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Working Paper

Separation of Powers, Political Competition and Efficient Provision of Public Goods

Discussion Papers, No. 60

Provided in Cooperation with:
Courant Research Centre 'Poverty, Equity and Growth in Developing and Transition Countries', University of Göttingen

Suggested Citation: Boukouras, Aristotelis; Koufopoulos, Kostas (2011) : Separation of Powers, Political Competition and Efficient Provision of Public Goods, Discussion Papers, No. 60, Georg-August-Universität Göttingen, Courant Research Centre - Poverty, Equity and Growth (CRC-PEG), Göttingen

This Version is available at:
https://hdl.handle.net/10419/90557

Courant Research Centre

'Poverty, Equity and Growth in Developing and Transition Countries: Statistical Methods and Empirical Analysis'

Georg-August-Universität Göttingen
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Discussion Papers

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January 2011

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Separation of Powers, Political Competition and Efficient Provision of Public Goods*

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This Version: 03 September 2010
First Version: 28 September 2007

Abstract

In this paper we provide a political game where agents decide whether to become legislators or politicians. Legislators determine the political institutions constraining politicians' behavior and politicians compete for gaining the power to make decisions about the level of the public good. We derive the following results: i) Political competition is a necessary but not a sufficient condition for the elimination of political rents. ii) Agents utilize the separation of powers in order to endogenously select institutions which restrict the power of politicians. iii) In conjunction with political competition, these institutions implement the Lindahl allocation in the economy as a sub-game perfect Nash equilibrium of the political game. iv) As a consequence of the previous result, political rents are zero in equilibrium, in the sense that the winning politician does not extract part of the social surplus because of his power. To the best of our knowledge, this in the only citizen-candidate model with this equilibrium property.

Keywords: Lindahl allocation, political competition, voting games
JEL Classification: D02, D62, D72, H41

*We would like to thank Vincent Anesi, Bhaskar Dutta, Peter Hammond, Claudio Mezzetti, Julio Robledo and John Tsoukalas and for their very useful comments and remarks, for which we feel grateful.

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1 Introduction

Voting games on public goods usually have two undesirable features: i) non-existence of equilibrium when policy platforms are multi-dimensional, ii) inefficiently low provision of public goods when the equilibrium exists (Jackson and Moselle, 2002). Citizen-candidate models (Osborne-Slivinski, 1996, Besley-Coate, 1997) solve the problems of existence and efficiency of Nash equilibria in voting games, but generate a different concern. The elected politician is free to choose any allocation of resources he prefers and hence, in any equilibrium of these games, the social position of an individual (citizen or executive) matters for his payoff. Therefore, in a sense, the equilibria of these games generate excessive "rents" for the elected politician, which can be captured by the difference between their payoffs as citizens and as elected politicians.

The purpose of this paper is to show that this negative side-effect of the citizen-candidate models can be solved by the use of appropriately designed institutional restrictions in economies with public goods and complete information (which is the natural setting for these voting games). We show how agents may reach agreement on the type of political institutions selected and how these institutions lead to efficient social choices with zero political rents in equilibrium.

The institutions that arise endogenously from our political game is the utilization of the separation of powers by agents (some of them choose to become politicians, while others choose to become legislators to set the constitution) and the constitution (a set of restrictions on the voting behavior of citizens and politicians). Therefore, institutional arrangements on collective decisions become a necessary prerequisite for efficiency in this case.

More specifically, we present an economy with one private and one public good and we use a five-stage game, where all agents start as citizens. At stage one each citizen decides on whether to become a politician or a legislator (but not both) or to remain as a citizen. At stage two, legislators set the constitution of the economy, which defines restrictions on political competition, and at stage three politician propose platforms. At stage four, agents vote and at stage five the elected politician imposes taxation and produces the level of the public good according to his proposal and constitutional restrictions.

We show that the pure-strategy sub-game perfect equilibria of this political game implement the Lindahl allocation of the economy, which implies that none of the agents has sufficient power to achieve his most preferred outcome (and essentially becoming a social dictator). Thus, political rents are zero, in the sense that, in equilibrium, the utility of an agent is not dependent on whether he is a politician or not. To the best of our knowledge, no paper in the voting literature so far has implemented efficient allocations implying zero political rents as Nash equilibria. In our paper, this outcome is due to political competition in conjunction with appropriate political institutions, and hence we highlight the importance of these two factors in eliminating political rents and achieving efficiency.

The following assumptions are crucial for our results: i) An agent can become

either a politician or a legislator, but not both (Separation of Powers), ii) the rules set by legislators apply equally for all agents, conditional on their characteristics, namely preferences and endowments (No-discrimination Principle).

In section 3, we start with a very simple model. We show why both political competition and political institutions are necessary conditions for the implementation of Lindahl allocations when political parties (or politicians) are exogenous. The economy we consider consists of 2 agents and 2 goods, one private and one public. Political parties are selfish entities which make proposals over the allocation of resources in order to extract as much of the social surplus as possible. Agents vote for their most preferred proposal and the party which wins the election becomes the government and implements its policy.

The actions of the parties and agents may be restricted by the Constitution, which in this section of the paper is an exogenously imposed set of restrictions. The constitution determines the dimension of commitment to political proposals and the maximum amount of taxation, which a government can levy on citizens. We consider a particular form of the constitution, which specifies that political proposals are committing only to the level of the public good but not taxation levels and the maximum taxation on a citizen must be such that his marginal willingness-to-pay for the proposed level of the public good is not violated[1].

Using the above constitutional rule, we examine three different cases. The first case assumes that the constitution limits taxation, but there is a single candidate politician. In this case, we show that the party acts as a social dictator and reaps as much political rents as possible, given the limitation it faces. In the second case, we allow for free entry of political parties, but we remove the maximum taxation restriction from the constitution. In this case, we show that, despite the presence of political competition, parties still earn political rents. In fact, because the taxation restriction is removed, parties face weaker restrictions than the social dictator of the previous case and they may earn strictly higher rents than him.

In the third case, we allow for both political competition and the maximum taxation restriction to apply in the economy. We show that under these conditions the equilibria of the game are the Lindahl allocation of the economy and prove that political rents to parties are zero. We, thus, establish the necessity of both types of checks and balances over the power of government for efficiency.

In section 4 we move one step further and show how political institutions emerge endogenously, by extending the political game to the five-stage game we described earlier. More specifically, at the first stage of the game agents decide what type of political power they want to hold from the two types available: legislative and executive power. Given theses choices, agents are distinguished into three classes, namely legislators, politicians and citizens. Therefore, we introduce separation of powers as a potential

[1]We explain this definition of the maximum-taxation constraint more thoroughly in section 3. It essentially implies that the taxation imposed by the government on an agent can not reduce his utility below the utility he would have received if he were on his offer curve for the specific level of the public good implemented.

institutional control on the power of politicians, and agents in the economy choose whether to utilize it or not. Legislators determine the constitution of the economy, which is the set of political institutions that restrict voting behavior and political actions. Specifically, we allow legislators to determine how committing political proposals will be and what is the constraint on maximum taxation. The rest of the political game, then follows the game in section 3.

We find that the extended game has multiple sub-game perfect Nash equilibria, all of which implement the Lindahl allocation of the economy. Under any preference profile, legislators decide that politicians will be committed to the level of the public good they announce but not to the taxation level. Instead they set an upper bound to the level of taxation politicians can impose, namely the maximum-taxation constraint of section 3. With these restrictions in place, and because of the free entry of candidates in the political arena, politicians can not extract social surplus by simply being in power. In other words, political rents are zero[2].

Therefore, the contribution of this paper is threefold: First, we contribute to the citizen-candidate models by showing how institutional restrictions and the separation of powers can facilitate political competition in achieving zero-political rents. Second, we show that this requires that political proposals be only partially committing (committing only to the level of the public good but not taxation). Third, we show how the required institutions can emerge endogenously by the actions of the agents themselves.

2 Related Literature

The model closest to our own is the citizen-candidate model, pioneered by Osborne and Slivinski (1996). In their paper, each agent (citizen) in the economy decides whether to become a candidate politician or not and then citizens vote for electing one of the politicians under different electoral rules. The winner of the election chooses his most preferred policy. The authors show that the number of candidates at the second stage depends on the cost of running the campaign and the potential benefits of winning. They also show that the plurality rule generates more candidates than an electoral rule based on runoffs.

Besley and Coate (1997) introduce the citizen-candidate framework into a multi-dimensional policy setting and examine the implications of the model for the efficiency of the final allocations. They also present an application of their model in economies with public goods. They show that an equilibrium of the game always exists, even though the policy space is multi-dimensional, and that the resulting allocations are Pareto efficient.

Despite the similar structure of political competition between the above papers and ours, there are some major differences as well. In both models (Osborne and Slivinski,

[2]There are also other equilibria of the game, which hold only for specific preference profiles, but the equilibrium allocation remains the same. The only difference is in terms of the constitutional restrictions that arise in these equilibria.

Besley and Coate), the (lack of) commitment to political proposals is exogenously imposed, while in our case it emerges endogenously. In other words, the case they consider, namely that politicians implement their most preferred policy when they are in power, corresponds to the case in our model where legislators decide that political proposals are not committing to any dimension. Moreover, we show that if commitment is endogenous this case will never be chosen (that is, in our model, this case is off the equilibrium path.). We also assume implicitly that political entry is costless, while the assumption in these papers is that each citizen must pay some cost to become a candidate.

As a result, the properties of the equilibrium allocations in the two types of games differ substantially. The main difference is that in our case politicians do not implement their most preferred policy. In fact, the equilibrium allocation does not depend on the identity of the politician and as a result, as long as there are at least two candidates, there are no incentives for strategic entry. A second implication of this is that, in our model, political rents are zero in equilibrium, in the sense that, given a specific equilibrium allocation, the utility of an agent is not dependent on whether he is a politician or not. In other words, in equilibrium, becoming a politician does not provide additional benefit to a citizen. Obviously, in the political game of Osborne-Slivinski or Besley-Coate this does not apply, as the equilibrium utility level of an agent depends critically on his social identity (citizen or politician).

There is an extensive literature on voting games with simultaneous proposals and multi-dimensional policy space. The main finding of these papers is that, if the proposing members are free to make any type of offer, then the corresponding voting games have generally no equilibrium. The theoretical literature has tried to overcome this problem by examining restrictions on preferences that would make them compatible with a notion of political equilibrium. It is not in our intentions to provide a comprehensive list of these articles. Some of the most noteworthy contributions are related with the work of Sen (1964, 1966) and Inada (1964), but they restrict their analysis to triplets of preferences. Kramer (1973) provides a general characterization of necessary conditions in order for social welfare functions to be consistent with Arrow's assumptions and shows how restrictive these requirements can be. Plott (1967) provides a different notion of political equilibrium and demonstrates how general preferences violate the conditions required to satisfy it under a simple majority rule. Subsequently, Slutsky (1979) generalizes this result for any type of majority rules, including unanimity.

Our model is also related to the one adopted by Baron and Ferejohn (1989). They adopt a sequential bargaining approach for the sharing of a private good, which is essentially a generalization of the sequential bargaining game by Rubinstein (1982). Each agent in their model has a positive probability of being a proposer and if his allocation is objected by a majority of the agents, the bargaining process moves to the next round. The authors show that when the time discount factor is less than one there is a sub-game perfect equilibrium, where the first individual to propose makes an offer which the majority accepts. It is a general feature of their model that the first proposer has superior bargaining position compared to the rest so that some bargaining rents

will accrue to him. On the contrary, we show that in our game political rents are zero in equilibrium.

Nevertheless, many authors, following their seminal work, have demonstrated how social choices can be implemented through the mechanism of a sequential bargaining game[3]. Jackson and Moselle (2002) extend Baron and Ferejohn's model to the case where the economy contains public goods (alternatively, an ideological dimension). They show that, if there is a sufficiently high cost of delay, then the offer of the first proposing legislator will be approved and will contain a decision in both dimensions. The offer will trade part of the potential private good distribution gains for a compromise in the public good dimension and under this procedure there is a wide set of potential equilibrium proposals. The main difference between our model and Jackson and Moselle is that the sequential approach generates allocations where the final quantity of the public good does not fully reflect the associated externalities and therefore it is under-produced. In contrast, the equilibrium outcome of our model implies the elimination of political rents and the efficiency of proposals, irrespectively of party identities.

More recently, Dávila, Eeckhout and Martinelli (2006) have proposed a similar sequential bargaining mechanism for the distribution of a private and a public good between two individuals. They find that as the cost of delay vanishes the equilibria of the game converge to the Lindahl allocations and so the inefficiency generated by sequential bargaining disappears. In our game, though, the efficiency result of the proposals remains even if we were to assume strictly positive costs of delay. Also, it is not clear whether their result holds for more than two agents, whereas our result holds for any number of players greater or equal to three. Furthermore, the equilibrium outcome of our game is exactly the Lindahl allocation.

Finally, our paper is related to the literature of political competition as a driving force for eliminating political rents. Stigler (1972) was among the first to point out the similarities that exist between political and market competition. In a similar way that competition among producers reduces their ability to earn abnormal returns, competition among candidates or political parties reduces the magnitude of opportunistic behavior and the adoption of socially undesirable policies. Wittman (1989) pushes the argument one step further, by presenting many features of the modern representative democracies as institutional designs of monitoring and control over the actions of politicians. Despite the existence of informational constraints on their actions or the bargaining power nested in their authorities, institutions, like political parties, elections or the structure of the legislative bodies, create a variety of reputation and competition considerations that prevent politicians from extensive abuse of their positions. Wittman's conclusion is that we should not expect the inefficiencies of the political system in democracies to be greater than the failures of competitive markets.

Though our analysis does not consider such a general set of institutional designs it is in line with the political efficiency argument. The main difference is that we are

[3]See for example Merlo and Wilson, 1995 and Banks and Duggan, 2000

explicitly concerned with the issue of the provision of the public good and the role of political competition in solving it, while the aforementioned research agenda is centered around the elimination of political rents, whatever form they may take.

3 Description of the economic environment and the mechanism

Consider an economy with 2 agents and 2 goods. Good 1 is a private good while good 2 is a public good. Let e_1 and e_2 be the endowments of the private good for agents 1 and 2 respectively. The public good is produced through a linear production function $F(z) = mz$, where z stands for the aggregate quantity of the private good used as an input and m is a scaling coefficient (technological constant).

Agent $i = \{1, 2\}$ has a well defined ordering of preferences which can be represented by a continuous, non-decreasing, strictly quasi-concave utility function $u_i(x_i, y)$, where x_i represents the consumption of private good for agent i and y represents the quantity of the public good produced. We assume that $u_i \to 0$, as $x_i \to 0$ or $y \to 0$. Furthermore, for every agent, the demand for the public good is strictly increasing as its relative price decreases. This means that the offer curve of each individual is strictly increasing (see also Figure 1), which is the case when the income effect is not strong (negative) enough to overcome the (positive) substitution effect. Besides simplifying the analysis, this assumption is made in order to restrict the attention to economies with a unique Lindahl allocation[4].

As a benchmark case we define the allocation outcome generated by competitive markets. Each agent places an order for a certain quantity of the public good to firms so as to maximize his utility given his endowment and the order of the other agent. Firms, facing conditions of free entry, buy inputs from agents and try to maximize their profits. Assume that k is the number of firms operating in the economy, where k is a large number. Assume, without loss of generality, that the equilibrium allocation of resources under free markets is unique and is given by: $a^{fm} = \{x_1^{fm}, x_2^{fm}, y^{fm}\}$. The resulting utility level for agent 1 and 2 is $v_1^{fm} = u_1(x_1^{fm}, y^{fm})$ and $v_2^{fm} = u_2(x_2^{fm}, y^{fm})$ respectively: $\mathbf{v}^{fm} = \{v_1^{fm}, v_2^{fm}\}$[5].

[4]The uniqueness of the Lindahl allocation, in turn, is required in order to ensure the existence of equilibrium in our game, as we also note later on.

[5]Formally, agents maximize their utility with respect to the quantity of the public good they privately demand (y_i): $\max_{y_i} u_i(e_1 - py_i, \sum_i y_i)$, and firms maximize their profit: $\max_{y^f}(p - \frac{1}{m})y^f$, where p is the price of the public good in terms of the private. We can also formulate the problem in game-theoretic terms by assuming that each agent has access to the production technology of the public good and chooses how much to produce as a best-response to the choice of the other agent: $\max_{y_i} u_i(e_1 - \frac{y_i}{m}, \sum_i y_i)$. It is easy to verify that the two formulations give the same final allocations. See also Bergstrom, Blume and Varian (1986) for the definition and the characterization of the Nash equilibrium of the above game. They also establish the uniqueness of the equilibrium under very weak assumptions.

Because of the nature of good 2, a^{fm} is not Pareto efficient. There exists a feasible re-allocation of resources that can make at least one of the agents better-off without making the other worse-off. This can be achieved through a centralized decision making process, which takes into account the consumption externalities. However, at the same time, we allow each agent to veto any centralization process, in which case we assume that it is effectively blocked and agents resort to competitive markets for allocating resources. Therefore, under the assumption of veto power, v^{fm} is an effective outside option, which determines the individual participation constraints on any centralized allocation scheme. Even though the ability to veto centralized processes does not change our results (political rents are defined in terms of the competitive equilibrium utility levels instead of the no-private consumption outcome that would be produced under absolute dictatorship), we include it for checking the robustness of our results to the existence of participation constraints or not.

First, we highlight the importance of political competition for the efficient provision of the public good. In order to make the source of political rents as transparent as possible, we initially take the institutional constraints and political parties as exogenous (we will relax these assumptions in the subsequent section). Consider the following centralized decision making mechanism manifested into a voting game dictated by the rules of a Constitution. The players of the mechanism are political parties (or alternatively politicians) and the 2 agents. A political party is an exogenous entity which makes offers of prospective quantities of the public good to agents and tries to be elected as government. Parties exhibit risk neutrality and their utility is the probability to win the election in the voting game times the rents they receive from their offers: $V^p = p_{win} r^p$ [6]. Agents play the double role of being the consumers of the final allocations produced in the economy and voters, who decide which party will become the government.

The Constitution is a exogenous political institution which puts restrictions on the action set of parties and voters. More specifically, it specifies the types of political proposals that parties can make, the way agents vote and how a government is elected to implement its proposed allocation. Agents vote for the party whose proposal provides the greatest level of utility for them (sincere voters). If agents are indifferent between two proposals, then we assume that they vote arbitrarily for one of them, say the proposal of the party with the lowest index[7]. The party which receives the majority of votes, wins the election. Ties are again solved arbitrarily, say for the party with the lowest index[8].

Party proposals consist of only one element: the quantity of the public good to be produced (y^p). Let $PR^p = \{y^p\}$ denote the political proposal of party p. If a party is elected into power, then it will be called to implement the level of the public good it proposed before the election. Note, however, that, while the party has committed itself to the quantity of the public good, it has not committed itself to the taxation

[6]None of the results we produce is affected by the degree of risk aversion of political parties.

[7]Even though the assumption of sincere-voting is quite restrictive, it is without loss of generality. We will come back to this point and explain it in more detail in the analysis that follows.

[8]Of course, any other assumption about who wins the election under a tie would work equally well.

levels that will be imposed on agents. The only constraint, which we assume that is imposed on the government by the Constitution, is that the taxation each individual will pay can not exceed the taxation that the same agent would have paid for the proposed level of the public good if he were on his offer curve. This is equivalent to saying that, given a specific proportion of aggregate taxation that an agent pays, the maximum taxation possible is one that gives the agent the same utility level as the one he would have obtained when the proposed level of the public good was an optimal choice for the agent. For example, the maximum taxation possible for agent i for the proposed level y in Figure 1 (page 12) is equal to t_i. For the rest of this paper, we will call this institutional restriction as the maximum willingness-to-pay constraint or the maximum-taxation constraint.

However, on its own, this restriction is not sufficient to eliminate political rents, as we show for the case of a single party. A party that faces only this constraint can find levels of the public good for which the aggregate willingness-to-pay exceeds the required expenditure. That is, the presence of political competition is also necessary for the elimination of rents. On the other hand, if there are more than one parties, but the Constitution does not impose the maximum willingness-to-pay constraint, then political parties can still earn political rents, despite the presence of political competition. Therefore, some form of institutional restrictions are also necessary for the efficient provision of public goods.

In order to show that political competition and institutional constraints are both necessary requirements for the efficient provision of the public good in this economy, we present the equilibrium of the game under 3 different conditions: i) when the Constitution restricts party proposals and imposes the maximum-taxation constraint, but there is only one party in the economy, ii) when there are two parties in the economy, but the maximum-taxation constraint is not in place (the only constraint that applies is the standard participation constraint) and finally iii) when both conditions (multiple parties and the maximum-taxation constraint) are satisfied.

Case I

Consider, first, the case when there is only one party, which has secured the control of the government and acts as a dictator. This provides a base of comparison for political competition. The party's objective is to maximize its rents given the constitutional constraint on policies, and hence it tries to find the level of the public good, for which the summation of agents net valuation is the highest. More formally, the party's maximization problem can be described as:

$$\max_y r^p(y) = \sum_i t_i(y) - \frac{y}{m}$$

subject to

$$t_i(y) = \frac{y s_i^m(y)}{m}$$

$$s_i^m(y) = \left\{ s_i | \frac{\frac{\partial u_i}{\partial y}}{\frac{\partial u_i}{\partial x_i}} = \frac{s_i}{m} \right\} \ , \forall i \in \{1, 2\}$$

The party's problem is straightforward. It needs to choose a level of the public good such that both agents would like to contribute a share of their endowment as big as possible, so that political rents are maximized. The rents come from the fact that, at the proposed level of the public good, aggregate taxation will be higher than the required resources for its production, so that the difference is received by the party. Below we show that these rents are positive[9].

Proposition 1: Under the assumptions made above on agents' preferences, the maximization problem of the party has at least one solution with strictly positive rents.

Proof: The party's maximization problem can be rewritten as:

$$\max_y r^p(y) = \left(\sum_i \left(\frac{y s_i^m(y)}{m} \right) - \frac{y}{m} \right) \Leftrightarrow$$

$$\max_y r^p(y) = \frac{y}{m} \left(\sum_i s_i^m(y) - 1 \right)$$

The First Order Condition for this problem is given by:

$$\frac{\partial r_p(y)}{\partial y} = 0 \Leftrightarrow \frac{\partial}{\partial y} \left[\frac{y}{m} \left(\sum_i s_i^m(y) - 1 \right) \right] = 0 \Leftrightarrow$$

$$\frac{1}{m} \left(\sum_i s_i^m(y) - 1 \right) + \frac{y}{m} \left(\sum_i \frac{\partial s_i^m(y)}{\partial y} \right) = 0 \Leftrightarrow$$

$$\sum_i s_i^m(y) = 1 - y \sum_i \frac{\partial s_i^m(y)}{\partial y} \tag{1}$$

[9]Note that the formulation above does not include agents' participation constraints. It is easy to show that the main result of Proposition 1 (namely that political rents are positive) holds when participation constraints are included. The main intuition is that the allocation generated by competitive markets is inefficient and, therefore, the political party can still find an allocation that generates strictly positive political rents, even when some participation constraints are binding. The results are available by the authors upon request.

The left-hand side of equation (1) is the marginal benefit to the party by an increase in the level of the public good, while the right-hand side reflects the marginal cost. Also, notice that $s_i^m(y)$ is a continuous, strictly decreasing function of y. Because of the assumptions of non-satiation and strict quasi-concavity of the utility functions, for every level of expenditure sharing s_i there exists a unique level of the public good y, such that agent i maximizes his utility. Furthermore, by assumption, as s_i decreases the demand for the public good strictly increases. In other words, the offer curves for both agents are strictly decreasing functions of s_i (as it is shown also in Figure 1). Essentially, $s_i^m(y)$ is the inverse function of the offer curve and hence it is also a decreasing function of y: $\frac{\partial s_i^m(y)}{\partial y} < 0$.

First, notice that as $y \to 0$, the left-hand side of equation (1) goes to 2, as both individuals are willing to shoulder the full burden of taxation for low levels of the public good. At the same time, the right-hand side of equation (1) is equal to 1 ($\partial s_i^m(y)/\partial y = 0$ for very small values of y), which means that the difference of the left-hand side minus the right-hand side is positive[10]. On the other hand, as $y \to \infty$, the left-hand side tends to 0, as individuals are willing to provide an infinitesimally small part of their endowment for very high levels of the public good. At the same time, because $\partial s_i^m(y)/\partial y < 0 \Rightarrow -y\sum_i \partial s_i^m(y)/\partial y > 0$ for large values of y, and hence the right-hand side is greater than 1. This means that, as $y \to \infty$, the difference of the left-hand side minus the right-hand side is negative. Since both sides are continuous functions of y, there exists at least one level of the public good y^* such that the two sides are equal.

Second, because $\frac{\partial s_i^m(y)}{\partial y} < 0$, $-y^* \sum_i \frac{\partial s_i^m(y)}{\partial y}|_{y=y^*} > 0$, so that at any solution of the party's problem it holds that: $\sum_i s_i^m(y^*) > 1$. This means that the shares of expenditure that agents are willing to provide for the public good exceed the required expenditure and therefore political rents are strictly positive.

The intuition for this result is simple. When only one party is allowed to operate in the economy it knows that it has full bargaining power over the population since its offers will go unchallenged, so long as both agents are willing to forgo a part of their endowment for the proposed level of the public good. It therefore becomes a social dictator, using its power to provide allocations that maximize its rents. Because the marginal utility of the public good is higher than the marginal rate of transformation for both agents when its quantity is very low, proposals associated with positive political rents are easy to find. Of course, all such proposals are socially inefficient, since they

[10]Recall our earlier assumption that individuals have access to competitive firms, which can produce the public good instead of the government. As a result, the maximum proposed share of public expenditure ($s_i^m(y)$) will not exceed one. If it did, the agent would be better off by producing the good on her own, by ordering it by a firm. In other words the maximum value of $s_i^m(y)$ is 1 and for very small values of y, $\partial s_i^m(y)/\partial y = 0$.

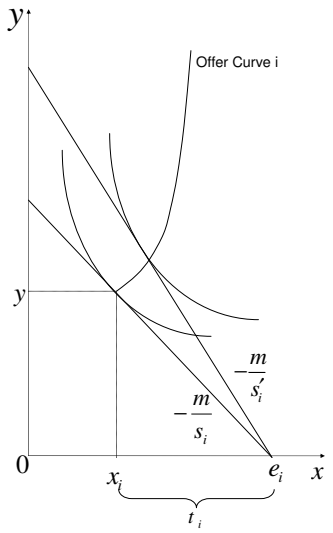

Figure 1: Offer curve for individual i

imply excessive supply of resources into the production process and consequently waste (because politicians are exogenous entities, political rents are deadweight loss for the society.).

Case II

The main elements of the game are the same as in the first case. However, we assume that there are two parties in the economy and the maximum-taxation constraint does not hold[11]. This means that parties are free to choose any taxation level after being elected in government, as long as the participation constraints are satisfied. In order to be more explicit, we present the structure of the game below:

Stage 1: Each party makes an offer on the level of the public good and it is committed to it.

Stage 2: Each agent decides which party to vote and the election takes place. The party which receives the majority of votes wins the election. In case of draw, party 1 is arbitrarily chosen to implement its proposal.

Stage 3: The elected party takes over power and implements its proposal.

[11]It is straightforward to generalize for cases with more than two parties as the same reasoning applies. Essentially, the only requirement for political competition is free entry of parties in the political contest.

The removal of the maximum-taxation constraint has an important implication for the equilibrium outcome. Because the party in power is not constrained over the level of taxation, political competition is rendered powerless. No matter what promises parties make at the first stage for the level of the public good, the government will impose such a high level of taxation on each agent, so that he is indifferent between the market and the governmental allocation of resources. This happens because there is no effective commitment to taxation levels after the election has taken place.

Agents, anticipating this, understand that all proposals imply the same utility level for them, irrespectively of their promise over the quantity of the public good. Therefore, they are indifferent between voting for one party or the other and vote arbitrarily for one (we restrict our attention to pure-strategies). Political parties, of course, anticipate this as they realize that their commitment to the level of the public good does not affect agents' voting behavior at the subsequent stage. Since the probability of winning the election (which is either zero or one, depending on the pure-strategies of agents when they are indifferent about party proposals) is independent of its proposal for any party, the best choice for them is to commit to the level of the public good that maximizes their rents after the election and simultaneously satisfies the participation constraints of agents. In this case, parties are acting effectively as social dictators. Proposition 2 summarizes the result.

Proposition 2: The equilibrium outcome of the 2-agent, 2-party game, without the maximum-taxation constraint enforced by the Constitution, implies strictly positive political rents for the party that is elected in government.

Proof: At stage 3, whichever party is elected will impose the maximum taxation possible. Given that there is no commitment to the level of taxation at stage one by a party's proposal and that there is no constitutional restriction, the maximum taxation is the one that makes each individual indifferent between the allocation he would obtain by competitive markets and the one implemented by the government.

At stage 2, agents are indifferent between party proposals, as all of them imply the same utility level for each individual. Therefore, their vote can not affect the final outcome of the game and they vote arbitrarily for one party. At stage 1, parties realize that their political offer has no impact on the voting behavior of agents. Their best response is to set the level of the public good so as to maximize their political rents. Formally, each party solves the following problem:

$$\max_{y} r^p(y) = \sum_i t_i(y) - \frac{y}{m}$$

subject to

$$t_i(y) = \{t_i |\ u_i(e_i - t_i, y) = v_i^{fm})\}\ ,\ \forall i \in \{1, 2\}$$

From the First Order Condition we get that:

$$\sum_i \frac{\partial t_i(y)}{\partial y} = \frac{1}{m} \tag{2}$$

This is a simple cost-benefit equation. It states that the party should offer a level of the public good such that for the last unit of it, the marginal benefit of the extra taxation is equal to the marginal cost of the extra resources required for its production. Let $\widehat{y}$ denote this level of the public good. Notice that $\widehat{y}$ is unique. This is due to the strict quasi-concavity of agents' utility functions, which implies that $\frac{\partial t_i(y)}{\partial y} > 0$ and $\frac{\partial^2 t_i(y)}{(\partial y)^2} < 0$. This means that the first partial derivative of $t_i(y)$ is a strictly decreasing continuous function and hence the left-hand side of equation (2) is also a strictly decreasing continuous function. Hence, the level of the public good that satisfies (2) is unique. Also, from the total derivative of the participation constraint notice that:

$$\frac{dt_i}{dy} = \frac{\frac{\partial u_i}{\partial y}}{\frac{\partial u_i}{\partial x_i}} \Rightarrow \sum_i \left(\frac{\frac{\partial u_i}{\partial y}}{\frac{\partial u_i}{\partial x_i}} \right)_{y=\widehat{y}} = \frac{1}{m}$$

This implies that the summation of the ratio of marginal utilities is greater than the marginal rate of transformation for all $y < \widehat{y}$:

$$\sum_i \left(\frac{\frac{\partial u_i}{\partial y}}{\frac{\partial u_i}{\partial x_i}} \right)_{y<\widehat{y}} > \frac{1}{m} \Rightarrow \int_0^{\widehat{y}} \sum_i \left(\frac{\frac{\partial u_i}{\partial y}}{\frac{\partial u_i}{\partial x_i}} \right) dy > \int_0^{\widehat{y}} \frac{1}{m} dy \Rightarrow$$

$$\sum_i \int_0^{\widehat{y}} \left(\frac{dt_i}{dy} \right) dy > \frac{\widehat{y}}{m} \Rightarrow \sum_i t_i - \frac{\widehat{y}}{m} > 0$$

The last inequality above states that political rents are strictly positive for the party that proposes $\widehat{y}$. Now, since agents vote arbitrarily at stage two (because they are indifferent on which party to vote), it might be the case that they always vote for one of the two parties, say party one. The other party anticipates this and may propose any level of the public good (since it expects to lose the election). But the winning party is not indifferent, as it maximizes its rents by proposing $\widehat{y}$. If, on the other hand, both parties receive a strictly positive probability of winning the election (say one agent votes for party one and the other for two), then both parties will propose $\widehat{y}$ in equilibrium. In other words, the game has multiple sub-game perfect equilibria in terms of strategies, but the equilibrium level of public good is unique and it implies strictly positive political rents for the elected party. This completes the proof of proposition 2.

This shows that political competition on its own is not a sufficient condition for the elimination of political rents. Institutional restrictions are also necessary, a point that we will emphasize in the next case. In fact, without the maximum-taxation constraint, political parties can implement perfect price discrimination at the third stage of the

game, so that the political rents for the ruling party will be at least as large as the ones of the social dictator in case I, under any combination of individual preferences and endowments. This is because political competition is powerless if there are no restrictions on the maximum level of taxation and as a result parties face one less constraint than the sole party of the previous case. Once the maximum-taxation constraint is reinstated, however, political competition leads to efficiency, as shown below.

Case III

The primitives of the economy and the political game remain the same as in the previous case, with the difference that the two parties in the economy face the maximum-taxation constraint. An immediate consequence of competition is that parties can not secure election victory by simply satisfying agents' willingness-to-pay, as was the case with a single party. In fact political rents will be zero in equilibrium, irrespectively of the offer that will pass.

Proposition 3: The political game as described above, with 2 agents, 2 parties and the Constitution as described in the previous section, has a unique sub-game perfect Nash equilibrium. Both parties propose the level of the public good that corresponds to the Lindahl allocation of the economy. Both agents are indifferent and vote arbitrarily for one. At the third stage, the party which receives most votes becomes the government, otherwise party 1 is selected to implement the common proposal.

Proof: Note that, because both individuals have strictly increasing offer curves, they intersect at most once. This means that there is a unique Lindahl allocation in the economy. Let y^L, s_1^L, s_2^L be the quantity of the public good and the respective expenditure shares associated with the Lindahl allocation of this economy. By definition, $s_1^L + s_2^L = 1$.

At the last stage of the game, the party that wins the election maximizes its rents given the commitment it has undertaken at stage 1 regarding the level of the public good. The implication of this is that agents will be asked to contribute their maximum willingness-to-pay at stage 3. If a party has offered y^L, then it can not extract any political rents after election, since the maximum willingness-to-pay of the agents is exactly the same as the expenditure required for the public good. To see that, recall from the previous section that $s_i^m(y)$ (the maximum willingness-to-pay of agent i) is a decreasing function of y and that the Lindahl allocation is defined as a sharing of the public good expenditure such that both agents agree on the demanded quantity. This means that $s_1^m(y^L) + s_2^m(y^L) = 1$, while for $y < y^L :\ s_1^m(y) + s_2^m(y) > 1$ and for $y > y^L :\ s_1^m(y) + s_2^m(y) < 1$.

If a party ever offered $y^p > y^L$, then agents would anticipate that such a level of the public good can not be implemented without violating their maximum willingness-to-pay and hence they would not vote for the corresponding party. On the other hand, if party p offers $y^p < y^L$, then agents, as we noted in the previous paragraph, anticipate

strictly positive political rents for the party. Furthermore, both agents would be strictly better-off by an offer with a greater level of the public good. This is because levels of y closer to the Lindahl allocation correspond to points on the offer curves with higher utility (See also Figure 1).

Therefore, if party p offers $y^p = y^L$, then the other party will lose the election with certainty if it makes any other offer. If party p offers $y^p < y^L$, then the other party can win the election with certainty by offering a quantity of the public good slightly greater. Finally, any offer $y^p > y^L$ is not credible, and party q can win with certainty by making any offer with $y^q \leq y^L$[12]. As a result, the unique sub-game perfect equilibrium involves both parties proposing $y = y^L$. The rest of the proposition follows immediately.

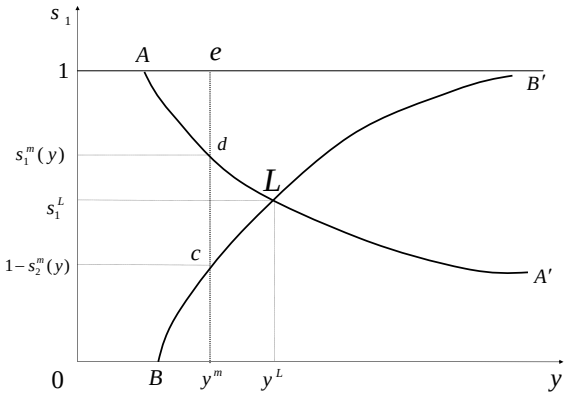

Figure 2: Voting equilibrium under political monopoly and competition

The main intuition of the proposition is that, when competition is allowed, then parties can not maximize their political rents without taking into account the offers of their contestants. Since agents anticipate that parties can commit to the level of the public good, but not to the tax level, they will vote the proposal which minimizes rents. Note that the Lindahl allocation is the only credible allocation on the Pareto frontier. Political contesters understand this and make efficient offers. The resulting equilibrium of the game is represented diagrammatically in Figure 2. The level of the public good y^m corresponds to the choice that a monopolistic party would do. Such a level implies strictly positive political rents for the government, as the summation of the maximum willingness-to-pay of the two individuals exceeds one. On the other hand, y^L is the level of the public good that is obtained under conditions of political competition and

[12]Given the enforcement of the maximum-taxation constraint, any level of the public good, that is greater than the Lindahl, means that the summation of private taxation, that can be levied on the citizens, is less than the resources required to produce it. Hence any party that makes such a proposal, if it is voted on power, will have to either accept the infeasibility of the proposal and implement a lower level of public good (in this sense the proposed allocation is not credible) or to pay out the difference by its own wealth (negative rents, in which case the proposal is clearly not a best-response for the party). Therefore, there can be no equilibrium of the game where the implemented level of the public good exceeds y^L.

it corresponds to the level of the public good under the Lindahl allocation L.

We can also see now why the assumption of sincere voting is not crucial for the result. In the case where political proposals commit parties only to the level of the public good, agents' expected utility is an increasing function of the proposed public good levels. Therefore, all agents would like to vote for the party which offers the highest level of the public good. Even though coordination failures may arise (indeed, without the sincere voting assumption, one can find equilibria where all agents vote for a party with a dominated platform), one can easily dismiss them. For instance, instead of simultaneous voting, consider the modified game where agents vote publicly and sequentially. This eliminates any type of coordination failure and allows all agents to vote only for the party that offers the highest utility to all of them[13].

Proposition 3 seems to hold because of the way the maximum-taxation constraint is constructed. In the following section we extend the political game and allow agents to create the Constitution and to make proposals for the allocation of resources in the economy. We thus allow the required conditions for the efficient provision of the public good to arise endogenously.

4 Separation of Powers and Endogenous Political Institutions

In the previous section we showed the importance of both political competition and institutional restrictions for the efficient provision of the public good in the economy. Most elements of the political game, however, were exogenously imposed and it would seem as if our results are derived by assuming the partial commitment of parties to their proposal and the maximum-taxation constraint.

In this section we will show how these elements of the institutional environment can arise endogenously. Most importantly, we show that separation of powers is an important institution for imposing checks and balances on a government.

Consider an economy with n agents, where $n \geq 3$. As in the previous section, there is one private and one public good. Each agent has an endowment e_i of the private good and a utility function $u_i(x_i, y)$, which satisfies the same assumptions as before. Let the production function of the public good be also the same as before: $F(z) = mz$. Once again, let $\mathbf{v}^{fm}$ be the vector of utilities that the agents of the economy receive, if the public good is provided by a decentralized mechanism (competitive markets). Of course, such an allocation is suboptimal. Finally, note that our assumptions on preferences mean that the economy has a unique Lindahl allocation.

Consider the following political game. At stage 1, agents decide what type of political power to hold. There are two types of power-holders: i) legislators and ii) politicians.

[13]Of course one may point out that sequential, public voting almost never occurs in contemporary democracies. However, explaining this fact would require an environment with multiple public goods and would add additional complications to our model, which would derail us from our initial purpose. We leave these and some other considerations for future work.

Legislators decide the institutional arrangements (the Constitution) of the economy. Politicians, participate in the election by making proposals over the level of the public good to be produced. Once in government they implement their policy. Agents decide whether they want to become legislators or politicians or neither. However, an agent can not become both. If no agent becomes a legislator, then no Constitution is set and the politician elected in government has unlimited power (i.e. non-commitment of political proposals and non-existence of the taxation constraint is the status quo). On the other hand, if no agent becomes a politician, then no centralized decision is made and competitive markets decide the level of the public good to be produced (i.e. the allocation a^{fm} is the status-quo).

At stage 2, legislators decide on the form of the Constitution. Specifically, they decide on two different institutions of political competition: i) which elements of a political proposal are committing if the respective politician rises to power, and ii) whether the government will face the maximum-taxation constraint (as defined in the previous section) or not. In other words, legislators choose the institutional constraints for political parties and the government. Each legislator simultaneously makes a proposal on these two issues and according to a given choice rule, one of the proposals is chosen to be the Constitution of this economy.

The choice rule used for deciding the Constitution is inconsequential for the final outcome of the political game, as we will show later. For reasons of expositional clarity, we assume that the legislative proposal which is made by the majority of legislators becomes the Constitution. We also assume that the Constitution is binding for politicians. If any of its clauses is violated by the government or other agents, then the centralized decision making process breaks down and agents allocate resources through competitive markets (a^{fm}).

In terms of the decisions, which the legislators make on the Constitution, the following assumptions are made. First, legislators choose whether political offers are committing to the level of the public good only, to the level of taxation only, to both or to neither. Second, legislators can choose whether to impose the maximum-taxation constraint or not. But, the maximum-taxation constraint is anonymous. It holds for either all agents in the economy or none. In other words, if an upper bound on taxation is set, it can not be the case that some agents in the economy enjoy this privilege while others are heavily taxed by the government. We call this condition the Anonymity of the Taxation Constraint.

If there is no restriction on the maximum level of taxation and no commitment to taxation during the election, then the government faces only one form of constraint: the participation constraint of agents in the economy, which, as we explained in the previous section, implies a lower bound to the utility level agents can receive by the centralized allocation, equal to $\mathbf{v}^{fm}$. Effectively, we allow any agent to block the formation of any centralized decision making mechanism, which gives him lower utility than the one he receives under competitive markets.

The rest of the stages are similar to the ones in the previous section. At stage 3, those, who have become politicians, make proposals over the quantity of the public

good and the level of taxation. At stage 4, each individual in the economy votes for one proposal and the proposal that receives most votes wins[14]. At stage 5, the politician who made the successful proposal, receives the power to levy taxation and implement the allocation of resources, given the restrictions of the Constitution.

Notice that some sub-games of the game above may not have an equilibrium in pure strategies. For example, if legislators choose that political proposals are committing to both the public good and individual taxation, then, irrespectively of whether the maximum-taxation constraint holds or not, there is no equilibrium in pure strategies. For all these sub-games, we avoid issues of non-existence of equilibrium by adopting a sequential bargaining approach. Specifically, we assume that there are T stages of bargaining, $T \in N$. At every stage, each political receives an equal probability of being chosen to make a proposal. If the proposal wins the majority of votes then the politician wins the election. Otherwise, the procedure moves to the next stage. If the final proposal is not passed then the agents return to the status-quo allocation (a^{fm}). Finally, we assume that all agents have the same discount factor δ.

We solve the game and derive its results by backward induction. Since there are four different types of commitment to political proposals and two different options on the maximum-taxation constraint, it is convenient to conduct the analysis in terms of the sub-games which result from the eight different Constitutions that legislators can set. Below, we analyze each in turn, by focusing on the sub-game equilibrium payoff of non-politicians, since this is crucial for the decisions of legislators at stage two. Also note that in all the cases analyzed below we suppose that at stage one at least two agents have decided to become politicians and one agent is a legislator (we will examine later the rest of possible cases).

Sub-game 1: No commitment to political proposals, no taxation constraint

Suppose that at stage two of the game legislators have chosen to impose no constraints on politicians. This means that political proposals are not committing to any dimension and that there is no maximum-taxation constraint. Recall that, by the assumptions we have made about the structure of the game, this is equivalent to the sub-game where no citizen decides to become a legislator. It is also equivalent to the structure of the games in the citizen-candidate literature.

At stage five, the elected politician chooses the policy that maximizes his utility given the participation constraints of agents. As we have seen in the previous sub-section, this generally implies positive political rents, in the sense that the elected politician receives higher utility than the level of utility he receives either under the Lindahl allocation or the competitive markets allocation. Formally, politician p solves the following problem:

[14]One can show that the type of election rule does not affect the main results. We will discuss this in more detail later.

$$\max_{y,\mathbf{t}} u_p \left(\sum_i t_i - \frac{y}{m},\ y \right)$$

$$\text{subject to} \quad u_i(e_i - t_i, y) \geq v_i^{fm} \quad \text{for} \quad i \neq p$$

Apart from the politician, all the other agents lie on their participation constraint. Otherwise, the politician would tax away all their private endowment and they would consume only the public good (recall that $u_i \to 0$, as $x_i \to 0$). Hence, $u_i = v_i^{fm}, \forall i \neq p$.

Given this, at stage four, all non-politicians are indifferent on whom to vote, since their utility levels are not affected by the politician in power, and they vote arbitrarily for some agent (as in section 3, we consider only pure strategies). At stage three, politicians also anticipate voters' actions and they are also indifferent on which political platform to propose, as they do not affect the election result. Hence, they arbitrarily propose some policy. However, the main point is that all non-politicians expect to receive $u_i = v_i^{fm}$ from this sub-game.

Sub-game 2: Commitment to the level of the public good, no commitment to taxation, no taxation constraint

At stage five the elected politician is committed to the level of the public good he proposed at stage three. However, we obtain the same result as in sub-game 1. This is due to the non-commitment to taxation and the lack of the maximum-taxation constraint, which allows the politician to tax each agent's private endowment until his participation constraint becomes binding. Hence, non-politicians are indifferent at stage four on whom to vote and politicians' best-response at stage three is to propose the level of the public good that maximizes their utility given the non-commitment to taxation at stage five.

Sub-game 3: Commitment to taxation, no commitment to the level of the public good, no taxation constraint

Since political proposals are committing to individual taxation and not to the public good, politicians' preferences matter for voting behavior. This is because, given the same taxation proposals from politicians, voters prefer the politician who has the strongest preferences for the public good and hence will produce more of it. However, this sub-game may not have an equilibrium in pure strategies and we analyze it in terms of the sequential voting procedure described earlier. For instance, if all politicians have the same preferences, then any proposal by one politician can be countered by a proposal which slightly decreases taxation on all voters and increases proposed taxation slightly for the politician who made the original offer.

In terms of the sequential voting procedure, at the last stage of political offers, stage T, the politician who makes the offer faces no competition and hence he will propose the allocation that maximizes his utility given the participation constraint of all other

agents. Let $P^{max} = \{\mathbf{t}_P^{max}, y_P^{max}\}$, be this proposal. As before, it is easy to check that all participation constraints are binding under P^{max}. Also, let v_p^{max} be the utility level that the elected politician p receives under P^{max}. Let also E be the total number of votes required for passing a proposal: $\frac{n+1}{2} \leq E \leq n$. As a result, the expected utility of a politician p at the beginning of stage T is equal to: $E_T(u_p) = \frac{1}{K} v_p^{max} - \frac{K-1}{K} v_p^{fm}$, where K is the total number of politicians. Note also that the expected utility of a non-politician i at the beginning of stage T is v_i^{fm}.

At the bargaining stage $T-1$, the chosen politician q can win the approval of non-politicians by offering $Q = \mathbf{t}_Q, y$ such that $u_i(t_{Q,i}, y_Q^{max}) = \delta v_i^{fm}$. If the number of non-politicians is greater than the election threshold, $n - K \geq E$, then politician q secures election by proposal Q. Otherwise proposal Q must be such that $u_i(t_{Q,i}, y_Q^{max}) = \delta v_i^{fm}$ for the $n-K$ non-politicians and $u_p(t_{Q,p}, y_Q^{max}) = \delta E_T(u_p)$ for $E - (n-K)$ politicians. If such a proposal Q is not feasible then politician q can not receive adequate support for any of his offers and the game moves to stage T.

The same reasoning applies to any bargaining stage $t \leq T$. This means that in any sub-game perfect equilibrium of the sub-game with commitment to taxation and no maximum-taxation constraint, the maximum equilibrium payoff of non-politicians, $\delta^t v_i^{fm}$ for $\forall i \in N - P$, is strictly less v_i^L. Again, the main result of the analysis is that the expected utility of non-politicians is strictly less than the utility they receive under the Lindahl allocation.

Sub-game 4: Commitment to taxation and to the level of the public good, no taxation constraint

Due to the commitment of political proposals to both dimensions, the sub-game has no equilibrium in pure strategies and it is analyzed in terms of the sequential voting. The analysis is identical to the one in sub-game three. At each stage of the bargaining procedure the randomly chosen politician tries to win the minimum amount of votes require in order to secure the election. This, however, implies that non-politicians receive the discounted value of their participation constraints.

Sub-game 5: No commitment to political proposals, taxation constraint

Political proposals are not committing and hence they are not credible. At the last stage of the game, the politician maximizes his utility subject to the participation and the maximum-taxation constraints. This means that if the politician chooses to produce the level of the public good y, he will impose the maximum taxation possible to each agent for that level of the public good and place agents on their respective offer curves (as long as their participation constraints are not violated). Also, recall that, due to the assumptions on preferences, the utility level of an agent along his offer curve is strictly increasing and that participation constraints are not binding if the Lindahl allocation is provided.

Politician p can not produce any level of the public good above the Lindahl alloca-

tion, because this either violates the maximum-taxation constraint for some agent or it is not feasible. If the politician chooses the Lindahl level of the public good it will also impose taxation consistent with the Lindahl allocation, so that agent i receives the final utility that corresponds to the Lindahl equilibrium v_i^L. This is because the summation of the maximum willingness-to-pay of all agents is exactly equal to the inputs needed to produce the the public good at the Lindahl allocation and, hence, any other taxation scheme violates the maximum-taxation constraint for at least one agent.

If the politician in power reduces the level of the public good below the Lindahl, then his utility may increase because the maximum willingness-to-pay of the agents relaxes and he can extract political rents for private consumption, but it also may decrease because the level of the public good is reduced. Adopting the same notation as before, $t_i^m(y) = \frac{y s_i^m(y)}{m}$ is the maximum taxation which can be imposed on agent i for the level of the public good y, where $s_i^m(y)$ is the maximum willingness-to-pay of agent i. Given that the budget constraint of the politician is given by $x_p + y/m \leq e_p + \sum_{i \neq p} t_i^m(y)$, the overall effect in his utility by a small reduction of the public good below the Lindahl level is given by:

$$-\frac{du_p}{dy}|_{y=y_L} = -\frac{\partial u_p}{\partial x_p}\left[-\frac{s_p^m(y_L)}{m} + \frac{y_L}{m}\sum_{i \neq p}\frac{\partial s_i^m(y)}{\partial y}|_{y=y_L}\right] - \frac{\partial u_p}{\partial y}$$

In the sum above, the first term is positive (both terms inside the brackets are negative) and reflects the marginal increase in utility due to the increase in the consumption of the private good, while the second term is negative and reflects the marginal decrease in utility due to the decrease of the public good. If the first term is greater than the second in absolute values, then the politician prefers to decrease the level of the public good below the Lindahl. In this case, agents final utility decreases as they move along their offer curves to lower levels of the public good. If the second term is greater than the first, then the politician imposes the Lindahl allocation of the economy.

At stage 4 agents anticipate this behavior by the elected politician. Therefore, they vote for the politician who will choose the highest level of the public good at stage 5, and this voting behavior is independent of any political proposal. As a consequence, any combination of political proposals at stage 3 is an equilibrium of this sub-game and agents, except for the preferred politician, receive at most the utility levels of the Lindahl allocation (v^L).

Sub-game 6: Commitment to the level of the public good, no commitment to taxation, taxation constraint

This is effectively Case III of section 3. Since political proposals are committing to the level of the public good only and the maximum-taxation constraint holds, politicians compete on who will offer the highest level of the public good. As a consequence, in the equilibrium of this sub-game, non-politicians will end up receiving v_i^L.

Sub-game 7: Commitment to taxation, no commitment to the level of the public good, taxation constraint

Since this is one of the sub-games that may have no equilibrium in pure strategies, the analysis follows closely the one for sub-game 3. The only difference is that politicians can not tax agents more than their maximum willingness-to-pay due to the maximum-taxation constraint. Let $P^{mw} = \{\mathbf{t}_p^{mw}, y_p^{mw}\}$ be the policy that maximizes the utility of politician p under the maximum taxation and individual participation constraints. As we we showed for the case where there is no commitment to any dimension of political proposals but the maximum-taxation constraint is imposed (see also sub-game 5), $y^{mw} \leq y^L$ and therefore for any agent i other than the politician it holds that $u_i(t_i^{mw}, y^{mw}) \leq u_i(t_i^L, y^L)$.

Therefore, at the last stage of proposals, stage T, if politician p is chosen, he makes the offer $P^{mw} = \{\mathbf{t}_p^{mw}, y^{mw}\}$ and agents vote for it. Then, by backward induction and by using the same reasoning as in sub-game three, at every stage $t \leq T$ the chosen politician makes a proposal which gives to the rest of the agents the maximum between their continuation value of the game and their participation constraint. In all possible cases, the maximum utility level for non-politicians does not exceed v_L^i.

Sub-game 8: Commitment to taxation and the level of the public good, taxation constraint

The analysis of sub-game 7 also implies in this case.

Stage 2:

It is clear that the critical stage is stage 2, at which legislators decide the Constitution, given that they know the identity of all politicians. Using the analysis that preceded, we conclude that it is a weakly dominant strategy for legislators to set the constitutional rules of sub-game 6. This is because these rules ensure that the Lindahl allocation will be implemented by political competition irrespectively of the identity of the politicians[15].

To see this, recall that in sub-games 1 to 4, legislator l expects to receive utility equal to v_l^{fm}, in other words, his participation constraint is binding. In sub-game 5, the legislator's expected utility is dependent on the preferences of the elected politician and his utility is at most v_l^L, only if the politicians' most preferred level of the public good (given constitutional restrictions) is y^L (which, in turn, requires specific restrictions on the politicians' preferences). In sub-games 7 and 8, the legislators expected utility

[15]It remains to be shown that political competition will indeed be part of the equilibrium path at stage one.

depends on the identity of all politicians, since they all have a chance of being elected at stage one of bargaining, and his expected utility is at most v_l^L, only if all politicians' most preferred allocation is the Lindahl.

In contrast, in the equilibrium of sub-game 6, l expects to receive v_l^L, irrespectively of the preferences of politicians. Notice also that it is a weakly dominant strategy for every legislator to set the constitutional rules of sub-game 6, irrespectively of his preferences. Therefore, in any sub-game perfect equilibrium of sub-stage two in which there is at least one legislator and two politicians, the Lindahl allocation will be the equilibrium outcome. If, furthermore, none of the politicians' preferences satisfy the condition we described at sub-stage 5 (i.e. the restrictions on preferences that make the Lindhal allocation the most preferred one by a politician), then the unique optimal action for all legislators is to make political proposals committing to the level of the public good only and to impose the maximum-taxation constraint.

Notice also that these equilibria are independent of the election rule for either the Constitution (the way legislators decide on the political constraints) or the politician (the way voters decide on who will be the elected politician).

Stage 1: Political Entry

Finally, at stage one, we analyze the entry of citizens on political competition and the legislation authority. Clearly, it is a best-response for at least one agent to become a politician. Since a^{fm} is generally below the Pareto frontier, if one agent becomes a politician then, under any constitution, he can strictly improve his utility by proposing his most preferred allocation given constitutional restrictions.

We consider different constitutional cases in order to examine whether a second agent prefers to become a politician. Assume that there is at least one citizen who decides to become a legislator at stage one. If agent p decides to become a politician and his preferences satisfy the condition of sub-game 5, then legislators will be indifferent between setting the rules of sub-game 5 or 6 at stage two. Given that, any citizen at stage one will be indifferent between becoming a politician or a legislator and remaining as a citizen, as the final outcome will be the Lindahl allocation, irrespectively of how many other agents become politicians.

If, however, p does not satisfy the condition of sub-game 5 (which is generally the case) then there are two cases to consider. If there is no legislator, then there is no commitment to political proposals, any non-politician i expects to receive v_i^L and therefore he is indifferent on whom to vote. If another agent p' decides to become a politician, then he may win the election if he is favored by the arbitrary strategies of voters when they are indifferent on whom to vote or by the election rule in case of a tie. If such p' exists then it is a best-response for him to become a politician and hence it can not be an equilibrium of the game p to be the only politician.

If there is no other agent p' who is favored over p, then all other agents are indifferent on whether to enter political competition or not. However, this may still not be an

equilibrium of the game. If p preferences are such that, under the maximum-taxation constraint, his most preferred policy implies strictly greater utility than v_l^L for some agent l, then this agent's best-response is to become a legislator instead of remaining a citizen in order to impose the maximum-taxation constraint at stage two. In other words, there is an equilibrium of the game such that agent p becomes the only politician and all the other agents remain citizens, but it requires restrictions on the set of preferences for p and specific pure-strategies for voting when voters are indifferent on whom to vote (for example, always vote for agent 1 whenever his proposal is equivalent to any other politicians').

First, notice that the above equilibrium of the game is equivalent to the equilibria generated by the citizen-candidate models. However, unlike these models, the positive-political-rents equilibrium holds only for specific preference profiles and only if we consider specific voting strategies for tie breaking. Hence it is not a general equilibrium of our game. Notice also that, whenever the conditions for this equilibrium are fulfilled there are also other equilibria of the game with zero political rents (which we derive shortly). Finally, this equilibrium is not robust if there is an infinitesimally small but positive probability that agents would vote for another candidate (since that agent's best-response would be to enter the political contest in order to reap the infinitesimally small expected political-rents).

On the other hand, if there is at least one legislator, then, by becoming a politician, another agent p' ensures that it is the best response for the legislator to choose the constitutional restrictions of sub-game 6 and hence ensures a minimum payoff of $v_{p'}^L$. In other words, apart from some special cases described above, it is not an equilibrium of the game for only one agent to become a politician. Therefore, the set of politicians is greater or equal to two.

Stage 1: Entry of Legislators

We now come to examine if any citizen decides to become a legislator. First, suppose that there are no legislators, a number of citizens greater or equal to one and at least two politicians. Then this is clearly not an equilibrium outcome, since at least one of the agents can improve his utility by becoming a legislator, imposing the constitutional restrictions of sub-game 6 and receiving a final payoff of $v_i^L > v_i^{fm}$. This means that the only potential equilibrium with no legislators, apart from a special case examined above, is the one where all agents decide to become politicians.

We have also examined the case where there is no legislator and only one politician and under which conditions it may turn out be an equilibrium of the game. The remaining alternatives to consider are the following cases: i)all agents become politicians and ii) there is at least one politician and at least one legislator.

Suppose that all N agents decide to become politicians. If voting is sincere, then each agent votes for his own proposal and agent 1 is elected (recall that in the case of ties, the politician with the lowest index is elected). This can not be an equilibrium of the game, as at least one other politician can increase his utility by becoming a

legislator instead and ensuring a payoff of v_i^L for himself. If voting is not sincere, then under any pure strategy profile, a specific politician will be chosen (for example, all politicians vote for p). This can not be an equilibrium either by the same argument as above. Hence, there is no pure-strategy equilibrium of the game with all agents deciding to become politicians[16].

Consider the case where there is at least one legislator and only one politician. This is an equilibrium of the game only if p's preferences satisfy the condition of sub-game 5. If this condition is satisfied then legislators set the maximum-taxation constraint and this is sufficient for ensuring that the final policy implements the Lindahl allocation (as we showed in sub-game 5). The rest of the agents of the economy are indifferent whether they become politicians or not and hence there is no profitable deviation. Once again, this is a special type of equilibrium that holds for specific preference profiles.

However, the following class of equilibria holds for all possible preference profiles[17]. Suppose that at least two agents decide at stage one to become politicians and at least one to become legislator. Then the best-response of legislators at stage two is to impose the maximum-taxation constraint and make political proposals committing to the level of the public good only (this is a best-response for legislators for all preference profiles, unlike the previous case examined above). As a consequence and due to the analysis in sub-game 6, all agents receive the level of utility corresponding to the Lindahl allocation.

This is a sub-game prefect equilibrium of the game, because no one can unilaterally deviate and become better off. If the number of politicians is greater than two and the number of legislators in greater than one, a unilateral deviation by any agent does not affect equilibrium institutions or political proposals. If, on the other hand, there are only two politicians, none of them wants to exit political competition as in the best of cases his final utility will remain unchanged and in the worst it will strictly decrease. Likewise, if there is only one legislator there is no other strategy for him that can strictly increase his utility and therefore it is a best-response for him to remain a legislator. However, apart from at most three agents, the rest of the citizens are indifferent on what social role to choose and hence any distribution of agents between politicians, legislators and citizens, which is consistent with the above results, is an equilibrium of the game.

Proposition 4, below, summarizes the analysis so far for the class of equilibria which are independent of the preference profile of the economy.

Proposition 4: The game of section 4 has multiple sub-game perfect pure-strategy equilibria. However, the following class of equilibria is the only class of equilibria that holds for all possible preference profiles of the game: At least two agents decide to become politicians, at least one becomes a legislator, political proposals are committing to the level of the public good only and the maximum-taxation constraint holds. The

[16]Things get a little more complicated under mixed-strategy equilibria, but we can show that if the number of agents is sufficiently large, then there is at least one agent who prefers to become a legislator

[17]Because the conditions for the other "special-case" equilibria are mutually exclusive, there are preference profiles for which the general class of equilibria is the only class of equilibria of the game

equilibrium allocation is the Lindahl allocation.

First, the following assumptions are crucial for our results: i) the Anonymity of the Taxation Constraint, and ii) the restriction that an agent can hold only one power. Other assumptions can be relaxed without affecting the equilibria of the game. For instance, the choice rule through which legislators decide the Constitution plays no role, since in equilibrium, all legislators agree on the desirable set of restrictions. We use it only for the facilitation of the analysis.

Second, in our game, almost all political institutions required for the implementation of an efficient allocation of resources, arise endogenously. Legislators decide what type of restrictions to set to voters and politicians. Proposals are also made endogenously by politicians. The anonymity condition and the separation of powers are the only institutions which are not created by agents. However, as far as separation of powers is concerned, it should be noted that agents have the choice between utilizing this institution or not. Since both types of power are used in equilibrium, it makes sense to say that separation of powers emerges endogenously.

5 Conclusion

Centralized decision making is very helpful for the solution of the free riding problem, but, without any set of restrictions on the authority that implements it, inefficiencies, in the form of political rents, arise. This paper shows why political competition is a necessary but not sufficient condition for political efficiency. Other forms of institutional restrictions, like restrictions to maximum taxation, are required for aligning political incentives with societal interests, so that voting games achieve equilibria, which otherwise they would not have. It is also worth noting that we focus our analysis on public goods, because private goods do not exhibit externalities and therefore, if centralized decisions fail to provide efficient outcomes, this is not crucial for societal welfare. Competitive markets could be used, instead, to allocate resources. In other words, the reason why we examine the role of political institutions is exactly because they impact the efficiency of social decisions when they are needed the most: to solve problems which involve public goods.

We take our analysis one step further, by asking whether and how the required political institutions can emerge endogenously. The answer we give to this question is to the affirmative. In the extended political game of section 4, we show how separation of power can arise endogenously and how legislators select appropriate institutions in order to limit the extractive powers of politicians. Thus, the point we make is that whenever collective decisions may increase societal welfare, agents have an incentive to devise and agree upon appropriate political institutions so that the decision process does not break down. In fact, because the equilibrium outcomes of our game coincide with the Lindahl allocations of the economy, we can say that agents have the incentive to devise appropriate institutions so that they limit the rents of politicians.

There is a variety of dimensions which our game can be extended to, while retaining its power, and most of these dimensions were discussed in the preceding sections. Our next step is to generalize the game for economies with multiple public goods and find if additional political institutions are necessary for achieving the same set of equilibria. We also intend to examine how these institutions can emerge by the actions of the agents. Another question of interest is whether our results can be extended to economies with asymmetric information. In this case, what are the political incentives for selecting a specific mechanism and through which institutions do agents align political interests with their own? We leave these questions for future research.

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