 0 & & \\ 0 & \beta\frac{\partial^2 u_2}{\partial x_{2j}^2} & \beta\frac{\partial^2 u_2}{\partial x_{2j}\partial h_j} & 0 \\ 0 & -\bar{p}_x & & \\ \frac{\partial^2 u_1}{\partial h_j \partial x_{1j}} & \beta\frac{\partial^2 u_2}{\partial h_j \partial x_{2j}} & \frac{\partial^2 u_1}{\partial h_j^2} + \beta\frac{\partial^2 u_2}{\partial h_j^2} & 0 \\ -p_{hj} & 0 & & \\ 0 & 0 & 0 & 0 \\ 1 & -(1+\bar{r}_y) & & \\ -\bar{p}_x & 0 & -p_{hj} & y_o \\ 0 & 0 & & \\ 0 & -\bar{p}_x & 0 & -(1+\bar{r}_y)y_o \\ 0 & 0 & & \end{pmatrix}$$

$$d_{l1} = \begin{pmatrix} dx_{1j}/d\tau_{lo} \\ dx_{2j}/d\tau_{lo} \\ dh_j/d\tau_{lo} \\ d\gamma_1/d\tau_{lo} \\ d\lambda_1/d\tau_{lo} \\ d\lambda_2/d\tau_{lo} \end{pmatrix}$$

$$z_{l1} = \begin{pmatrix} 0 \\ 0 \\ 0 \\ 0 \\ -\gamma_1\left(\frac{\partial p_{ho}}{\partial \tau_{lo}}\frac{h_o}{1+\tau_{lo}} - \frac{p_{ho}h_o - \bar{r}_k k_{ho}}{(1+\tau_{lo})^2}\right) \\ -(1-\gamma_1)(1+\bar{r}_y)\left(\frac{\partial p_{ho}}{\partial \tau_{lo}}\frac{h_o}{1+\tau_{lo}} - \frac{p_{ho}h_o - \bar{r}_k k_{ho}}{(1+\tau_{lo})^2}\right) \end{pmatrix}$$

$$\frac{\partial^2 u_1}{\partial x_{1j}^2} = \frac{\bar{p}_x}{p_{hj}}\frac{\partial^2 u_1}{\partial h_j \partial x_{1j}}$$

$$\frac{\partial^2 u_2}{\partial x_{2j}^2} = \frac{\bar{p}_x}{p_{hj}(1+\bar{r}_y)}\frac{\partial^2 u_2}{\partial h_j \partial x_{2j}}$$

$$\frac{\partial^2 u_1}{\partial x_{1j}\partial h_j} = (1+\bar{r}_y)\beta\frac{\partial^2 u_2}{\partial h_j \partial x_{2j}}$$

$$\frac{\partial^2 u_1}{\partial h_j^2} = \frac{p_{hj}}{\bar{p}_x}\frac{\partial^2 u_1}{\partial x_{1j}\partial h_j} - \beta\frac{\partial^2 u_2}{\partial h_j^2}$$

Subsection 5.1.4: Total Equilibrium

$$A_{l2}d_{l2} = z_{l2} \quad \Rightarrow \quad A_{l2}^{-1}z_{l2} = d_{l2}$$

$$A_{l2} = \begin{pmatrix} \frac{\partial v_j}{\partial y_o}\frac{h_o}{1+\tau_{lo}} & \frac{\partial v_j}{\partial p_{hj}} \\ \frac{\sum_o \frac{\partial h_j}{\partial y_o}}{1+\tau_{lo}} - \frac{\sum_o h_j \frac{\partial h_o}{\partial k_{ho}}\frac{\partial k_{ho}}{\partial p_{ho}}}{h_o^2} & \frac{\sum_o \frac{\partial h_j}{\partial p_{hj}}}{h_o} \end{pmatrix}$$

$$d_{l2} = \begin{pmatrix} dp_{ho}/d\tau_{lo} \\ dp_{hj}/d\tau_{lo} \end{pmatrix}$$

$$z_{l2} = \begin{pmatrix} -\frac{\partial v_j}{\partial y_o}\left(\frac{h_o\frac{\partial p_{ho}}{\partial \tau_{lo}}}{1+\tau_{lo}} - \frac{p_{ho}h_o - \bar{r}_k k_{ho}}{(1+\tau_{lo})^2}\right) \\ -\frac{1}{h_o}\sum_o \frac{\partial h_j}{\partial y_o}\left(\frac{h_o\frac{\partial p_{ho}}{\partial \tau_{lo}}}{1+\tau_{lo}} - \frac{p_{ho}h_o - \bar{r}_k k_{ho}}{(1+\tau_{lo})^2}\right) + \frac{\sum_o h_j \frac{\partial h_o}{\partial k_{ho}}\frac{\partial k_{ho}}{\partial p_{ho}}\frac{\partial p_{ho}}{\partial \tau_{lo}}}{h_{lo}^2} \end{pmatrix}$$

Section 5.2: Taxation of Capital Rent

Subsection 5.2.1: Housing Firms

$$F_{k1} = p_{ho}(\tau_{lo}, G_o)\frac{\partial h_o}{\partial k_{ho}} - \bar{r}_k(1+\tau_{ko}) = 0$$

$$\frac{dk_{ho}}{d\tau_{ko}} = -\frac{\frac{\partial F_{k1}}{\partial \tau_{ko}}}{\frac{\partial F_{k1}}{\partial k_{ho}}}$$

Subsection 5.2.2: Households

$$A_{k1}d_{k1} = z_{k1} \quad \Rightarrow \quad A_{k1}^{-1}z_{k1} = d_{k1}$$

$$A_{k1} = A_{l1}$$

$$d_{k1} = \begin{pmatrix} dx_{1j}/d\tau_{ko} \\ dx_{2j}/d\tau_{ko} \\ dh_j/d\tau_{ko} \\ d\gamma_1/d\tau_{ko} \\ d\lambda_1/d\tau_{ko} \\ d\lambda_2/d\tau_{ko} \end{pmatrix}$$

$$z_{k1} = \begin{pmatrix} 0 \\ 0 \\ 0 \\ 0 \\ \gamma_1 \bar{r}_y k_{ho} \\ (1-\gamma_1)(1+\bar{r}_y)\bar{r}_k k_{ho} \end{pmatrix}$$

Subsection 5.2.4: Total Equilibrium

$$A_{k2} d_{k2} = z_{k2} \quad \Rightarrow \quad A_{k2}^{-1} z_{k2} = d_{k2}$$

$$A_{k2} = \begin{pmatrix} \frac{\partial v_j}{\partial y_o} h_o & \frac{\partial v_j}{\partial p_{hj}} \\ \sum_o \frac{\partial h_j}{\partial y_o} - \frac{\sum_o h_j \frac{\partial h_o}{\partial k_{ho}} \frac{\partial k_{ho}}{\partial p_{ho}}}{h_o^2} & \frac{\sum_o \frac{\partial h_j}{\partial p_{hj}}}{h_o} \end{pmatrix}$$

$$d_{l2} = \begin{pmatrix} dp_{ho}/d\tau_{ko} \\ dp_{hj}/d\tau_{ko} \end{pmatrix}$$

$$z_{l2} = \begin{pmatrix} -\frac{\partial v_j}{\partial y_o}\left(h_o \frac{\partial p_{ho}}{\partial \tau_{ko}} - \bar{r}_k k_{ho}\right) \\ \frac{1}{h_o^2}\sum_o h_j \frac{\partial h_o}{\partial k_{ho}}\left(\frac{\partial k_{ho}}{\partial \tau_{ko}} + \frac{\partial k_{ho}}{\partial p_{ho}}\frac{\partial p_{ho}}{\partial \tau_{ko}}\right) - \frac{1}{h_o}\sum_o \frac{\partial h_j}{\partial y_o}\left(h_o \frac{\partial p_{ho}}{\partial \tau_{ko}} - \bar{r}_k k_{ho}\right) \end{pmatrix}$$

Section 5.3: Taxation of Housing Sales

Subsection 5.3.2: Households

$$A_{s1} d_{s1} = z_{s1} \quad \Rightarrow \quad A_{s1}^{-1} z_{s1} = d_{s1}$$

$$A_{s1} = \begin{pmatrix} \frac{\partial^2 u_1}{\partial x_{1j}^2} & 0 & \frac{\partial^2 u_1}{\partial x_{1j}\partial h_j} & 0 \\ -\bar{p}_x & 0 & & \\ 0 & \beta\frac{\partial^2 u_2}{\partial x_{2j}^2} & \beta\frac{\partial^2 u_2}{\partial x_{2j}\partial h_j} & 0 \\ 0 & -\bar{p}_x & & \\ \frac{\partial^2 u_1}{\partial h_j \partial x_{1j}} & \beta\frac{\partial^2 u_2}{\partial h_j \partial x_{2j}} & \frac{\partial^2 u_1}{\partial h_j^2} + \beta\frac{\partial^2 u_2}{\partial h_j^2} & 0 \\ -p_{hj}(1+\tau_{sj}) & 0 & & \\ 0 & 0 & 0 & 0 \\ 1 & -(1+\bar{r}_y) & & \\ -\bar{p}_x & 0 & -p_{hj}(1+\tau_{sj}) & y_o \\ 0 & 0 & & \\ 0 & -\bar{p}_x & 0 & -(1+\bar{r}_y)y_o \\ 0 & 0 & & \end{pmatrix}$$

$$d_{s1} = \begin{pmatrix} dx_{1j}/d\tau_{sj} \\ dx_{2j}/d\tau_{sj} \\ dh_j/d\tau_{sj} \\ d\gamma_1/d\tau_{sj} \\ d\lambda_1/d\tau_{sj} \\ d\lambda_2/d\tau_{sj} \end{pmatrix}$$

$$z_{s1} = \begin{pmatrix} 0 \\ 0 \\ \lambda_1\left(\frac{\partial p_{hj}}{\partial \tau_{sj}}(1+\tau_{sj}) + p_{hj}\right) \\ 0 \\ h_j\left(\frac{\partial p_{hj}}{\partial \tau_{sj}}(1+\tau_{sj}) + p_{hj}\right) \\ 0 \end{pmatrix}$$

$$\frac{\partial^2 u_1}{\partial x_{1j}^2} = \frac{\bar{p}_x}{p_{hj}(1+\tau_{sj})}\frac{\partial^2 u_1}{\partial h_j \partial x_{1j}}$$

$$\frac{\partial^2 u_2}{\partial x_{2j}^2} = \frac{\bar{p}_x}{p_{hj}(1+\tau_{sj})(1+\bar{r}_y)}\frac{\partial^2 u_2}{\partial h_j \partial x_{2j}}$$

$$\frac{\partial^2 u_1}{\partial h_j^2} = \frac{p_{hj}(1+\tau_{sj})}{\bar{p}_x}\frac{\partial^2 u_1}{\partial x_{1j}\partial h_j} - \beta\frac{\partial^2 u_2}{\partial h_j^2}$$

Subsection 5.3.4: Total Equilibrium

$$A_{s2}d_{s2} = z_{s2} \quad \Rightarrow \quad A_{s2}^{-1}z_{s2} = d_{s2}$$

$$A_{s2} = \begin{pmatrix} \frac{\partial v_j}{\partial y_o} h_o & (1+\tau_{sj})\frac{\partial v_j}{\partial p_{hj}} \\ \sum_o \frac{\partial h_j}{\partial y_o} - \frac{\sum_o h_j \frac{\partial h_o}{\partial k_{ho}} \frac{\partial k_{ho}}{\partial p_{ho}}}{h_o^2} & (1+\tau_{sj})\frac{\sum_o \frac{\partial h_j}{\partial p_{hj}}}{h_o} \end{pmatrix}$$

$$d_{s2} = \begin{pmatrix} dp_{ho}/d\tau_{sj} \\ dp_{hj}/d\tau_{sj} \end{pmatrix}$$

$$z_{s2} = \begin{pmatrix} -\frac{\partial v_j}{\partial p_{hj}} \left(p_{hj} + (1+\tau_{sj})\frac{\partial p_{hj}}{\partial \tau_{ko}} \right) \\ -\sum_o \frac{\partial h_o}{\partial p_{hj}} \frac{1}{h_o} \left(p_{hj} + (1+\tau_{sj})\frac{\partial p_{hj}}{\partial \tau_{ko}} \right) \end{pmatrix}$$

Section 5.4: Taxation of Housing Property

Subsection 5.4.2: Households

$$A_{v1} d_{v1} = z_{v1} \quad \Rightarrow \quad A_{v1}^{-1} z_{v1} = d_{v1}$$

$$A_{v1} = \begin{pmatrix} \frac{\partial^2 u_1}{\partial x_{1j}^2} & 0 & \frac{\partial^2 u_1}{\partial x_{1j} \partial h_j} & 0 \\ -\bar{p}_x & 0 & & \\ 0 & \beta \frac{\partial^2 u_2}{\partial x_{2j}^2} & \beta \frac{\partial^2 u_2}{\partial x_{2j} \partial h_j} & 0 \\ 0 & -\bar{p}_x & & \\ \frac{\partial^2 u_1}{\partial h_j \partial x_{1j}} & \beta \frac{\partial^2 u_2}{\partial h_j \partial x_{2j}} & \frac{\partial^2 u_1}{\partial h_j^2} + \beta \frac{\partial^2 u_2}{\partial h_j^2} & 0 \\ -p_{hj}(1+\tau_{vj}) & 0 & & \\ 0 & 0 & 0 & 0 \\ 1 & -(1+\bar{r}_y) & & \\ -\bar{p}_x & 0 & -p_{hj}(1+\tau_{vj}) & y_o \\ 0 & 0 & & \\ 0 & -\bar{p}_x & -p_{hj}\tau_{vj} & -(1+\bar{r}_y) y_o \\ 0 & 0 & & \end{pmatrix}$$

$$d_{v1} = \begin{pmatrix} dx_{1j}/d\tau_{vj} \\ dx_{2j}/d\tau_{vj} \\ dh_j/d\tau_{vj} \\ d\gamma_1/d\tau_{vj} \\ d\lambda_1/d\tau_{vj} \\ d\lambda_2/d\tau_{vj} \end{pmatrix}$$

$$z_{v1} = \begin{pmatrix} 0 \\ 0 \\ \lambda_1 \left(\frac{\partial p_{hj}}{\partial \tau_{vj}} (1 + \tau_{vj}) + p_{hj} \right) + \lambda_2 \left(\frac{\partial p_{hj}}{\partial \tau_{vj}} \tau_{vj} + p_{hj} \right) \\ 0 \\ h_j \left(\frac{\partial p_{hj}}{\partial \tau_{vj}} (1 + \tau_{vj}) + p_{hj} \right) \\ h_j \left(\frac{\partial p_{hj}}{\partial \tau_{vj}} \tau_{vj} + p_{hj} \right) \end{pmatrix}$$

$$\frac{\partial^2 u_1}{\partial x_{1j}^2} = \frac{\bar{p}_x}{p_{hj} \left(1 + \tau_{vj} + \frac{\tau_{vj}}{1 + \bar{r}_k} \right)} \frac{\partial^2 u_1}{\partial h_j \partial x_{1j}}$$

$$\frac{\partial^2 u_2}{\partial x_{2j}^2} = \frac{\bar{p}_x}{p_{hj} \left(1 + \tau_{vj} + \frac{\tau_{vj}}{1 + \bar{r}_k} \right)} \frac{\partial^2 u_2}{\partial h_j \partial x_{2j}}$$

$$\frac{\partial^2 u_1}{\partial h_j^2} = \frac{p_{hj} \left(1 + \tau_{vj} + \frac{\tau_{vj}}{1 + \bar{r}_k} \right)}{\bar{p}_x} \frac{\partial^2 u_1}{\partial x_{1j} \partial h_j} - \beta \frac{\partial^2 u_2}{\partial h_j^2}$$

$$\Omega_{v1} = \frac{\left(1 + \tau_{vj} + \frac{\tau_{vj}}{1 + \bar{r}_k} \right) + \frac{\tau_{vj}}{1 + \bar{r}_k} h_j \frac{\partial u_{1j}}{\partial h_j}}{1 + \tau_{vj}}$$

$$\Omega_{v2} = \frac{2 + h_j \frac{\partial u_{1j}}{\partial h_j}}{1 + \tau_{vj}} + \frac{\tau_{vj} h_j \frac{\partial u_{1j}}{\partial h_j}}{(1 + \tau_{vj}) \left(1 + \tau_{vj} + \frac{\tau_{vj}}{1 + \bar{r}_k} \right) (1 + \bar{r}_k)}$$

$$\Omega_{v3} = \frac{(2 + \bar{r}_y) \left(1 + 2\tau_{vj} + (2\bar{r}_y + \bar{r}_y^2)(1 + \tau_{vj})^2 \right)}{(1 + \bar{r}_y^2)(1 + \bar{r}_y + 2\tau_{vj} + \bar{r}_y \tau_{vj})(1 + \tau_{vj})}$$

$$\begin{aligned} \Omega_{v4} = & \frac{1 + \bar{r}_y + 2\tau_{vj} + \bar{r}_y \tau_{vj} + \tau_{vj} h_j \frac{\partial u_{1j}}{\partial h_j}}{(1 + \bar{r}_k^2)(1 + \bar{r}_y + 2\tau_{vj} + \bar{r}_y \tau_{vj})(1 + \tau_{vj})} * \\ & * \frac{1 + 2\tau_{vj} + (2\bar{r}_k + \bar{r}_y^2)(1 + \tau_{vj})^2}{(1 + \bar{y}_k^2)(1 + \bar{r}_y + 2\tau_{vj} + \bar{r}_y \tau_{vj})(1 + \tau_{vj})} \end{aligned}$$

$$\Omega_{v5} = \frac{h_j \left((1 + 3\tau_{vj} + \bar{r}_y^2 (1 + \tau_{vj})^2 + \bar{r}_k (2 + 5\tau_{vj} + 2\tau_{vj}^2) \right) \frac{\partial u_{1j}}{\partial h_j}}{(1 + \bar{r}_y^2)(1 + \bar{r}_y + 2\tau_{vj} + \bar{r}_y \tau_{vj})(1 + \tau_{vj})}$$

Subsection 5.4.4: Total Equilibrium

$$A_{v2}d_{v2} = z_{v2} \quad \Rightarrow \quad A_{v2}^{-1}z_{v2} = d_{v2}$$

$$A_{v2} = \begin{pmatrix} \frac{\partial v_j}{\partial y_o}h_o & \left(1+\tau_{vj}+\frac{\tau_{vj}}{1+\bar{r}_k}\right)\frac{\partial v_j}{\partial p_{hj}} \\ \sum_o \frac{\partial h_j}{\partial y_o} - \frac{\sum_o h_j \frac{\partial h_o}{\partial k_{ho}}\frac{\partial k_{ho}}{\partial p_{ho}}}{h_o^2} & \left(1+\tau_{vj}+\frac{\tau_{vj}}{1+\bar{r}_k}\right)\frac{\sum_o \frac{\partial h_j}{\partial p_{hj}}}{h_o} \end{pmatrix}$$

$$d_{l2} = \begin{pmatrix} dp_{ho}/d\tau_{vj} \\ dp_{hj}/d\tau_{vj} \end{pmatrix}$$

$$z_{v2} = \begin{pmatrix} -\frac{\partial v_j}{\partial p_{hj}}\left(p_{hj}\left(1+\frac{1}{1+\bar{r}_y}\right)+\left(1+\tau_{vj}+\frac{\tau_{vj}}{1+\bar{r}_y}\right)\frac{\partial p_{hj}}{\partial \tau_{vj}}\right) \\ -\sum_o \frac{\partial h_o}{\partial p_{hj}}\frac{1}{h_o}\left(p_{hj}\left(1+\frac{1}{1+\bar{r}_y}\right)+\left(1+\tau_{vj}+\frac{\tau_{vj}}{1+\bar{r}_y}\right)\frac{\partial p_{hj}}{\partial \tau_{vj}}\right) \end{pmatrix}$$

Appendix B

List of Empirical Variables

local fiscal budget

CUCHAR	current charges
DEBTSV	total government debt services
EDUCAT	expenditure: educational sevices: education
FINADM	expenditure: government administration: financial administration
HEALTH	expenditure: social sevice and income maintenance: health
HIGHW	expenditure: transportation: highways
HSDEVM	expenditure: housing and community development
IGMREV	total intergovernmental revenue
OSCREV	total general revenue from own sources
OTHADM	expenditure: other government administration
OTHTAX	revenue from other taxes
POLICE	expenditure: public safety: police protection
PPTAX	total property tax revenue
RECRTN	expenditure: environment and housing: parks and recreation
TLDEBT	total government indebtness
TLEXPD	total expenditure
TLREV	total revenue
TLTAX	total tax revenue
UTREV	utility revenue

housing prices

HSVALL	specified owner-occupied housing units: lower value quartile
HSVALM	specified owner-occupied housing units: median value
HSVALU	specified owner-occupied housing units: upper value quartile
RENTCM	specified renter-occupied housing units paying cash rent: median contract rent
RENTGM	specified renter-occupied housing units paying cash rent: median gross rent
	dwelling
DETDHS	housing units: percent detached
HSAGE	median age of housing structure
HSDEBT	specified owner-occupied housing units: percent with a mortgage contract to purchase, or simlar debt
MDNRR	median number of rooms
OCCDUR	owner occupied housing: median duration of occupancy
OCC1PS	occupied housing units: percent 1-person household
OWNOCC	occupied housing units: percent owner occupied
REINC	specified renter-occupied housing units paying cash rent: median gross rent as a percentage of household income
RM3OL	housing units: percent 3 rooms or less
VACHS	housing units: percent vacant
	demography
BACHPL	population 25 and over: percent bachelors degree or higher
FGBORN	population: percent foreign born
HHWMIN	total households: percent with one or more people under 18 years
HHWSEN	total households: percent with one or more people 65 years and over
MINOR	total population: percent of people under 18
MVSMCT	population 5 years plus: percent moved within same county within last 5 years

MV1DCT	population 1 year and over: different house 1 year ago in the same county
NUSCIT	population: percent not a U.S. citizen
ONEPHH	total households: percent of one-person households
SMHS5Y	population 5 years plus: percent have lived in the same house for 5 years
WHITE	total population: percent of white population

income level

HHMINC	household median income
OFFEARN	local officials: average march/ october earnings, all full-time employees
OFFHHMI	deviation of officials' average earnings from household median income
OFFPCI	deviation of officials' average earnings from per capita income
PCINC	total population: per capita income

income status

BELPOV	population for whom poverty status is determined: percent income in the past 12 months below poverty level
INTRST	total households: percent with interest, dividends, or net rental income
LABFC	total population: percent in labor force
PUBASS	total households: percent with public assistance income
RETIRE	total households: percent with retirement income
SFEMPL	total households: percent with self-employment income
UNEMPL	population in labor force: percent unemployed
WGSAL	total households: percent with wage or salary income

employment

AVTRT	workers 16 years and over who did not work at home: average travel time to work
HIEMPL	population 16 years and over: usually worked 35 or more hours per week, 50 to 52 weeks per year

UNEMPL	families: percent husband, wife or single householder are unemployed
WKCTRSD	workers 16 years and over: worked in the county of residence
WKPBTRP	workers 16 years and over: percent used public transportation
WKWALK	workers 16 years and over: percent walked

geography

DSHS	housing units: density per acre of land
DSPOP	population: density per acre of land

Appendix C

List of Abbreviations

ACS	American Community Survey
AIC	Akaike information criterion
adj.	adjusted
AL	Alabama, U.S.A.
AR	Arkansas, U.S.A.
AZ	Arizona, U.S.A.
BBLD	Brennan Buchanan Leviathan decentralization
CA	California, U.S.A.
ch.	chapter
CO	Colorado, U.S.A.
CoG	Census of Government
CBD	Central Business District
DC	District of Columbia, U.S.A.
FL	Florida, U.S.A.
GA	Georgia, U.S.A.
GDP	gross domestic product
HI	Hawaii, U.S.A.
IA	Iowa, U.S.A.
ID	Idaho, U.S.A.
IL	Illinois, U.S.A.
IN	Indiana, U.S.A.
J.-Bera	Jarque-Bera (statistic)
JD	jurisdiction
KY	Kentucky, U.S.A.
LA	Lousiana, U.S.A.
MA	Massachusetts, U.S.A.

MD	Maryland, U.S.A.
MI	Michigan, U.S.A.
MN	Minnesota, U.S.A.
MS	Mississippi, U.S.A.
NC	North Carolina, U.S.A.
NE	Nebraska, U.S.A.
NH	New Hampshire, U.S.A.
NJ	New Jersey, U.S.A.
NV	Nevada, U.S.A.
NY	New York, U.S.A.
OK	Oklahoma, U.S.A.
OLS	Ordinary Least Squares
PA	Pennsylvania, U.S.A.
POP	population
RESET	regression specification error test
R-squ.	R-squared
SMSA	Standard Metropolitan Statistical Area
TX	Texas, U.S.A.
U.S.A.	United States of America
USD	United States dollar
UT	Utah, U.S.A.
VA	Virginia, U.S.A.
WI	Wisconsin, U.S.A.
2SLS	two-stage least squares
#	number of

Zusammenfassung

Die vorliegende Doktorarbeit versteht sich als ein Beitrag zur Diskussion um eine optimale finanzpolitische Verfassung. Eine solche Verfassung dient der Aufgabe, die Steuergewalt zu beschränken. Die Steuergewalt kann dadurch gerechtfertigt werden, dass sie zur Lösung des Trittbrettfahrer-Problems bei der Bereitstellung lokaler öffentlicher Güter geeignet ist. Beschränkungen werden dann notwendig, wenn sich die staatlichen Akteure eigeninteressiert verhalten; also insgesamt als 'Leviathane'.

Teil I befasst sich mit der Festlegung von lokalen Steuerbasen in die Verfassung. Wir analysieren modelltheoretisch die Eigenschaften von vier verschiedenen Basen, welche sind: Bodenertrag, Kapitalertrag, Wohnungsumsatz und Wohnungswert. Wir konstruieren dazu vier zwei-Stufen-Modelle, in denen jeweils eine dieser Basen vorgegeben ist und die Leviathane den entsprechenden Steuersatz bestimmen dürfen. Die Haushalte streben danach, ihren Nutzen aus den lokalen öffentlichen Gütern, den Wohnungen und kombinierten Privatgütern zu maximieren. Da Haushalte lokale öffentliche Güter (per Definition) nur dort konsumieren können, wo sie wohnen, nehmen finanzpolitische Entscheidungen Einfluss auf die Wohnungsmärkte. Somit untersuchen wir im Besonderen, wie Wohnungsfirmen, Haushalte und Wohnungspreise auf Steuersatzänderungen reagieren. Wir finden heraus, dass einige Reaktionen qualitativ von bestimmten Bedingungen abhängen. Gemäß einem verfassungstheoretischen Ansatz lassen sich die Einzelwirkungen in ihren Ergebnissen nicht aggregieren. Wir können aus ihnen jedoch einige allgemeine und abstrakte Regeln für die Wahl einer Steuerbasis ableiten. Eine finanzpolitische Verfassung mag diese Regeln schützen.

Bürger haben die Möglichkeit, durch Migration auf lokale Finanzpolitik zu reagieren. Aus einer solchen Reaktion ergeben sich Änderungen der Wohnungsnachfrage. In Teil II versuchen wir, die Wirkungen lokaler fiskalischer Variablen auf die Wohnungspreise zu schätzen. Bei diesen Schätzungen können wir uns auf eine breite Diskussion um die Kapitalisierung der Grund-

steuer stützen. Es zeigt sich, dass dieses Untersuchungsfeld mit mehreren ernsthaften methodologischen Problemen verbunden ist. In Teil II bewerten wir einige der vorgeschlagenen Lösungen. Von dort aus suchen wir nach einer geeigneten Methodik für unsere eigenen Schätzungen. Unsere Schätzungen basieren auf Stichproben aus 234 US-amerikanischen Grafschaften in den Jahren 2002 und 2003. Wir messen Kapitalisierungseffekte durch die Grundsteuer und andere fiskalische Variablen in vier Schritten. Dabei stellt sich heraus, dass die Grundsteuer mit den Wohnungspreisen eher positiv verbunden ist. Doch erscheint diese Verbindung von anderen Determinanten dominiert; insbesondere aus den Bereichen Einkommen und Mobilität. Von allen fiskalischen Variablen zeigen die öffentlichen Gesamtausgaben die größte Robustheit. Auf Grundlage dieser Ergebnisse beabsichtigen wir zu beurteilen, wie effektiv die Bürger Leviathan durch Migration beschränken.

In einem verfassungstheoretischen Ansatz betrachten wir den Staat als monolithisches und eigeninteressiertes Gebilde namens Leviathan. Dessen Eigeninteresse äußert sich im Allgemeinen in der Maximierung der eigenen fiskalischen Haushaltseinnahmen oder des Haushaltsüberschusses. Zentrale Grundlagen für eine ökonomische Theorie der Verfassung wurden von Brennan und Buchanan (1980) geschaffen. Sie stellten im Besonderen die Hypothese auf, dass fiskalische Dezentralisierung und die Macht der Leviathane in einem negativen Verhältnis zueinander stünden. Auf diese Hypothese gestützt, unternahmen es einige Autoren, spezifische Tests für die 'reale Existenz' von Leviathanen zu entwickeln. In Teil III werden diese Tests prägnant diskutiert. Wir legen dar, weshalb diese Tests insgesamt unzureichend sind. Als Konsequenz führen wir einen neuen Testansatz ein. Dieser Ansatz behauptet, dass sich die soziale Macht eines Leviathans über die relative Abweichung seines persönlichen Einkommens vom Durchschnittseinkommen in seiner Gebietskörperschaft messen lässt. Das Ausmaß seiner sozialen Macht steht zudem in Abhängigkeit von den Quellen seiner fiskalischen Einnahmen. Um diese Abhängigkeit zu messen, arbeiten wir mit Stichproben aus 234 US-amerikanischen Grafschaften in den Perioden 1989/ 1992 und 1999/ 2002. Unser Hauptergebnis lässt sich wie folgt formulieren: Lokale Leviathane beziehen mehr soziale Macht aus zwischenstaatlichen Transfers als aus Grundsteuern oder aus anderen Quellen fiskalischer Einnahmen.

Lebenslauf

Name:	Jürgen Göbel
Geburtsdatum:	21. Juli 1971
Geburtsort:	Trier (D)
Staatsangehörigkeit:	deutsch

Hochschulausbildung

Oktober 2003 bis Februar 2008:	Promotionsstudium in VWL an der Universität Wien (A); Studienschwerpunkte: Finanzwissenschaft, angewandte Mikroökonomik, Ökonometrie
August 1999 bis Mai 2000:	Promotionsstudien in 'economics' an der Clark University in Worcester (MA, USA); Studienschwerpunkte: advanced microeconomics, econometrics
Oktober 1994 bis Februar 1999:	Diplomstudium in VWL an der Universität Trier; Studienschwerpunkte: Außenwirtschaft, Entwicklungstheorie, Institutionenökonomik; Titel der Diplomarbeit: Minimalstaat als sozialphilosophisches Leitbild und institutioneller Wettbewerb
September 1993 bis Juni 1994:	Studium an der Université Jean Moulin in Lyon (F); Studienschwerpunkte: Industrieökonomik, europäische Geschichte des 20. Jahrhunderts
Oktober 1991 bis August 1993:	Studium in VWL an der Universität Trier; Studienschwerpunkte: allgemeine VWL, allgemeine BWL, allgemeine Soziologie

Schulausbildung

August 1978 bis Mai 1991:	Grundschule, gemeinsame Orientierungsstufe und Gymnasium in Bitburg (D)

Berufserfahrung

Dezember 2002 bis Juni 2003:	Anstellung: Provinzial Versicherungen Rheinland in Düsseldorf (D); Abteilung: Produktivität und Entwicklung
Jänner 2001 bis Juni 2002:	Anstellung: UBS AG in Zürich (CH); Ausbildung: 'Junior Key Person': Private Banking Module; Abteilungen: Active Portfolio Supervision, Economic Research
Juni 2000 bis August 2000:	Aushilfstätigkeit: Activest Investmentgesellschaft in Luxemburg (LUX); Abteilung: Controlling/ Risikomanagement