CESifo, the International Platform of the Ifo Institute of Economic Research and the Center for Economic Studies of Ludwig-Maximilians University

CESifo Venice Summer Institute

19 - 24 July 2010

"Ethics and Economics"

to be held on **19 - 20 July 2010**
on the island of San Servolo in the Bay of Venice, Italy

Sincere Lobbying Formation

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March 20, 2010

Abstract

This paper studies the impact of lobbying, modeled as a common-agency problem, on a public goods provision. I introduce a sincere lobbying formation condition for equilibrium, namely, an equilibrium occurs only if no lobby member would prefer her lobby to cease to exist. I show that individuals with more extreme income levels are more likely to join lobbying activities. I solve the model numerically for the US data to show that lobbying does not necessarily favor the rich. If the government does not care about its reelection chances and does care about individuals' welfare, final policy outcome favors the poor. The lobby of the poor is more numerous and in total contributes more than the lobby of the rich. However, per member contribution is greater in the lobby of the rich. In the case where the elections are coming and the government wants to be reelected, lobbying does favor the rich. Although the lobby of the poor is more numerous, it contributes in total and per member less than the lobby of the rich. If the government cares only about contribution payments all individuals participate in lobbying, and political competition results in a socially optimal outcome.

JEL classification: D72, H4.

Keywords: Sincere Lobbying Formation; Common-Agency; Publicly Provided Goods.

*The author is grateful to Luis Corchón and Ignacio Ortuño Ortín for helpful comments, suggestions and encouragement. The author also thanks Toke S. Aidt, Filipe Campante, Avinash Dixit, Raquel Fernández, Arye L. Hillman, Sebastian Miller, António M. Osório-Costa, Socorro Puy, John Roemer, Joaquim Silvestre, Albert Solé-Ollé, Heinrich W. Ursprung, Allard Van Der Made, Shlomo Weber and conference participants at CORE 2007 (Louvain-la-Neuve), LAGV 2007 (Marseille), Silvaplana 2007, Labsi 2007 (Siena), Public Economics 2008 (Salamanca), IEA 2008 (Istanbul), EEA-ESEM 2008 (Milan), PEUK 2009 (London) and NASM 2009 (Boston) for useful comments. The FPI Grant BES-2005-10017 of the Spanish Ministry of Education and Science is gratefully acknowledged. This paper originally circulated under the title "Income Redistribution under Sincere Lobbying Formation." The usual disclaimer applies.

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1. Introduction

The literature claims that wealthy citizens influence policy disproportionately because the willingness of the rich to make higher campaign contributions than the poor causes policy-makers to adopt positions the rich prefer (see, for example, Domhoff (1983) and Mills (1956), and, for the more recent contribution, Glazer and Gradstein (2005)). However, in the ranking of the "Top 50" US political action committees (PACs) by contributions to candidates in 1999-2000 there are PACs listed whose members are more likely to be "poor" rather than "rich": Laborers' Political League, International Brotherhood of Electrical Workers Committee on Political Education, United Brotherhood of Carpenters and Joiners of America, etc.[1] Thus, the poor take an active part in lobbying to bias policy in their favor. Campante and Ferreira (2007) show that lobbying does favor the poor in the case where they have a comparative advantage in politics, rather than in production. However, I believe that the core of the problem is to model a decision rule that individuals use to decide whether to participate in lobbying or not. The aim of this paper is to build a tractable framework to explain this phenomenon analyzing individuals' decision to take part in lobbying activities.

The most prevalent formal literature approach builds on the assumption that lobbies influence political decisions through contributions (see Baron (1989), Becker (1983, 1985), Snyder (1990)). The reviews of this and alternative approaches can be found in Austen-Smith (1997), Grossman and Helpman (2001), and Persson and Tabellini (2002). One wonders why some special interest groups have organized into lobbies and others have not. Olson (1971) identified some important issues of the problem. On the one hand, individuals with similar policy preferences can jointly influence policy outcome. On the other hand, there is always the strong temptation to free ride. Unfortunately, to solve a free-riding problem with a large number of individuals one needs to use coalition formation theory that proves to be very complicated. So the recent literature has addressed the question of lobbying formation in different contexts. Some authors focus mainly on formation of lobbies from exogenously given special interest groups (see Drazen et al. (2007), Felli and Merlo (2006, 2007), Laussel (2006) and Mitra (1999)). Others address the problem of individuals' choice to lobby in some way. For example, Damania and Fredriksson (2000, 2003) and Magee (2002) analyze incentives for two firms and for n identical firms, respectively, to organize into a single industry lobby to affect policy outcomes. In turn, Bombardini (2008) proposes "Optimal Lobby Criterion" that reads: it is optimal for a firm to "join the lobby" if the joint surplus of a perspective

[1] Data from the Federal Election Committee. Available online at http://www.fec.gov/press/press2001/053101pacfund/053101pacfund.html (accessed January 23, 2008).

member firm and the lobby is higher under firm participation. Glazer and Gradstein (2005) study the heterogeneous individuals' decision to make campaign contributions and show that people who contribute the most are extremists.

I develop a model of special interest politics analyzing individual's decision to participate in lobbying to influence public goods provision. I study complete information model with one-dimensional policy space. The incumbent government, which is either utilitarian or pro-median, cares about its utility and lobbies' contribution payments. Individuals are assumed to be heterogeneous in income, and I refer to low-income individuals as the poor and to high-income individuals as the rich. Accordingly, two lobbies can be organized: the lobby of the poor and the lobby of the rich. Moreover, I assume that there is no cost of forming lobbies and the lobbying mechanism is modeled as a common-agency problem à la Grossman and Helpman (1994). In equilibrium each individual either belongs to one of the two lobbies or does not participate in lobbying activities. I propose an intuitive condition for equilibrium termed *sincere lobbying formation*: an equilibrium occurs only if no lobby member would prefer her lobby to stop existing. This condition is obviously a necessary condition for equilibrium. Note that Alesina and Rosenthal's conditional sincerity condition for voter equilibrium applies a similar concept in voting context (see Alesina and Rosenthal (1995, 1996)).

Why will individuals behave sincerely forming lobby groups rather than be involved in free-riding? One possible explanation could be that individuals simply enjoy participating in special interest politics, unless they cannot afford it. In light of this fact, individuals may gain some personal satisfaction from showing allegiance to their special interest group. Another possible answer captures the idea of social norm individual behavior, that is, individuals take part in lobbying activities (unless they are better off without any lobby), because it is a social norm of the society. In other words, the social norm may advise: one should join a lobby if the gain one gets from lobbying activities is higher than the fee one is to pay as a lobby member. Alternatively, one can think of an ethical society where individuals bear a very high psychological cost if they engage in free-riding. So unless the gain from free-riding is considerably high, citizens will refrain from free-riding to avoid this psychological cost. In his turn, Smith (2000) in a systematical analysis of postwar lawmaking, shows that the public does overcome free-riding problem in the issues that affect the interests of the majority of the population such as tax rates, air pollution, and product liability.

I show that individuals with more extreme income levels are more likely to be involved in lobbying activities. To be more specific, in equilibrium each lobby is characterized by a threshold level of income such that all individuals with higher (for the lobby of the rich) or lower (for the lobby of the poor) income participate in lobbying activities. This is in line

with the results of Glazer and Gradstein (2005) and McCarty et al. (2006) that extremists want to contribute the most.

I solve the model numerically, assuming that the gross income has lognormal distribution and using US gross income descriptive statistics from the Luxembourg Income Study. I find that the institute of lobbying does not necessarily favor wealthy citizens. On the contrary, in the case of a utilitarian government the final policy outcome favors the poor (in comparison with the socially optimal one). Accordingly, the lobby of the poor is more numerous and makes higher total campaign contributions than the lobby of the rich, while per member contribution is greater in the lobby of the rich. For example, for the United States the model predicts that the lobby of the poor is almost 4 times more numerous than the lobby of the rich, total contributions of the poor are 1.08 times higher than total contributions of the rich, while each member of the lobby of the rich contributes 3.64 times more than each member of the lobby of the poor.

In the case of a pro-median government my results are in line with the existing literature: the final policy outcome does favor the rich (in comparison with the one preferred by the median voter). Although the lobby of the poor is more numerous, it contributes in total and per member less than the lobby of the rich. For example, for the United States the numerical results read: the lobby of the poor is more than twice the size of the lobby of the rich, while total contributions of the rich are 3.56 times higher than the ones of the poor, with each member of the lobby of the rich contributing almost 8 times more than each member of the lobby of the poor.

So the conceptual difference in my results comes from the assumptions on the government preferences: under a utilitarian government lobbying favors the poor, while under a pro-median government lobbying favors the rich. The reason for this is quite intuitive and due to the fact that income distribution is recognized to be skewed to the right. Pro-median government tends to satisfy the median voter preferences, while utilitarian government implements the policy preferred by the individual with mean income. Therefore, under a pro-median government, the rich have more stake in the policy and coordinate better, since without lobbying the policy outcome is not in their favor. Accordingly, under a utilitarian government, the poor have more stake in the policy and coordinate better, since the mean individual preferred policy does not favor them. Still, with or without lobbying, the poor would prefer a pro-median government to a utilitarian one, while the rich would prefer a utilitarian government to a pro-median one.

If the government cares only about contribution payments all individuals participate in lobbying: individuals with income lower than the mean one belong to the lobby of the poor,

and individuals with income higher than the mean one belong to the lobby of the rich. This happens because individuals know that the only way to get favorable policy outcome is lobbying: the government does not care about citizens' wellbeing at all. In this case political competition results in socially optimal outcome.

I analyze how the degree of income inequality in a society affects the composition of lobbies and the final outcome in the equilibrium. The model predicts that the less egalitarian the society is, the more (resp. the less) numerous the lobby of the poor (resp. the rich) is, and the higher the final tax rate for both utilitarian and pro-median government. Still the qualitative results stay the same: in the case of a utilitarian government, lobbying favors the poor while in the case of a pro-median government lobbying favors the rich.

Now turn to the assumptions of the model. I assume that individuals' utility is quasilinear in income. I want to concentrate on relative rather than absolute magnitudes of lobbying formation, so this assumption allows to isolate the effects of interest (for example, how lobbying formation depends on the shape of income distribution). Would my results change with concave utility function? The answer to this question is not obvious. In this case the rich would value each additional unit of income less than the poor so one expects that the rich will contribute more than the poor. However, in the case where the government is utilitarian, it cares about the social welfare of all the individuals, and the poor would value a slight increase in taxes much more than the rich would value a slight (same) decrease in taxes, so it would be much cheaper for the poor to buy influence than for the rich. What effect would dominate depends on the particular utility function. Still, I expect that my results will prevail for utility functions that are not too concave in income.

Summing up, I make the following contributions. First, I introduce a new condition for lobbying formation equilibrium, namely, *sincere lobbying formation* that reads: an equilibrium occurs if no lobby member would prefer her lobby to cease to exist. Second, I show that the institute of lobbying can favor the poor if office-holders do not care about their reelection prospects and do care about the citizens' welfare (the case of a utilitarian government). However, if the elections are coming and policymakers want to be reelected for the next term, the wealthy citizens get more political power and the final policy outcome favors the rich (the case of a pro-median government). Finally, I find that political competition can result in socially optimal outcome. It happens if office-holders care only about contribution payments.

The rest of the paper is organized as follows. Section 2 lays out a simple model of public goods provision. Section 3 describes the common-agency model of lobbying. Section 4 develops the sincere lobbying formation concept. Section 5 contains numerical solutions for

lognormal distribution of gross income. Finally, Section 6 concludes.

2. A Simple Model of Public Goods Provision

Consider a society inhabited by a large number (formally a continuum) of individuals, where I normalize the size (mass) of the population to unity. Individuals differ in their income x. I assume that x is distributed in the population according to a smooth, at least twice differentiable cumulative distribution function $F(\cdot)$ with mean $\widehat{x}$ and support $[0, \infty)$. The corresponding density function is denoted by $f(\cdot)$. Assume further that x is skewed to the right, in accordance with evidence from virtually every country.

Each individual with income x has the same quasi-linear preferences over private consumption $c(x)$ and publicly provided goods g, which is given by

$$u(c, g) = c + \sqrt{g}.$$

One can interpret g in different ways, as publicly provided private goods, or traditional public goods. Let g measure spending per capita. Government spending is financed by taxing the income of every individual at a common rate $t \in [0, 1]$. Then consumption differs according to

$$c(x) = (1 - t)\, x,$$

and the government budget constraint is then simply

$$t\widehat{x} = g.$$

Then the tax preferences of individual x read

$$u(x, t) = (1 - t)\, x + \sqrt{t\widehat{x}},$$

that are concave in tax, implying that every individual x has a uniquely preferred tax rate t_x:

$$t_x = \begin{cases} 1 & \text{if} \quad x \in \left[0, \frac{1}{2}\sqrt{\widehat{x}}\right] \\ \frac{\widehat{x}}{4x^2} & \text{if} \quad x \in \left(\frac{1}{2}\sqrt{\widehat{x}}, \infty\right). \end{cases}$$

Richer individuals want a smaller government because, with taxes proportional to income, they pay a larger share of the tax burden.[2]

[2] I assume that individuals' utility is quasilinear in income to isolate the effects of income inequality on lobbying formation.

Let us formulate a normative benchmark. As a basis for this benchmark, consider a utilitarian social welfare function that simply integrates over the welfare of all individuals:

$$U^o(t) = \int_0^\infty u(x,t) f(x)\, dx = (1-t)\,\widehat{x} + \sqrt{t\widehat{x}},$$

where the last term is just the utility of the individual with mean income. Then the socially optimal tax rate coincides with the tax desired by the mean individual $t^o = \frac{1}{4\widehat{x}}$.

Alternatively, the median voter preferences can be considered as a benchmark:

$$U^m(t) = (1-t)\,x_m + \sqrt{t\widehat{x}},$$

where x_m stands for the median voter income and $F(x_m) = \frac{1}{2}$. Then the median voter preferred tax rate reads $t^m = \frac{\widehat{x}}{4x_m^2}$ (that is assumed to be less than 1).

In what follows I work with these two alternative benchmarks.

3. Lobby Groups

I focus on lobbying activities in the context of the common-agency model of Bernheim and Whinston (1986) adapted to lobbying by Grossman and Helpman (1994). In this approach, lobbying is modeled as "menu auction" where lobbies confront a government with contribution schedules that map any possible policy into a contribution payment. Several authors have applied the common-agency model of lobbying to study trade policy, commodity taxation, provision of local public goods and other policies (see Dixit et al. (1997), Grossman and Helpman (1996), Helpman and Persson (2001), Persson (1998)). I use this approach as well.

I assume that just two lobbies can be formed: a lobby of low-income individuals (the poor) given by set P, and a lobby of high-income individuals (the rich) given by set R. Denote by L the set of organized lobbies. In this section I leave aside lobbying formation considerations and assume that each individual can join one lobby using a decision rule to be specified below. Suppose further that the lobbies care about the sum of their members' welfare. Thus, the gross objective function of each lobby $l \in L$ is given by:

$$U^l(t) = \int_{x\in l} u(x,t) f(x)\, dx.$$

At the first stage of the game each lobby $l \in L$, non-cooperatively and simultaneously, presents its common agent, the government, with a contribution schedule $C^l(t)$ giving a binding promise of payment conditional on the chosen tax rate. Following the literature, I concentrate on (globally) truthful contribution schedules that satisfy:

$$C^l(t) = \max\left[U^l(t) - b^l, 0\right],$$

where b^l is a constant chosen optimally by lobby l. The objective of lobby l is to maximize the net welfare of its members, namely $U^l(t) - C^l(t)$.

At the second stage, the government sets t to maximize a weighted sum of its utility and contributions:

$$\alpha U(t) + \sum_{l \in L} C^l(t), \ \alpha \geq 0. \tag{3.1}$$

An equilibrium of the game is a Subgame perfect Nash equilibrium in the contribution schedules and the chosen tax rate.

I analyze two alternative scenarios, namely an utilitarian government, $U(t) = U^o(t)$, and a pro-median government, $U(t) = U^m(t)$. In the former case, the government cares about the individuals' welfare and about contribution payments. In the latter case, the government is concerned both about total amount of contributions and about its chances of being reelected. In political economy literature the government concerned about its reelection prospects maximizes the probability of winning the election. However, in this framework the election itself is not modeled, so it is more convenient if the government's objective function gives greater weight to individuals that are believed to determine the election outcome. Then the closer the government's objective is to the median-voter preferred policy, the higher the probability to win the election. Alternatively, one can think of the situation where office-holders are "citizen-candidates" (as in Besley and Coate (1997) or Osborne and Slivinski (1996)) who share the preferences of either an individual with mean income or the median voter.

To derive an equilibrium in truthful strategies, I use the fact that equilibrium tax rate is Pareto optimal in the bilateral relation between the government and each lobby.[3] Therefore, the equilibrium tax rate t maximizes the sum of the organized lobbies' net welfare $\sum_{l \in L} \left(U^l(t) - C^l(t) \right)$ and the government objective (3.1). Then the optimal tax rate maximizes:

$$\alpha U(t) + \sum_{l \in L} U^l(t). \tag{3.2}$$

The first-order condition of (3.2) yields the equilibrium tax rate t^*:

$$t^* = \arg \max_{t \in [0,1]} \left(\alpha U(t) + \sum_{l \in L} U^l(t) \right).$$

To find the contribution levels in the equilibrium, define by t^{-l} the tax rate that would

[3] See Bernheim and Whinston (1986) and Dixit et al. (1997) for the proof.

emerge if the contribution offered by lobby l were zero, so

$$t^{-l} = \arg\max_{t\in[0,1]} \left(\alpha U(t) + \sum_{\substack{i\in L \\ i\neq l}} C^i(t) \right).$$

In other words, t^{-l} is the tax rate that would emerge if lobby l were not formed.

Lobby l will raise its b^l to the point where the government is just indifferent between choosing the tax rate t^{-l} and choosing the equilibrium tax rate t^*, that is

$$\alpha U\left(t^{-l}\right) + \sum_{\substack{i\in L \\ i\neq l}} C^i\left(t^{-l}\right) = \alpha U(t^*) + \sum_{i\in L} C^i(t^*) \text{ for all } l \in L.$$

These two sets of equations allow us to solve for the lobbies' contributions in the equilibrium:

$$\begin{aligned} C^{P*} &= \alpha\left(U\left(t^{-P}\right) - U(t^*)\right) + U^R\left(t^{-P}\right) - U^R(t^*) \\ C^{R*} &= \alpha\left(U\left(t^{-R}\right) - U(t^*)\right) + U^P\left(t^{-R}\right) - U^P(t^*). \end{aligned} \tag{3.3}$$

In the case where there is just one organized lobby, the government derives exactly the same utility as it would have achieved without any contribution. Thus, a lobby that faces no competition captures the entire surplus from lobbying activities. If all individuals participate in lobbying, the government captures the entire surplus from lobbying activities and each lobby pays according to the political strength of its rival.

So far my analysis leaves aside the crucial issue of lobbying formation. I study this question in the following section.

4. Sincere Lobbying Formation

I assume that lobby P's goal is to defend special interests of the poor while lobby R aims to defend special interests of the rich. In my simple model the special interests vary with preferences over tax rate, that is, in general the poor prefer bigger government and, thus, a higher tax rate, while the rich want smaller government and a lower tax rate. To reflect this conceptual difference between the two lobbies, I assume that in equilibrium lobby P and lobby R make contributions to the government in order to raise and to drop, respectively, the final tax rate, that is, $t^{-P} \leq t^* \leq t^{-R}$.

In this game the choice of each individual is either to be a member of one of two lobbies, P or R, or not to participate in lobbying activities at all. I assume that each individual can belong just to one lobby group since in my model lobbies represent opposite interests. There

is no fixed cost of forming lobbies. If an individual belongs to a lobby, her welfare is taken into account when the lobby develops a contribution schedule, but she should bear a contribution burden which is the same for all the lobby members.[4] How do individuals manage to solve the coordination problem while making their choice? I assume that the coordination has a simple form that I call *sincere lobbying formation*.[5]

Sincere Lobbying Formation Condition: An equilibrium occurs only if no lobby member would prefer her lobby to cease to exist.

It is evident that the condition should hold in equilibrium: if a lobby member would like her lobby to cease to exist, then she is "lobbying" in the "wrong" way given her expectations and preferences. Formally, the sincere lobbying formation condition reads:

$$\text{if } x \text{ belongs to lobby } P, \text{ then } u\left(x, t^*\right) - \frac{C^{P*}}{\int_{z \in P} f\left(z\right) dz} > u\left(x, t^{-P}\right)$$
$$\text{if } x \text{ belongs to lobby } R, \text{ then } u\left(x, t^*\right) - \frac{C^{R*}}{\int_{z \in R} f\left(z\right) dz} > u\left(x, t^{-R}\right).$$

Term indifferent individuals as sincere indifferent poor, π, and sincere indifferent rich, ρ, such that

$$u\left(\pi, t^*\right) - \frac{C^{P*}}{\int_{z \in P} f\left(z\right) dz} = u\left(\pi, t^{-P}\right) \tag{4.1}$$
$$u\left(\rho, t^*\right) - \frac{C^{R*}}{\int_{z \in R} f\left(z\right) dz} = u\left(\rho, t^{-R}\right).$$

Given this equilibrium concept there can be multiple equilibria. In what follows I consider the largest possible lobbies, that is, if there are more than one π and more than one ρ satisfying conditions (4.1), then I call sincere indifferent poor the highest π and sincere indifferent rich the lowest ρ.

Then I establish:

Lemma 1. *If in equilibrium there exist lobby P and lobby R then $P = \{x | x \in [0, \pi)\}$ and $R = \{x | x \in (\rho, \infty)\}$.*

[4] In this quasilinear model it is reasonable to assume that contributions should be proportional to a marginal utility of income that is the same for all individuals.

[5] Alternatively, one can think of a society inhabited by individuals of two types with the size of each group normalized to unity. The first type individuals are free-riders: they never participate in lobbying activities. The second type individuals are faithful to their special interest group: they join a lobby if the gain they get from lobbying activities exceeds the contribution fee. The analysis stays the same for this alternative interpretation of the model.

The formal proof can be found in the Appendix.

Solve the game backwards. Suppose that in equilibrium there exist lobby $P = \{x | x \in [0, \pi)\}$ and lobby $R = \{x | x \in (\rho, \infty)\}$. To reflect the fact that in equilibrium each individual can belong either to one lobby or to no lobby I assume that $\pi \leq \rho$. The final goal is to find these π and ρ.

Now I introduce new pieces of notation. I denote by $s^l(\cdot)$ the size of lobby l. Then $s^P(\pi) \equiv F(\pi)$ and $s^R(\rho) \equiv 1 - F(\rho)$. The aggregate income in lobby P (resp. R) is $W^P(\pi) \equiv \int_0^\pi x f(x)\, dx$ (resp. $W^R(\rho) \equiv \int_\rho^\infty x f(x)\, dx$).

The lobbies gross objective functions read:

$$\begin{aligned} U^P(t, \pi) &= \int_0^\pi u(x, t) f(x)\, dx = (1 - t) W^P(\pi) + \sqrt{t\widehat{x}} s^P(\pi) \\ U^R(t, \rho) &= \int_\rho^\infty u(x, t) f(x)\, dx = (1 - t) W^R(\rho) + \sqrt{t\widehat{x}} s^R(\rho). \end{aligned}$$

Then the lobbies develop truthful contribution schedules to offer to the government that chooses a final tax rate t^*:

$$t^*(\pi, \rho) \equiv \arg\max_{t \in [0,1]} \left(\alpha U(t) + U^P(t, \pi) + U^R(t, \rho) \right) = \frac{\widehat{x}}{4} \left(\frac{\alpha + s^P(\pi) + s^R(\rho)}{\alpha\chi + W^P(\pi) + W^R(\rho)} \right)^2 \quad (4.2)$$

where

$$\chi = \begin{cases} \widehat{x} & \text{if} \quad U(t) = U^o(t) \\ x_m & \text{if} \quad U(t) = U^m(t). \end{cases}$$

If lobby l ($l = P, R$) were not around the tax rate $t^{-l}(\cdot)$ would emerge:

$$t^{-P}(\rho) \equiv \arg\max_{t \in [0,1]} \left(\alpha U(t) + U^R(t, \rho) \right) = t^*(0, \rho) = \frac{\widehat{x}}{4} \left(\frac{\alpha + s^R(\rho)}{\alpha\chi + W^R(\rho)} \right)^2 \quad (4.3)$$

$$t^{-R}(\pi) \equiv \arg\max_{t \in [0,1]} \left(\alpha U(t) + U^P(t, \pi) \right) = t^*(\pi, \infty) = \frac{\widehat{x}}{4} \left(\frac{\alpha + s^P(\pi)}{\alpha\chi + W^P(\pi)} \right)^2. \quad (4.4)$$

Denote by τ the tax rate that would emerge if there were no lobbies formed. It depends on the government type ($\tau = t^o$ or $\tau = t^m$) and reads $\tau = \frac{\widehat{x}}{4\chi^2}$.

In the case of the utilitarian government, $U(t) = U^o(t)$, the equilibrium tax rate can be efficient: $t^*|_{\chi = \widehat{x}} = t^o$. This happens when all individuals participate in lobbying. In this case lobbies "neutralize" one another, so that R's bids for a smaller government are matched in the equilibrium by P's bids for a bigger government, and political competition results in socially optimal outcome. Nonetheless, each lobby must make a positive contribution in order to induce the government to choose this outcome rather than one that would be still worse from its perspective. If just one lobby were organized, the equilibrium tax rate would differ from the social optimum in favor of the organized group.

In general, the following inequalities hold:

$$\begin{aligned} t^{-P}(\rho) &< t^{*}(\pi,\rho) < t^{-R}(\pi) \\ t^{-P}(\rho) &< \tau < t^{-R}(\pi), \end{aligned}$$

while the relationship between $t^{*}(\pi,\rho)$ and τ is as follows:

$$t^{*}(\pi,\rho) \gtreqless \tau \text{ iff } \chi \gtreqless \frac{W^{P}(\pi)+W^{R}(\rho)}{s^{P}(\pi)+s^{R}(\rho)}. \tag{4.5}$$

Condition (4.5) reads: Lobbying favors the poor (resp. the rich), in other words, the final tax rate is higher (resp. lower) than the tax rate that would emerge if there were no lobbies formed, if and only if the mean income in the society (in the case of utilitarian government) or the median-voter income (in the case of pro-median government) is higher (resp. lower) than the mean income in both lobbies. Lobbying does not affect the final tax rate if and only if the mean income in the society (in the case of utilitarian government) or the median-voter income (in the case of pro-median government) is equal to the mean income in both lobbies. Thus, the final tax rate goes in favor of a lobby with higher relative political strength.

I use (3.3) to find the lobbies' contributions in the equilibrium:

$$\begin{aligned} C^{P*}(\pi,\rho) &= \frac{\widehat{x}}{4\left(\alpha\chi+W^{R}(\rho)\right)}\cdot \\ &\left(\frac{\left(\alpha+s^{R}(\rho)\right)\left(\alpha\chi+W^{P}(\pi)+W^{R}(\rho)\right)-\left(\alpha+s^{P}(\pi)+s^{R}(\rho)\right)\left(\alpha\chi+W^{R}(\rho)\right)}{\alpha\chi+W^{P}(\pi)+W^{R}(\rho)}\right)^{2} \\ C^{R*}(\pi,\rho) &= \frac{\widehat{x}}{4\left(\alpha\chi+W^{P}(\pi)\right)}\cdot \\ &\left(\frac{\left(\alpha+s^{P}(\pi)\right)\left(\alpha\chi+W^{P}(\pi)+W^{R}(\rho)\right)-\left(\alpha+s^{P}(\pi)+s^{R}(\rho)\right)\left(\alpha\chi+W^{P}(\pi)\right)}{\alpha\chi+W^{P}(\pi)+W^{R}(\rho)}\right)^{2}. \end{aligned}$$

Given the results above I turn now to the lobbying formation stage of the game. Formally, for sincere indifferent poor π and sincere indifferent rich ρ, the following two conditions must hold:

$$\begin{aligned} u\left(\pi,t^{*}(\pi,\rho)\right)-\frac{C^{P*}(\pi,\rho)}{s^{P}(\pi)} &= u\left(\pi,t^{-P}(\rho)\right) \\ u\left(\rho,t^{*}(\pi,\rho)\right)-\frac{C^{R*}(\pi,\rho)}{s^{R}(\rho)} &= u\left(\rho,t^{-R}(\pi)\right), \end{aligned}$$

that yield the system of two equations with two unknowns π and ρ:

$$\begin{aligned} \sqrt{\frac{t^{-P}(\rho)}{\widehat{x}}}+\sqrt{\frac{t^{*}(\pi,\rho)}{\widehat{x}}} &= \frac{\alpha+s^{P}(\pi)+s^{R}(\rho)}{\pi s^{P}(\pi)+\alpha\chi+W^{R}(\rho)} \\ \sqrt{\frac{t^{-R}(\pi)}{\widehat{x}}}+\sqrt{\frac{t^{*}(\pi,\rho)}{\widehat{x}}} &= \frac{\alpha+s^{P}(\pi)+s^{R}(\rho)}{\rho s^{R}(\rho)+\alpha\chi+W^{P}(\pi)}. \end{aligned}$$

After plugging in the expressions for $t^*(\pi,\rho), t^{-P}(\rho), t^{-R}(\pi)$ from (4.2), (4.3) and (4.4) this system reads:

$$\begin{aligned}
\frac{\alpha+s^R(\rho)}{\alpha+s^P(\pi)+s^R(\rho)}\frac{\alpha\chi+W^P(\pi)+W^R(\rho)}{\alpha\chi+W^R(\rho)} &= \frac{\alpha\chi+W^R(\rho)+2W^P(\pi)-\pi s^P(\pi)}{\alpha\chi+W^R(\rho)+\pi s^P(\pi)} \\
\frac{\alpha+s^P(\pi)}{\alpha+s^P(\pi)+s^R(\rho)}\frac{\alpha\chi+W^P(\pi)+W^R(\rho)}{\alpha\chi+W^P(\pi)} &= \frac{\alpha\chi+W^P(\pi)+2W^R(\rho)-\rho s^R(\rho)}{\alpha\chi+W^P(\pi)+\rho s^R(\rho)}.
\end{aligned}$$

In general, it is not straightforward to find an explicit form solution for this system of two equations with two unknowns. In what follows, I assume the lognormal distribution of income and solve for π and ρ numerically.

5. Numerical Solution: Lognormal Distribution of Income

The lognormal distribution is very popular in modeling applications, when the variable of interest is skewed to the right. I use this distribution as well. Formally, I assume that x has a lognormal distribution (that is, $\ln x \sim N\left(\mu,\sigma^2\right)$). Then the density function reads

$$f\left(x|\mu,\sigma^2\right)=\frac{1}{\sqrt{2\pi}\sigma}\frac{1}{x}e^{-\frac{(\ln x-\mu)^2}{2\sigma^2}},\ 0<x<\infty,\ -\infty<\mu<\infty,\ \sigma>0$$

with mean

$$\widehat{x}=e^{\mu+\frac{\sigma^2}{2}}$$

and variance

$$Var=e^{2\left(\mu+\sigma^2\right)}-e^{2\mu+\sigma^2}.$$

To generate the distribution I use gross income descriptive statistics (in particular, mean and standard deviation) for the United States from the Luxembourg Income Study (LIS) dataset for households.[6] In LIS dataset gross income amounts are in national currency units on the year of survey. Since my primary goal is to see the relative magnitudes of lobbying formation, I normalize gross income statistics for the ease of presentation (see Table A.1 in the Appendix for the original LIS descriptive statistics, normalized descriptive statistics ($\widehat{x}$, $\sqrt{Var}$, x_m), μ and σ for the normalized descriptive statistics, and socially optimal tax rate t^o and median voter preferred tax rate t^m).

First, I consider a utilitarian government, $\chi=\widehat{x}$. Table A.2 in the Appendix contains numerical results and relative magnitudes of lobbying formation for an utilitarian government with $\alpha=1$ and $\alpha=100$. Note that the model predicts that in this case the final tax rate, t^*, favors the lobby of the poor P, that is $t^*>t^o$. Accordingly, the total contribution of lobby P

[6] Available online at http://www.lisproject.org/techdoc.htm (accessed December 11, 2007).

exceeds the total contribution of lobby R, while per member contribution is higher in lobby R than in lobby P. If $\alpha = 1$ the model predicts that around half of the population joins the lobby of the poor P. As for the lobby of the rich R, it is much smaller: just around 14 % of the population. The lobby of the poor P is around 4 times bigger than the lobby of the rich R. As for contribution, the lobby of the poor P pays in total slightly more than the lobby of the rich R, while per member contribution is around 3.6 times higher for lobby R members than for lobby P members. Figure 5.1 pictures lobbying formation for US data in the case of utilitarian government with $\alpha = 1$.

When $\alpha = 100$, the government cares much more about social welfare than about contribution payments, so it is not easy for lobbies to buy influence. As a result, lobbies are smaller in size and contribute much less than in the case of $\alpha = 1$. The equilibrium tax rate is just slightly higher than the social optimal one and lobby P in total contributes twice as much as lobby R.

The literature claims that the institute of lobbying does favor richer strata of the society (see Domhoff (1983) and Mills (1956)). However, my results indicate that it is not necessarily the case for the utilitarian government. My model of sincere lobbying formation predicts that lobbying favors poorer individuals, that is, the final outcome of lobbying formation is in favor of the lobby of the poor in comparison with the socially optimal one. Moreover, the lobby of the poor is considerably bigger and contributes more than the lobby of the rich, while per member contribution is higher in the lobby of the rich.

Now consider a pro-median government, $\chi = x_m$. Table A.3 in the Appendix presents the results for a pro-median government with $\alpha = 1$ and $\alpha = 100$. The results indicate that in this case lobbying does favor richer individuals, $t^* < t^m$. Lobby P is smaller in size and lobby R is bigger in size than in the case of the utilitarian government for corresponding values of α. Total contributions and per member contribution are higher in lobby R than in lobby P. If $\alpha = 1$ lobby P is twice bigger than lobby R. However, the lobby of the rich contributes around 3.5 times more in total and around 7.8 times more per member, than the lobby of the poor. Figure 5.2 pictures lobbying formation for the case of pro-median government with $\alpha = 1$ for US data.

When $\alpha = 100$, it is very difficult for lobbies to buy influence. Therefore, the lobbies are smaller in size and pay lower contributions than in the case of the pro-median government with $\alpha = 1$. Still, lobbying favors richer individuals since the equilibrium tax rate is slightly lower than the one preferred by the median voter, and the lobby of the rich pays 4.3 times higher total contribution than the lobby of the poor.

The results for the pro-median government are in line with the existing literature: lobbying

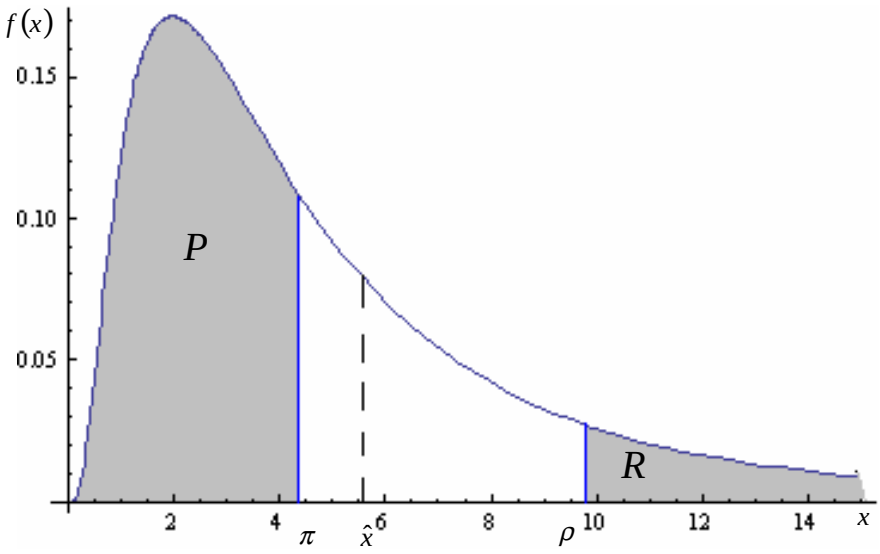

Figure 5.1: Sincere Lobbying Formation for US data: the case of utilitarian government with $\alpha = 1$.

does favor wealthy strata of the society. The final policy outcome is in favor of the lobby of the rich (in comparison with the one preferred by the median voter). The lobby of the poor is more numerous than the lobby of the rich. However, total contributions and per member contribution are higher in the lobby of the rich.

It is of interest to see the equilibrium evolution for $\alpha = 0$. Table A.4 in the Appendix contains numerical results and relative magnitudes of lobbying formation for $\alpha = 0$. Here the government cares only about contribution payments and individuals know this. As a result in the equilibrium all individuals participate in lobbying: individuals with income lower than the mean one belong to the lobby of the poor, and individuals with income higher than the mean one belong to the lobby of the rich. This happens because individuals know that the only way to get favorable policy outcome is lobbying: the government does not care about citizens' wellbeing at all. Political competition results in socially optimal outcome, $t^* = t^o$.[7] As I mentioned above, in this case in equilibrium lobbies "neutralize" one another. Both lobbies pay higher total contributions and higher per member contributions than in the case of $\alpha = 1$. However, the lobby of the rich, R, contributes in total more than the lobby of the

[7] The result that policy outcome is socially optimal when all individuals participate in lobbying is due to Grossman and Helpman (1994). My contribution here is to specify that this happens under a "corrupted" government that cares only about lobbies' donations.

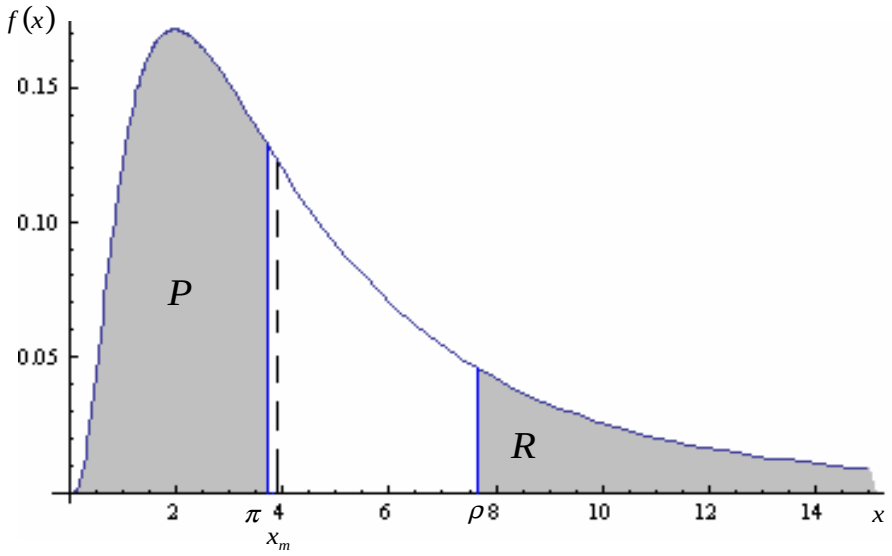

Figure 5.2: Sincere Lobbying Formation for US data: the case of pro-median government with $\alpha = 1$.

poor, P, and lobby P to lobby R size ratio is equal to lobby R to lobby P total contribution ratio. This is because in equilibrium each lobby pays according to the political strength of its rival: each lobby must contribute an amount equal to the difference between what its rival could achieve without competition and what it actually achieves in equilibrium. Figures A.1 and A.2 in the Appendix depict the evolution of lobbying formation equilibrium with the change of $\alpha \geq 0$ for US data. Note that the final tax rate under pro-median government is higher than the one under utilitarian government with lobbying or without it. Therefore, the poor would prefer the pro-median government to the utilitarian one in spite of the fact that under the latter they could influence final policy in their favor by lobbying. In their turn, the rich would prefer the utilitarian government to the pro-median one, even when they could lobby more successfully under a pro-median government.

How does the degree of inequality affect sizes of lobbies and policy outcome in the equilibrium? Figures A.3 and A.4 in the Appendix represent, respectively, the evolution of lobbies' sizes and tax rate in the equilibrium with the change of standard deviation given the mean.[8] The less egalitarian the society (the higher the standard deviation given the mean), the more numerous the lobby of the poor is and the less numerous the lobby of the rich is. This is due

[8] The mean comes from US data: $\widehat{x} = 5.611469$.

to the fact that there are more poor and fewer rich individuals in less egalitarian societies. As for the equilibrium tax rate, it is increasing in the degree of inequality both for utilitarian and pro-median governments. This happens just for the same reason: there are more poor individuals, the lobby of the poor is more numerous so it can influence final policy outcome more successfully. Note that the higher the income inequality is in the society, the more political influence the poor have under a utilitarian government.

6. Conclusion

The paper studies the impact of lobbying on a public goods provision. I propose a new equilibrium condition for lobbying formation, namely, *sincere lobbying formation*: an equilibrium occurs only if no lobby member would prefer her lobby to stop existing. Lobbying is modeled as a common-agency problem, only two lobbies can be organized, and there is no cost of forming lobbies. The model predicts that individuals with more extreme preferences are more likely to participate in lobbying. I solve the model numerically with the US data from the Luxembourg Income Study to show that lobbying does not necessarily favor wealthy citizens. The results indicate that if policymakers do not care about their reelection prospects and do care about the individuals' welfare (utilitarian government), the final policy outcome favors the poor (in comparison with the socially optimal one). In this case the lobby of the poor is bigger in size and makes higher total campaign contributions than the lobby of the rich, while per member contribution is greater in the lobby of the rich. However, if the elections are close and policymakers want to be reelected (pro-median government), the final policy outcome does favor the rich (in comparison with the one preferred by the median voter), which is in line with the existing literature. In spite of the fact that the lobby of the poor is more numerous, its total and per member contributions are lower than ones of the lobby of the rich. However, lobbying does not change final policy drastically: with or without lobbying the poor would prefer a pro-median government to a utilitarian one, while the rich would prefer a utilitarian government to a pro-median one. In the case where the government cares only about lobbies' contribution payments, all individuals participate in lobbying: individuals with income lower (resp. higher) than the mean one belong to the lobby of the poor (resp. the lobby of the rich). In this case political competition results in socially optimal outcome.

The degree of income inequality in the economy does affect the composition of lobbies and the final policy outcome in quantitative terms, namely, the less egalitarian the society, the more numerous the lobby of the poor, the less numerous the lobby of the rich, and the higher the final tax rate both for utilitarian and pro-median governments.

Appendix

A. Proof of Lemma 1

Assume that in equilibrium there exists lobby P. Then

$$P = \left\{ x \mid u\left(x, t^{*}\right) - \frac{C^{P*}}{\int_{z \in P} f\left(z\right) dz} > u\left(x, t^{-P}\right) \right\}.$$

After straightforward calculations and taking into account that $t^{*} \geq t^{-P}$, the last inequality reads

$$x < \frac{\sqrt{\widehat{x}}}{\sqrt{t^{*}} + \sqrt{t^{-P}}} - \frac{1}{t^{*} - t^{-P}} \frac{C^{P*}}{\int_{z \in P} f\left(z\right) dz} \equiv \pi.$$

Thus, in equilibrium lobby P satisfies

$$P = \left\{ x \mid x \in [0, \pi) \right\}.$$

If in equilibrium there exists lobby R, then

$$R = \left\{ x \mid u\left(x, t^{*}\right) - \frac{C^{R*}}{\int_{z \in R} f\left(z\right) dz} > u\left(x, t^{-R}\right) \right\}.$$

Taking into account that $t^{*} \leq t^{-R}$, the last inequality yields

$$x > \frac{\sqrt{\widehat{x}}}{\sqrt{t^{*}} + \sqrt{t^{-R}}} - \frac{1}{t^{*} - t^{-R}} \frac{C^{R*}}{\int_{z \in R} f\left(z\right) dz} \equiv \rho.$$

So, in equilibrium lobby R satisfies

$$R = \left\{ x \mid x \in (\rho, \infty) \right\}. \blacksquare$$

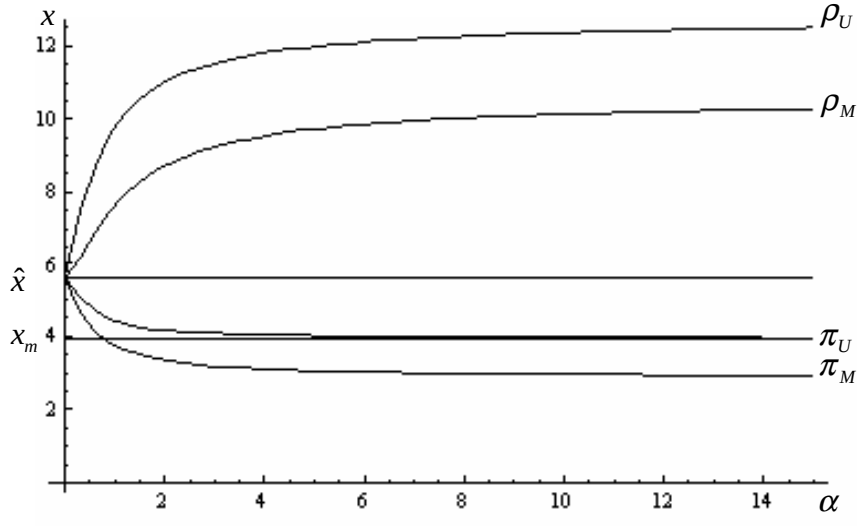

Figure A.1: Sincere indifferent poor π and rich ρ as a function of α for US data: π_U, ρ_U (utilitarian government) and π_M, ρ_M (pro-median government).

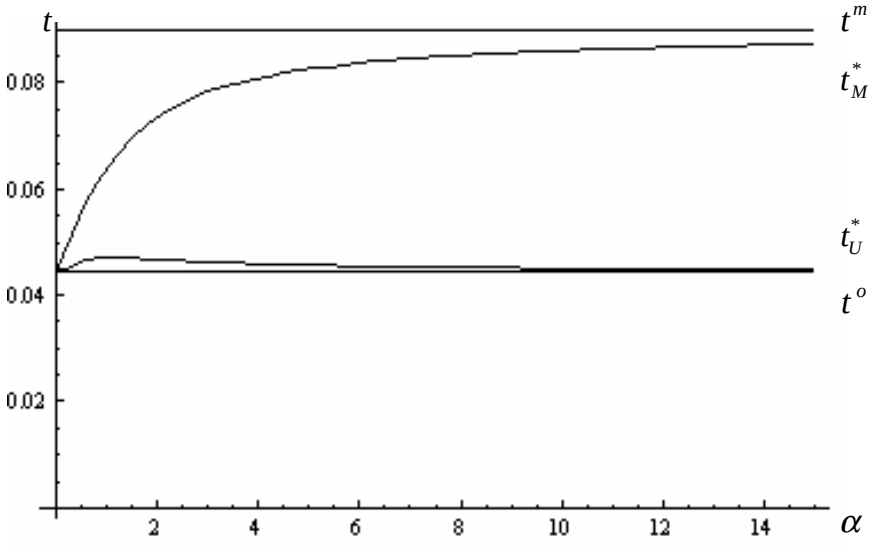

Figure A.2: Equilibrium tax rate as a function of α for US data: t^*_U (utilitarian government) and t^*_M (pro-median government).

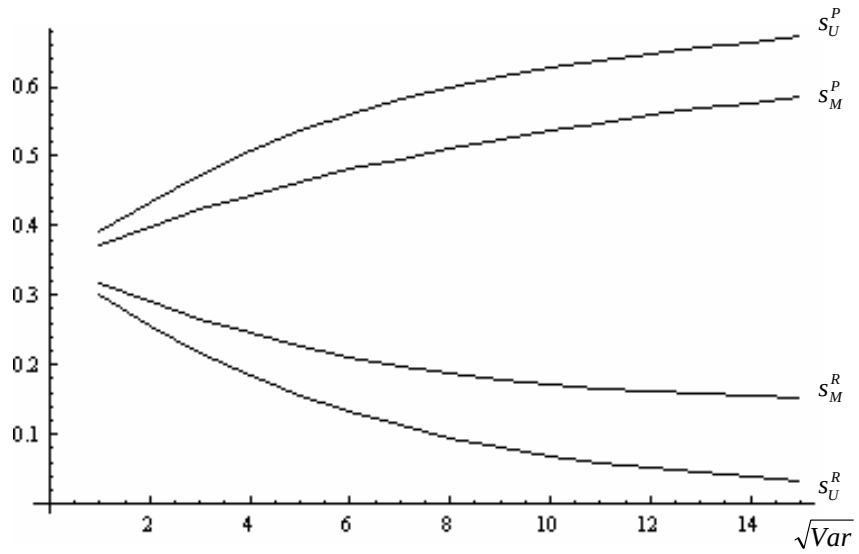

Figure A.3: The size of the lobby of the poor s^P and the size of the lobby of the rich s^R as a function of standard deviation $\sqrt{Var}$ for constant mean $\widehat{x} = 5.611469$ with $\alpha = 1$: s_U^P, s_U^R (utilitarian government) and s_M^P, s_M^R (pro-median government).

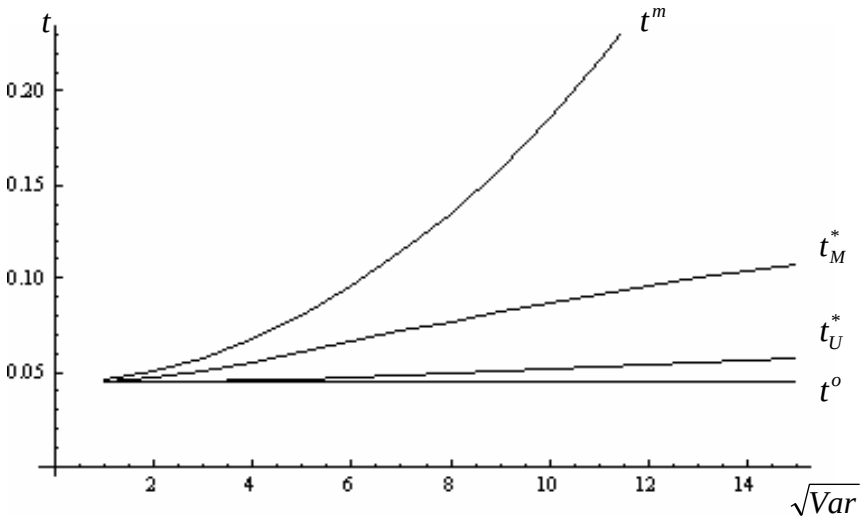

Figure A.4: Equilibrium tax rate as a function of standard deviation $\sqrt{Var}$ for constant mean $\widehat{x} = 5.611469$ with $\alpha = 1$: t_U^* (utilitarian government) and t_M^* (pro-median government).

Country	Year	LIS Mean	LIS Std. Dev.	$\widehat{x}$	$\sqrt{Var}$	x_m	μ	σ	t^o	t^m
United States	2000	56114.69	56463.514	5.611469	5.6463514	3.95559	1.37513	0.83628	0.0445516	0.0896588

Table A.1: Gross income descriptives from LIS household files, normalized descriptives $\widehat{x}$, $\sqrt{Var}$, x_m, corresponding parameters for lognormal distribution μ, σ, socially optimal tax rate t^o and median voter preferred tax rate t^m.

α	π	s^P	ρ	s^R	t^*	C^{P*}	$\frac{C^{P*}}{s^P}$	C^{R*}	$\frac{C^{R*}}{s^R}$	$\frac{s^P}{s^R}$	$\frac{C^{P*}}{C^{R*}}$	$\frac{\frac{C^{R*}}{s^R}}{\frac{C^{P*}}{s^P}}$
1	4.41232	0.551978	9.75917	0.140099	0.0471963	0.0165386	0.0299624	0.0152982	0.109195	3.93991	1.08108	3.64442
100	3.93564	0.497587	12.7233	0.0812024	0.0446328	$2.20784 \cdot 10^{-4}$	$4.43709 \cdot 10^{-4}$	$10.6438 \cdot 10^{-5}$	$13.1077 \cdot 10^{-4}$	6.12774	2.0743	2.95412

Table A.2: Numerical results and relative magnitudes of lobbying formation for an utilitarian government with $\alpha = 1$ and $\alpha = 100$: "sincere" indifferent poor π, size of lobby P, s^P, "sincere" indifferent rich ρ, size of lobby R, s^R, equilibrium tax rate t^*, total contribution of lobby P, C^{P*}, per member contribution of lobby P, $\frac{C^{P*}}{s^P}$, total contribution of lobby R, C^{R*}, per member contribution of lobby R, $\frac{C^{R*}}{s^R}$, lobby P to lobby R size ratio $\frac{s^P}{s^R}$, lobby P to lobby R total contribution ratio $\frac{C^{P*}}{C^{R*}}$, lobby R to lobby P per member contribution ratio $\frac{\frac{C^{R*}}{s^R}}{\frac{C^{P*}}{s^P}}$.

α	π	s^P	ρ	s^R	t^*	C^{P*}	$\frac{C^{P*}}{s^P}$	C^{R*}	$\frac{C^{R*}}{s^R}$	$\frac{s^P}{s^R}$	$\frac{C^{R*}}{C^{P*}}$	$\frac{\frac{C^{R*}}{s^R}}{\frac{C^{P*}}{s^P}}$
1	3.75018	0.474578	7.63875	0.215658	0.0641447	0.0131437	0.0276956	0.0467925	0.216976	2.20061	3.56007	7.83431
100	2.87648	0.351628	10.5252	0.120954	0.0892857	$1.31976 \cdot 10^{-4}$	$3.75329 \cdot 10^{-4}$	$5.71429 \cdot 10^{-4}$	$4.72435 \cdot 10^{-3}$	2.90712	4.3298	12.5872

Table A.3: Numerical results and relative magnitudes of lobbying formation for a pro-median government with $\alpha = 1$ and $\alpha = 100$: "sincere" indifferent poor π, size of lobby P, s^P, "sincere" indifferent rich ρ, size of lobby R, s^R, equilibrium tax rate t^*, total contribution of lobby P, C^{P*}, per member contribution of lobby P, $\frac{C^{P*}}{s^P}$, total contribution of lobby R, C^{R*}, per member contribution of lobby R, $\frac{C^{R*}}{s^R}$, lobby P to lobby R size ratio $\frac{s^P}{s^R}$, lobby R to lobby P total contribution ratio $\frac{C^{R*}}{C^{P*}}$, lobby R to lobby P per member contribution ratio $\frac{\frac{C^{R*}}{s^R}}{\frac{C^{P*}}{s^P}}$.

α	$\pi = \rho\,(= \widehat{x})$	s^P	s^R	$t^*\,(= t^o)$	C^{P*}	$\frac{C^{P*}}{s^P}$	C^{R*}	$\frac{C^{R*}}{s^R}$	$\frac{s^P}{s^R} = \frac{C^{R*}}{C^{P*}}$	$\frac{\frac{C^{R*}}{s^R}}{\frac{C^{P*}}{s^P}}$
0	5.611469	0.662078	0.337922	0.0445516	0.0396768	0.0599277	0.0777371	0.230044	1.95926	3.83869

Table A.4: Numerical results and relative magnitudes of lobbying formation with $\alpha = 0$: "sincere" indifferent poor π, "sincere" indifferent rich ρ, size of lobby P, s^P, size of lobby R, s^R, equilibrium tax rate t^*, total contribution of lobby P, C^{P*}, per member contribution of lobby P, $\frac{C^{P*}}{s^P}$, total contribution of lobby R, C^{R*}, per member contribution of lobby R, $\frac{C^{R*}}{s^R}$, lobby P to lobby R size ratio $\frac{s^P}{s^R}$, lobby R to lobby P total contribution ratio $\frac{C^{R*}}{C^{P*}}$, lobby R to lobby P per member contribution ratio $\frac{\frac{C^{R*}}{s^R}}{\frac{C^{P*}}{s^P}}$.

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