

# Income Inequality and the Size of the Public Sector

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## Abstract

This paper focuses on the question of how income inequality between two jurisdictions impacts upon government decision-making affecting the size of the public sector. We model policy choices as the outcome of regional representatives' negotiations in the legislature. We show that the more unequal income distribution is, the greater the degree of inefficiency in terms of under-provision of public goods. Particularly, a divergent income trend between rich and poor makes interregional redistributive conflicts more dramatic. Consequently, the larger the income disparity, the smaller the public sector. A wealthier economy as a result may lead to a relatively smaller public sector when income disparity increases.

Key words: Public goods; Government spending; Inequality; Redistribution; Bargaining.

JEL Classifications: D30, D78, H0, H41, H50.

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## 1 Introduction

Income disparities among regions, such as those between the North and the South of Italy and Spain, create conflicts in the provision of public goods due to the trade-off between equity and efficiency. Often, these tensions are mitigated either by reducing the size of the public sector as a whole or by decentralizing fiscal powers from the centre to local governments as examples from the United Kingdom, Canada and United States illustrate. In some cases, states choose to split up, as with, for example, the former Czechoslovakia.

Strong income inequalities among European countries will probably constrain future European public policies, especially following the recent enlargement.

Typically, governments introduce some redistributive mechanisms in the financing of public goods in order to reach equity targets. Tanzi (2000) argued that "*one of the major functions of a national government is precisely to redistribute income from richer regions and individuals to poorer regions and individuals through the broadly uniform provision of public goods and services*". However, the cost of greater equity is a loss of efficiency.

Income inequality may also lead to several forms of segregations between rich and poor, as argued by Bjorvatn and Cappellen (2003a) and Horstmann and Scharf (1999).

This paper studies the effects of regional income inequalities on a government's policy choices. In a context where policy is negotiated by regional representatives and not decided unilaterally by a paternalist central planner, we will show that greater income disparities among regions lead to greater inefficiencies in the provision of public goods. A divergent income trend between rich and poor makes interregional redistributive conflicts more dramatic and may lead to an under-provision of public goods. Consequently, the larger the income disparity, the lower the size of the public sector. As a result, a wealthier economy may lead to a relatively smaller public sector when income disparity increases. This paradoxical conclusion is particularly evident in the case of homogeneous preferences in which the only income disparity counts.

Bjorvatn and Cappellen (2003b) use cross-national regressions to show that more inequality, measured by Gini's coefficient, is associated with smaller government size. This paper gives a theoretical explanation of this phenomenon that is different from both Kristow, Lindert and McClelland (1992) and Tridimas and Winer (2004). In Kristow, Lindert and McClelland (1992), the size of the public sector depends on the po-

sition of the median of the medians. In particular, they argue that the closer the median voter to the riches, the less the redistribution, which implies a smaller government size in a model with a uniform proportional income tax. In our model, the medians of a richer and a poorer jurisdiction bargain in the central legislature over the size of the public sector, whose financing implies a certain amount of redistribution. The agreement is not coercive, which means that the poor cannot compel the rich to increase their tax income transfers without mutual consent and vice versa. It is, therefore, easier to reach a political agreement on a larger public sector in states with both more homogeneous preferences and distribution of income.

Tridimas and Winer (2004) suggest that an explanation of the smaller public sector in countries with more unequal income distribution could be a distribution of political influence in favour of the rich. In our cooperative bargaining model, political influence is equally distributed between rich and poor. However, the rich use the veto to constrain government spending when they have the perception that it exploits their private benefits. Similarly, there are also circumstances in which the veto is used by the poor to avoid exploitations against them.

As Aysan (2005) pointed out, income inequality increases the pressure for redistributions and, at the same time, the incentives to constrain them. In our model, which of the two conflicting interests prevails does not depend on the aggregate difference between benefits and losses, as a benevolent central planner would consider. It depends on the net gains of the rich and poor regions separately. When one region has negative net gains, then its representative exercises the veto and the agreement is not reached. The size of the public sector is smaller because a larger income inequality increases the incentive for the rich to exercise the veto. Furthermore, policies which appear efficient from an aggregate point of view because total gains are positive, fail to be implemented because they are not Pareto efficient for every region.

Our bargaining approach can also be considered as an alternative to the most common utilitarianism approach. The latter focuses on issues that involve no conflict between different jurisdictions, as well as individuals, groups and classes (Sen, 1973). Sen argues that the utilitarian approach by “*maximizing the sum of individual utilities is supremely unconcerned with the interpersonal distribution of that sum*”<sup>1</sup>. In this paper we show Sen’s argument when we compare the central planner’s with the bargaining outcome.

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<sup>1</sup>Sen, 1973, p. 16.

Jaramillo, Kempf and Moizeau (2001) explain the social segmentation produced by income inequality. They apply the theory of clubs in which members voluntarily contribute to the funding of the club good. As Max Weber theorized almost one century ago, fragmentation or “social closure” is a result of the attempt of the richer to exclude the less fortunate from the benefits of a common good. A way to create fragmentation in a society characterized by economic inequality among regions is the decentralization of taxing and spending powers from the central towards local and regional governments, as observed by Horstmann and Scharf (1999) and others.

Fausto (2003) stresses the consequences caused by the disparities between wealthy and poorer regions in Italy. He argues that the fundamental means used to make a surreptitious division of the country is the financing of regions on the basis of local tax revenues and of local revenues of national taxes. Inevitably, this leads to rich regions having greater financing and higher provision of public services thanks to their greater revenues. Furthermore, undermining redistributive flows among regions contributes to increased regional conflicts creating an atmosphere contrary to national cohesion.

Our model can be seen as extending Besley and Coate’s (2003) political economy analysis. They focus on the issue of which level of government should be responsible for particular taxing and spending decisions. We develop the workings of the central government focusing on the decision making process. In a model with two regions and two representatives, Besley and Coate approach decision making in the central government considering two scenarios: the non-cooperative and the cooperative legislature. In the first, power is randomly allocated to one of the regional delegates, who have a probability of 0.5 to choose policy by maximizing their own welfare. To some extent, we consider this case as the solution to the non-benevolent dictator. In the cooperative case, the legislature is assumed to maximize delegates’ joint surplus. We refer to this case as the social optimum or the first best policy outcome.

A main difference between this paper and Besley and Coate’s model is that we explicitly explain how regional representatives bargain over policy. Another difference is that government does not split the cost equally between regions, but it covers the provision of public goods through a proportional income tax. Furthermore, we stress the importance of income disparity on public policy decision-making. We highlight inter-regional redistributive conflicts, which cause a greater inefficiency in the size of the public sector the larger the income gap between regions.

Lockwood (2002), Cerniglia (2003) and Lucas (2002) presented three

different models of bargaining in the central legislature in a fiscal federalism context. Lockwood (2002) also focuses on Oates (1972) and Besley's and Coate's (2003) issue regarding the choice between centralisation and decentralisation of fiscal policy in a political economy setting. In Lockwood, it is interesting the working of the centralized legislature. He assumes that a central government forms policy in a legislature comprising of elected representatives from each region. Unlike our model, decisions on a local and discrete public goods are taken by majority vote. Precisely, delegates first propose their alternative projects. Then, all alternatives are voted on according to an amendment agenda. Following Ferejohn, Fiorina and McKelvey (1987), Lockwood assumes that "*the last vote pits the bill as amended against the status quo*".

Cerniglia (2003) integrates the distributive politics literature with the political economy literature of countries, unions or federations. She models a legislative bargaining model by specifying the behaviour of a central legislature composed of an odd number of representatives elected by regions and whose preferences differ over local public goods. As in Lockwood (2002), representatives make a decision by majority vote on how to allocate the amount of local public goods financed by a linear income tax or by a regional income tax. With respect to our model, Cerniglia considers a more extreme threat point represented by secession. She investigated whether the credible threat of secession by any region modifies the agenda-setter proposal and hence the outcome of the legislative bargaining game. The result is that the bargaining outcome depends on both the particular representative randomly chosen to be the agenda setter and the particular voting structure of the game.

Lucas (2002) gives a theoretical approach to transfers sharing by negotiation between central government and regions. He presents a model in which the central government, which takes action as a Stackelberg leader, first chooses the way to negotiate the transfers with regions (bilaterally or multilaterally). In the second stage, the bargaining process takes place and the federal government implements transfers to the regions. In this framework, Lucas analyses how spillovers affects the choice of the bargaining process.

The paper is organized as follows. Section 2 presents the model and analyses both the dictator solution and the social optimum. Section 3 presents the legislature equilibrium policy and sections 4, 5 and 6 the results. Section 7 concludes and Section 8 discusses some future developments.

## 2 The framework

### 2.1 The set-up

Consider two groups of people living, for example, in two separate regions or jurisdictions comprising a state. Each region elects its own representative, who is identified on the median voter. The regional representatives form the legislature which has to determine the size of the public sector.

The two median voters,  $i$  and  $j$ , have different income levels and preferences regarding the public sector. In other words, regions are not homogeneous. The public and private sectors are denoted respectively with  $g$  and  $y$ , with the last representing the median voter's income that is used for private consumption.

We indicate with  $c$  private consumption that is equal to the private income minus the cost of the public sector. The parameter  $y$  is the initial endowment of the median voters, which is partially used to finance the public sector. The parameter  $\lambda$  tells us how much a median voter prefers  $g$  with respect to  $y$ . The utility function of each median voter is the sum of private and public consumption, as follows:

$$u_i = c_i + \lambda_i H(g) \quad \text{with } i = 1, 2$$

where the public sector benefit function  $H(g)$  is increasing, smooth concave and satisfies the endpoint Inada condition.

We assume, for simplicity, that the unit cost of the public sector is one, so that if the size is  $g$  the cost of the public sector is just one times  $g$ . Private consumption is equal to private income minus the resources used to finance the public sector. The legislature finances the public good by levying a proportional income tax  $t$ , such that private consumption is  $c_i = (1 - t)y_i$  for the median voter  $i = 1, 2$ . Once the legislature decides the quantity of  $g$ , the tax rate is automatically determined by setting  $g = t(y_i + y_j)$ , which gives the tax rate<sup>2</sup>  $t = \frac{g}{y_i + y_j}$ . In particular, the cost paid by median voter  $i$  is  $ty_i = \frac{y_i}{y_i + y_j}g = \gamma_i g$ . Note that median voters share the cost according to their relative income, denoted with  $\gamma$ , such that:

$$\gamma_i = \frac{y_i}{y_i + y_j}$$

This means that an increase in the income of one median voter also increases her relative cost while decreasing that of the other median

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<sup>2</sup>The model can be extended in order to consider the case of a not uniform tax rate as follows:  $g = t_i y_i + t_j y_j$ . In this case, jurisdictional representatives bargain over  $g$ ,  $t_i$  and  $t_j$ . However, the median voter theory in this multidimensional case does not apply. One way to replace the median voters is to introduce representatives who maximize a function representing the social consensus.

voter; that is:  $\partial\gamma_i/\partial y_i > 0$  and  $\partial\gamma_i/\partial y_j < 0$ . The cost of the public sector is distributed between the median voters as follows  $g = \gamma_i g + \gamma_j g$ , implying that  $\gamma_i + \gamma_j = 1$ .

Private consumption can now be written in the form  $c_i = y_i - \gamma_i g$ , which gives the following utility function:

$$u_i = y_i - \gamma_i g + \lambda_i H(g) \quad \text{with } i = 1, 2$$

The cost sharing mechanism implies an income tax redistribution from the richest median voter to the poorest one. The provision of the public sector in the poorest region is partially financed by the richest region. We will study how the redistributive implications of a proportional income tax influence government policy.

### 2.1.1 Dictator solution and first-best

Policy is chosen through bargaining. Before studying the bargaining outcome of this model, we will first describe briefly two benchmark cases: the dictator solution and the social optimum.

First, we will determine how a non-benevolent dictator chooses policy. In this example, the median voter  $i$  possesses absolute executive power and he is in a position to choose the size of the public sector which maximizes his private welfare. It is easy to establish the following result: the size of the public sector  $g_i$  that the non-benevolent dictator would choose is the unique solution to the following equation:

$$\gamma_i = \lambda_i H'(g_i^D) \quad \text{with } i = 1, 2 \quad (1)$$

Solution 1 is shown in figure 9. It states that the non-benevolent dictator would choose  $g_i$  such that his private marginal cost is equal to his private marginal benefit. The private marginal cost  $\gamma_i$  corresponds to the share of the price the dictator pays for a unitary increment of the public sector. Instead,  $\lambda_i H'(g_i^D)$  is the private marginal benefit.

The dictator always reduces the public sector size when his private marginal cost increases; that is:  $\partial g_i^D/\partial y_i < 0$ ,  $\partial g_i^D/\partial y_j > 0$ . The private marginal cost increases when there is a rise in the dictator's relative cost and income. The effect of changes in the incomes of the dictator  $i$  and the other median voter  $j$  leads to the conclusion that *the non-benevolent dictator is a free-rider*. He increases the provision of  $g$  when the income of the other median voter increases because this reduces his relative and marginal cost at the expense of the median voter of the other region. For the same reason he reduces the provision of  $g$  when his private income increases. Instead, he increases the public good provision when his preference of the public good increases, while the preferences of the other

median voter  $j$  do not affect the choice of the non-benevolent dictator  $i$ ; that is:  $\partial g_i^D / \partial \lambda_i > 0$ ,  $\partial g_i^D / \partial \lambda_j = 0$ .

Now, we will analyse the efficient policy outcome, which can be interpreted as the central planner solution. We suppose that the benevolent dictator maximizes an additive social welfare function  $W(g) = u_1(g) + u_2(g)$ .

As in Besley and Coate (2003), we assume that the endowments of the median voters (and of all the taxpayers) are large enough to meet their tax obligations.

The efficient provision of the public good satisfies the familiar Samuelsonian condition,

$$(\lambda_i + \lambda_j) H'(g^e) = 1, \quad (2)$$

which means that the social marginal benefit is equal to the social marginal cost. The social marginal cost is the sum of the private marginal costs and it is equal to the unitary price, which is one. The social marginal benefit is the sum of the private marginal benefits<sup>3</sup>.

As a direct consequence of the quasi-linear preference function used in this model, the income level does not influence the central planner's choice; i.e.,  $dg/dy_i = 0^4$ , with  $i = 1, 2$ . The central planner increases the size of the public sector when preferences increase; that is:  $dg/d\lambda_i > 0^5$ , with  $i = 1, 2$ .

The optimum provision of the public good is not influenced by the way the cost is shared between regions; that is  $dg/d\gamma_i = 0^6$ , with  $i = 1, 2$ . From the social planner's point of view, the higher cost that the median voter  $i$  bears is compensated by the subsequent reduction of the relative cost for the median voter  $j$ . For the structure of the index  $\gamma$ , an increase in the relative cost for one region is always equal to the decrease in the relative cost for the other one. For this reason, the two effects always compensate each other and this means that the central planner does not care how median voters distribute the cost.

We conclude that redistributive conflicts are not captured by the central planner or utilitarian approach, as pointed out by Sen (1973) and other authors. In order to highlight the role played by redistributive conflicts on the legislature equilibrium policy we introduce the following bargaining approach.

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<sup>3</sup>Solution 2 is represented in figure 1.

<sup>4</sup>The proof is straightforward.

<sup>5</sup>The proof is straightforward.

<sup>6</sup>The proof is straightforward.



### 3 Legislature equilibrium policy

In this section we will analyze the public policy outcome when decisions are not taken by a central planner or a non-benevolent dictator, but directly by the median voters, who we consider to be the elected representatives of each region. In this case, representatives form a government and choose policy by negotiation.

The government has to choose the size of the public sector,  $g$ . We assume that, before the representatives meet in the legislature, the status quo consists of an inefficient provision of the public sector,  $\bar{g}$ . The status quo may be inefficient for several reasons because, for example, both median voters' preferences and income change over time. If any agreement is achieved, the status quo is maintained.

The utility that each median voter obtains in case of disagreement represents the median voters' inside option in the bargaining process and it is  $u_i^d = y_i - \gamma_i \bar{g} + \lambda_i H(\bar{g})$ ; with  $i = 1, 2$ . In other words, if an agreement is not reached, median voters receive a utility from both the inefficient government size, or public consumption, and private consumption<sup>7</sup>. In order to reach an agreement, median voters must have positive gains from having an efficient government size. Therefore, the agreement utility must be higher than the inside option for both representatives. In formulas, it must be  $u_i - u_i^d > 0$ , which implies  $-\gamma_i (g - \bar{g}) + \lambda_i (H(g) - H(\bar{g})) > 0$ ; where  $i = 1, 2$ .

We define the gain from reaching an agreement of median voter  $i = 1, 2$  as the *gain from having an efficient government size* and we denote it with the symbol  $\phi_i$ . In formulas:

$$\phi_i = u_i - u_i^d = \lambda_i (H(g) - H(\bar{g})) - \gamma_i (g - \bar{g})$$

The gain from reaching an agreement is equal to the net private benefit minus the net private cost and represents the private net benefit if agreement is reached on  $g$ . It is interesting to note that the marginal gain from trade is equal to the marginal utility; i.e.:

$$\frac{\partial \phi_i}{\partial g} = -\gamma_i + \lambda_i H'(g) = Mu_i. \quad (3)$$

Representatives choose the government size  $g$  by bargaining. We show that by maximizing the following Nash bargaining condition:

$$\max_g \left\{ \ln [-\gamma_i (g - \bar{g}) + \lambda_i (H(g) - H(\bar{g}))] + \ln [-\gamma_j (g - \bar{g}) + \lambda_j (H(g) - H(\bar{g}))] \right\}$$

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<sup>7</sup>This is presented in figure 2.

The First Order Condition is:

$$\frac{-\gamma_i p + \lambda_i H'(g)}{-\gamma_i p (g - \bar{g}) + \lambda_i (H(g) - H(\bar{g}))} + \frac{-\gamma_j p + \lambda_j H'(g)}{-\gamma_j p (g - \bar{g}) + \lambda_j (H(g) - H(\bar{g}))} = 0$$

Now, the First Order Condition can be formulated in an alternative form, which will be very useful in the comparative statics.

**Definition 1** Define with  $\epsilon_i = \frac{\partial \phi_i / \partial g}{\phi_i / g}$  the elasticity of the gain from reaching an agreement over an efficient government size of median voter  $i = 1, 2$ .

The elasticity measures the percent change of the gain from reaching an agreement relative to the percent change of the government size. The First Order Condition can be now formulated as follows:

**Proposition 1** *The Nash Bargaining First Order Condition is satisfied if and only if the sum of the elasticity of the gains from having an efficient government size is zero:*

$$\epsilon_i + \epsilon_j = 0 \tag{4}$$

**Proof.** The Nash Bargaining First Order Condition can be written under the following form:  $\frac{\phi'_i}{\phi_i} + \frac{\phi'_j}{\phi_j} = 0$ . Multiplying it by  $g$  we get the sum of the elasticity of the gains from reaching an agreement. ■

In other words, at the Nash bargaining equilibrium, the elasticity of the gains from having an efficient government size of the two median voters are equal in absolute value and take opposite sign:  $\epsilon_i = -\epsilon_j$ . Equation 4 leads to the following lemma:

**Lemma 1** *The agreement is a compromise which lies between the two median voters' first best outcomes, unless they coincide<sup>8</sup>.*

**Proof.** We need to prove that, at the agreement equilibrium the marginal utilities of the two representatives take different sign. To show that we write equation 4 under the following form:

$$\frac{Mu_i}{\phi_i} = -\frac{Mu_j}{\phi_j}$$

The sign of the elasticity of the gains from reaching an agreement depends only on the sign of the marginal utilities of the representatives because the denominators are both positive by definition. Equation 4 states that in equilibrium the elasticities of the gains from reaching an

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<sup>8</sup>A representation of the bargaining equilibrium is given in figure 2.

agreement have different signs. This is equivalent to say that, at the agreement point, the marginal utilities of median voters take opposite signs. This proves the lemma. ■

In the next section, we use the Nash bargaining First Order Condition to study the comparative statics.

## 4 Influence of income disparity over government size

Changes in the income of the median voters always generate conflicting interests and the bargaining outcome in the government is not straightforward. For example, each median voter would wish to consume more of the public good when his income grows. However, at the same time, he has to bear an increasing share of the public good cost. How do the median voters solve these conflicts?

We have already shown that the central planner approach, or the maximization of an additive social welfare function, is not able to capture the conflicting redistributive interests generated by income inequality. Instead, conflicts are evident when one of the median voter is a non-benevolent dictator. We have seen that a non benevolent dictator increases the size of the public sector when the income of the median voter of the other region increases because this reduces the cost borne by “his region” and increase regional redistributive benefits. To generalize, when a dominant region exists, it has an incentive to free-ride against the other region.

When regional median voters bargain over the size of the public sector, associated to a change of their income, they "*have a common interest to co-operate, but have conflicting interests over exactly how to co-operate*" Muthoo (1999). The following proposition is the key to solving the bargaining game between median voters.

**Proposition 2** *The government increases the size of the public sector when the income of a median voter increases only if the elasticity of the gains of the same median voter is sufficiently large and greater than a critical value expressed in the following condition:*

$$\frac{dg^*}{dy_i} > 0 \text{ when } \epsilon_i > \frac{(\gamma_i - \gamma_j)(g^* - \bar{g}) - (\lambda_i - \lambda_j)(H(g^*) - H(\bar{g}))}{(\lambda_i + \lambda_j)(H(g^*) - H(\bar{g})) - (\gamma_i + \gamma_j)(g^* - \bar{g})}. \quad (5)$$

**Proof.** The proof is in the appendix. ■

Now, it is interesting to study the sign of this comparative static since both terms of condition 5 can be either positives or negatives<sup>9</sup>. In order to do that we need to identify the items on the right hand side. The denominator represents the total or social gains from having an efficient government size. The social gains are the sum of median voters' net gains and can be written as the difference between the social benefit and cost, which we know to be positive by definition. The denominator leads to the following lemma:

**Lemma 2** *Larger social gains favour a larger public sector when the income of one median voter increases.*

**Proof.** It is straightforward to verify that larger social gains increase the denominator of the right-hand side of condition 5. ■

However, large social gains are often not enough to get a large public sector. The reasons is that income inequality creates incentives to constrain public expenditure. Redistributive conflicts are captured by the numerator of the right hand side of condition 5.

The numerator of condition 5 is the difference between the net benefit and the net redistribution associated with an efficient size of the public sector. We indicate with  $NB_i = (\lambda_i - \lambda_j) (H(g^*) - H(\bar{g}))$  and  $NT_i = (\gamma_i - \gamma_j) (g^* - \bar{g})$  respectively the net benefit and the net redistribution or transfers of median voter  $i$ .

Let us assume that  $H(g^*) > H(\bar{g})$ , which implies that  $g^* > \bar{g}$ . Then,  $NB_i$  is positive if median voter  $i$  values the public sector more than median voter  $j$ . In this case we say that median voter  $i$  wants more public sector than median voter  $j$ . Similarly,  $NT_i$  is positive when median voter  $i$  transfers income to median voter  $j$  through the tax system; that is:  $y_i > y_j$ . In other words, median voter  $i$  is partially financing the provision of the public sector in jurisdiction  $j$ . Conversely,  $NR_i$  is negative when median voter  $i$  receives a transfer from median voter  $j$ .

Both  $NB_i$  and  $NR_i$  are zero when median voters have the same preferences for the public sector and the same income respectively. This justifies the following proposition:

**Proposition 3** *Both homogeneous preferences and a small income disparity between jurisdictions favour a larger public sector when the income of one median voter increases.*

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<sup>9</sup>Note that  $-1 < \frac{(\gamma_i - \gamma_j)(g^* - \bar{g}) - (\lambda_i - \lambda_j)(H(g^*) - H(\bar{g}))}{(\lambda_i + \lambda_j)(H(g^*) - H(\bar{g})) - (\gamma_i + \gamma_j)(g^* - \bar{g})} < 1$ , as proved in the appendix.

**Proof.** The proof is straightforward considering that the numerator of the right-hand side of condition 5 is zero when  $\gamma_i = \gamma_j$  and  $\lambda_i = \lambda_j$ . ■

Up to now, we have not determined the sign of the comparative static. Before we do that, we will conveniently simplify the notation by writing the condition 5 under the following form:

$$\frac{dg^*}{dy_i} > 0 \text{ when } \epsilon_i > (NT_i - NB_i) \varphi$$

where  $\varphi$  is the reciprocal of the social net gains and as a positive term it does not influence the sign of the comparative static.

Before studying the general case in which median voters have both different income and preferences, we will first look at the case in which they have homogeneous preferences.

#### 4.1 The case of homogeneous districts

To simplify the discussion, we will first consider the case of homogeneous districts, in which the median voters have the same tastes for the public good; i.e.:  $\lambda_i = \lambda_j = \lambda$ . Condition 5 becomes:

$$\frac{dg^*}{dy_i} > 0 \text{ when } \epsilon_i > (\gamma_i - \gamma_j) (g^* - \bar{g}) \varphi; \quad (6)$$

It is now evident how the inefficiency in terms of an under-provision is produced from the conflicts generated by the income difference between the median voters. The greater the regional income disparity, the greater the tax income redistribution from the wealthy region in the direction of the poorer region.

It is easy to verify that the right-hand side of condition 6 is zero when the median voters have the same income, which means that they share the cost equally. In this case, the government always increases the size of the public sector when the total income increases, unless the elasticity of the net gains is perfectly inelastic or negative.

Now, we can establish the sign of  $\epsilon_i$ .

**Lemma 3** *In the Nash bargaining equilibrium with homogeneous preferences, the marginal utility, marginal gains and elasticity of the gains from having an efficient government size are negatives for the richer median voter and positives for the poorer.*

**Proof.** The lemma is a consequence of the homogeneity of preferences in equations 3 and 4. From equation 4, we know that in equilibrium the

elasticities of the benefit of the two median voters have different sign. Given the structure of the elasticity, equation 4 is satisfied if and only if median voters' marginal utilities have different sign. Now, associating this result with equation 3 and assuming homogeneous preferences, the rich median voter must be the one with negative marginal utility and the poorer median voter, who benefits from positive indirect transfers, must have a positive marginal utility. This proves the lemma. ■

The intuition of the lemma is that everybody receives the same benefit from the public sector, but the richer pay more for it. This implies that the rich's marginal utility is negative in equilibrium.

The lemma also proves that if the redistribution of the cost does not matter for the benevolent central planner it does matter in a bargaining context. Clearly, only if the income disparity was zero, both median voters would be equally satisfied and their marginal utility, gains and elasticity would be zero.

The size of the right hand side of condition 6 is directly proportional to the net redistribution and the term  $\varphi$ . In particular, it is interesting to analyze the effect of income inequality on the size of the public sector represented by the difference  $\gamma_i - \gamma_j$ . In order to do that, we will separately examine the cases in which the government increases the size of the public sector with respect to that of the status quo and the case in which the new efficient size is lower.

In the case where  $g^* > \bar{g}$ , the government needs more resources to finance the larger public sector. A consequence is an increase in income tax redistribution. As the following proposition states, the effect of changes on the income of the richer is different from the effect of changes on the income of the poorer.

**Proposition 4** *With homogeneous preferences, the government size increases when either the income of the poor median voter increases or that of the rich decreases. Conversely, the size of the public sector decreases when either the income of the poor decreases or that of the rich increases.*

**Proof.** In order to prove the proposition we need to focus on condition 6 and study separately the following two cases: the first in which  $i$  is the poorest median voter and the second in which  $i$  is the richest.

First case:  $i$  is the poorest median voter. We have already shown that the elasticity of the gains  $\epsilon_i$  of the poorest median voter is always positive with homogeneous preferences. At the same time,  $(\gamma_i - \gamma_j)(g^* - \bar{g})\varphi$

is always negative because  $\gamma_i < \gamma_j$ ,  $g^* > \bar{g}$  and  $\varphi > 0$ . As a result,  $dg^*/dy_i > 0$  when  $i$  is the poorest median voter.

Second case:  $i$  is the richest median voter. We have already shown that the elasticity of the gains  $\epsilon_i$  of the richest median voter is always negative with homogeneous preferences. At the same time,  $(\gamma_i - \gamma_j)(g^* - \bar{g})\varphi$  is always positive because  $\gamma_i > \gamma_j$  and  $g^* > \bar{g}$ , and  $\varphi > 0$ . As a result,  $dg^*/dy_i < 0$  when  $i$  is the richest median voter. ■

In the bargaining process, the wish to increase public consumption when income increases contrasts with the increase of the marginal cost. The poor have the lowest marginal cost and both a positive marginal utility and gain from increasing public consumption. Certainly, the legislature will agree to increase the government's size when the poor become wealthier. Similarly, the legislature will agree to decrease the government's size when the poor become poorer because the poor cannot afford a higher public consumption and the rich do not want to bear a higher marginal cost.

The case in which the rich become poorer is interesting because the government's size increases with homogeneous preferences. The reason is that in such a situation the rich would agree on a larger public sector simply because the marginal cost is now lower. As a consequence, the poor have to bear a higher marginal cost, but their net marginal gain is still positive and they will agree to a larger  $g^*$ , as well.

Similarly, when the richest become even richer and the income of the poor remain the same, the rich will force the legislature to implement a lower  $g^*$  under the threat that, in absence of an agreement, everybody gets  $\bar{g} < g^*$ .

The above proposition leads to the following main conclusions.

**Conclusion 1** *The poor median voter needs to reduce his or her economic disadvantage to obtain a higher public consumption.*

The behaviour of the rich leads to a paradoxical conclusion:

**Conclusion 2** *There may be cases in which the government size is larger when the economy becomes poorer, and smaller when the economy becomes wealthier.*

Similarly:

**Conclusion 3** *The size of the public sector may be relatively larger in a poorer but more equally distributed economy, and relatively smaller in a richer but more unequal economy.*

The impact of economic inequality upon government decision making is now clear:

**Conclusion 4** *A larger income disparity leads to a smaller public sector.*

The above results are based on the assumption that  $g^* > \bar{g}$ . The case in which  $g^* < \bar{g}$  is a distinctive case. The influence of an increase in the income of one median voter goes against the current policy of decreasing government size. The reduction of public consumption mitigates the redistributive conflicts and might drive to different results. In this situation, the rich median voter could agree to a larger size if her increased relative cost is sufficiently compensated by the reduction of transfers. Conversely, the poor could not allow for a larger size because of his loss of transfers. In this case, the sign of the comparative static cannot be determined a priori and depends on the median voters' losses and gains from having a smaller public sector with less redistribution.

## 4.2 The case of heterogeneous preferences

The analysis can be generalized by considering the case of heterogeneous preferences and income disparity. Condition 5 can be rewritten under the following form:

$$\frac{dg^*}{dy_i} > 0 \text{ when } \epsilon_i > (\phi_j - \phi_i) \varphi$$

which tells us that the sign on the right-hand side depends on the difference between the median voters' net gains.

Clearly, the size of the public sector always increases when the median voter  $i$ , whose income increases, has both a positive marginal gain and the larger gains from the public sector. On the other hand, government size moves to the opposite direction when the median voter  $i$  has both a negative marginal gain and a sufficiently low net gains. In the other intermediate cases, the sign of the comparative static depends on the relative strength of both the marginal gains and the gains difference.

## 4.3 Relative income and government size

The study of the variation in the public sector size due to changes in the median voter's relative income gives the same result as was reached above. This is because an increase in a median voter's income leads to an increase in both his relative income and his relative cost. In formulas:  $\frac{dg}{d\gamma_i} > 0$  when  $\epsilon_i > (\phi_j - \phi_i) \varphi$ ; with  $i = 1, 2$ .

However, this comparative static differs from the previous because the relative income may vary for several reasons.



It is interesting to review the case in which the income of the median voter  $i$  remains constant, but his relative income increases because the income of the median voter  $j$  decreases. In this case, the analysis of the preceding paragraph still holds. The consequence is that the government can decide to increase the provision of public goods even if the income of one region is lower and the income of the other remains the same. This circumstance confirms our paradoxical conclusion that the government may increase provision when the total income becomes lower because of a reduction in the redistributive conflicts between regions.

To summarize, interregional redistributive conflicts are more dramatic when the income gap between regions is greater. An expansion of the income gap facilitates an under-provision of public goods. The government reacts to changes in the relative income by increasing the provision of the public sector only if the gains from public consumption are sufficiently elastic. Furthermore, due to a reduction in the interregional income disparity, a reduction of interregional redistributive conflicts may cause an increase of public goods provision even when the total income decreases.

## 5 Preference shocks

It is interesting to see the government reaction to a variation in a median voter's preference. An increase in the preference parameter  $\lambda$  means that the median voter receives a higher benefit from the public sector. However, the comparative statics shows that the government behaviour is ambiguous: an increase in the benefit does not necessarily imply an increase in government's provision. Technically,  $dg^*/d\lambda_i > 0$  if and only if  $\epsilon_i < \frac{g^*H'(g^*)}{H(g^*)-H(\bar{g})}$ <sup>10</sup>. The reason is that any increase in  $g$  has always a negative impact upon median voters' cost. As a result, government's provision does not increase if the advantages are not sufficiently large to exceed the cost. The case in which an increase in a median voter's  $\lambda$  leads to a reduction of  $g$  might appear less intuitive. In some cases, it is more convenient to decrease  $g$ , instead of increasing it because median voters may have at list the same utility as before due to a reduction of the cost. Consequently, when there is a positive shock in the preferences government has to valuate if it is either more convenient to increase benefits by increasing  $g$  or reducing costs by lowering  $g$ .

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<sup>10</sup>The proof is straightforward.

## 6 Comparing the negotiated solution with the dictator's outcome

We can use the Nash bargaining First Order Condition in the form of equation 4 in order to compare the negotiated solution with that of the non-benevolent dictator. We already know that the marginal gain from cooperating of the median voter  $i = 1, 2$  is equal to  $i$ 's marginal utility; i.e.:  $\phi'_i = \frac{\partial(u_i - u_i^d)}{\partial g} = -\gamma_i p + \lambda_i H'(g) = \frac{\partial u_i}{\partial g} = Mu_i$ . As a consequence, the negotiated outcome lies between the two median voters' first best, unless they coincide. This result can be used to compare the bargaining with the non-benevolent dictator's outcome.

Recall that the median voter's first best can be interpreted as the provision of the public good that the non-benevolent dictator would choose. Indicating with  $g_i^D$ ,  $g_j^D$  and  $g^*$  the provision of the public good chosen respectively by the non-benevolent dictators and the negotiated provision, the three solutions are compared in figure 2. The axis measures the utility of the two median voters.

At the disagreement point, the median voters consume the private good plus an inefficient level of public goods. When the public sector is more efficiently provided, the total utility of the median voters starts to increase. They obtain the maximum level of private utility at their individual first best. If the government provides more public good than one median voter wants, his total utility decreases with respect to the individual first best utility. This is because the utility he gains from consuming more of the public good is lower than the utility he loses from consuming less of the private good. The agreement is a compromise; it lies between the two private first best solutions  $g_i^D$  and  $g_j^D$ . The Nash bargaining solution represents an agreement in which one of the median voters would like to consume more of the public good and the other one would like to consume less of it.

## 7 Conclusion

This paper analyses the relation between income disparity and the size of the public sector or, in general, the provision of public goods. We have presented a bargaining decision-making model between regional representatives alternative to the utilitarian approach. A quality of the model is that it captures the interregional redistributive conflicts generated by income inequality.

Both the financing of the public sector with a proportional income tax and the uniform provision across regions imply income tax redistributions, which cause inter-regional conflicts and under-provision in govern-

ment spending. The non-benevolent dictator free-rides over the others taxpayers increasing the provision of public goods when both the income and the relative cost of the median voter of the other jurisdiction increase. On the contrary, the central planner does not care about how the cost is shared among taxpayers.

Redistributive conflicts emerge dramatically when we consider the negotiated policy outcome. Both larger income disparity and heterogeneous preferences lead to a smaller public sector. In this scenario, in order to increase public consumption, the poor need to reduce their income gap or the rich need to increase tax income redistribution in favour of the poor. Furthermore, larger social gains favour a larger public sector. However, when the income of a regional median voter increases, the government increases the size of the public sector only if the gains of that median voter are sufficiently elastic. Unanimity agreement does not allow for coercion in this model.

The case of homogeneous districts is particularly explicative. In this case, inefficiency in terms of under provision is directly proportional to the inter-regional income inequality. It disappears when the difference between regional incomes converges to zero and becomes more relevant the larger the income gap. As a result, the size of the public sector is smaller either the higher the income of the rich or the lower the income of the poor. Conversely, the size of the government is larger when either the income of the poor increases or the income of the rich decreases. Paradoxically, reductions of median voters' income may cause an increase in the size of the public sector when income inequality between regions is smaller. This is due to a weakening of inter-regional redistributive conflicts. Similarly, when the median voters become wealthier, but at the same time the distribution of income is more unequal, the size of the public sector may be reduced because of the worsening of redistributive conflicts.

The Nash bargaining outcome is Pareto efficient from the individual point of view. However, looking at the comparative statics, the bargaining outcome appears as second best if compared with the social optimum. The central planner has a higher degree of freedom in choosing the size of the public sector and the associate redistribution. If we represent social welfare as the sum of median voters' utility, then the best response to any increase of total income is to increase the size of the public sector. Consequently, any size lower than the social optimum is a second best because it doesn't maximize social welfare.

The results of this paper support the theses of that part of the literature which argues that countries with larger income inequality tends to be less redistributive; see Bassett et al. (1999), Bènabou (2000), Bjorvatn and Cappellen (2003a), Persson (1995) and others.

## **8 Future developments**

This analysis can be expanded to incorporate political parties choosing policy by bargaining in a political competition context. Parties' leaders bargain over policy by taking into account a function representing the social consensus. As it is already well established in literature, median voter theory applies only to models regarding a one-dimensional policy issue with single peaked preferences. The replacement of median voters with political parties maximizing their probability to win an election, would allow for the extension of the model to the study of multidimensional cases. For example, it could be possible to study the relation between the government's size and the structure of its tax system.

The model can also be extended to analyze some international issues, like international or global bargaining over pollution control or the European decision-making process. The debate concerning a European defence policy, for example, can be formally analysed by introducing in the model an outside option representing the utility each single European country obtains if defence continues to be provided at the national level.

Finally, it could be interesting to build up a model in which the representatives of more than two districts have to form a minimum winning coalition to choose policy in the legislature.

## 9 Appendix

For simplicity, we denote the First Order Condition with

$$G = \frac{-\gamma_i + \lambda_i H'(g)}{-\gamma_i (g - \bar{g}) + \lambda_i (H(g) - H(\bar{g}))} + \frac{-\gamma_j + \lambda_j H'(g)}{-\gamma_j (g - \bar{g}) + \lambda_j (H(g) - H(\bar{g}))} = 0$$

**Proof.** Here, we prove condition 5. In order to do that we need to study the sign of  $\frac{dg^*}{dy_i}$  other variables constant  $\equiv -\frac{G_{y_i}}{G_g}$ ; where:

$$G_g = \frac{\lambda_i H''(g) [-\gamma_i (g - \bar{g}) + \lambda_i (H(g) - H(\bar{g}))] - [-\gamma_i + \lambda_i H'(g)]^2}{[-\gamma_i (g - \bar{g}) + \lambda_i (H(g) - H(\bar{g}))]^2} +$$

$$+ \frac{\lambda_j H''(g) [-\gamma_j (g - \bar{g}) + \lambda_j (H(g) - H(\bar{g}))] - [-\gamma_j + \lambda_j H'(g)]^2}{[-\gamma_j (g - \bar{g}) + \lambda_j (H(g) - H(\bar{g}))]^2}$$

is always negative.

Now, we study the sign of  $G_{y_i}$ ; where

$$G_{y_i} = \frac{-\frac{y_j}{y_i+y_j}p [-\gamma_i (g - \bar{g}) + \lambda_i (H(g) - H(\bar{g}))] + \frac{y_j}{y_i+y_j}pg [-\gamma_i + \lambda_i H'(g)]}{[-\gamma_i (g - \bar{g}) + \lambda_i (H(g) - H(\bar{g}))]^2} +$$

$$+ \frac{\frac{y_j}{y_i+y_j}p [-\gamma_j (g - \bar{g}) + \lambda_j (H(g) - H(\bar{g}))] - \frac{y_j}{y_i+y_j}pg [-\gamma_j + \lambda_j H'(g)]}{[-\gamma_j (g - \bar{g}) + \lambda_j (H(g) - H(\bar{g}))]^2}$$

$G_{y_i}$  is positive when

$$\epsilon_i > \frac{\phi_j - \phi_i}{\phi_j + \phi_i}$$

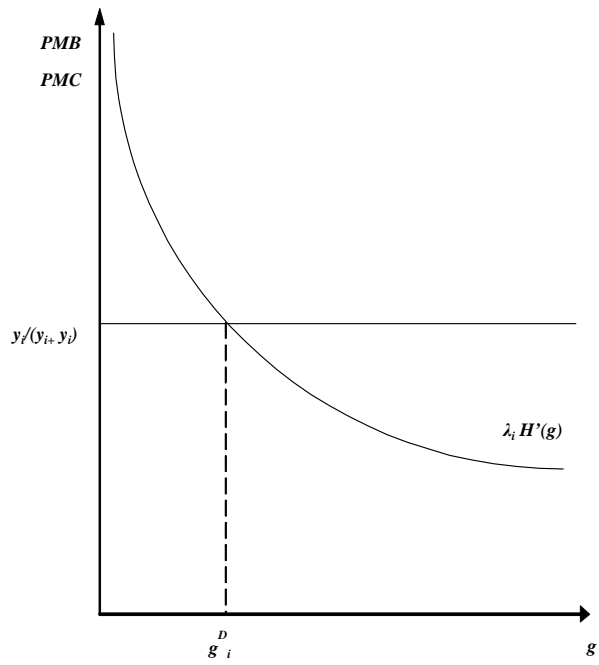
that gives condition 5.

Note that  $-1 < \frac{\phi_j - \phi_i}{\phi_j + \phi_i} < 1$ . ■

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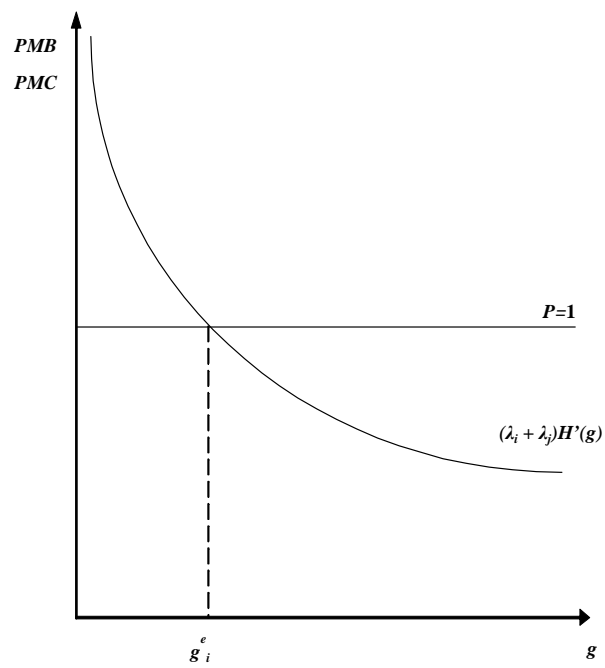


Figure 1: The efficient outcome.

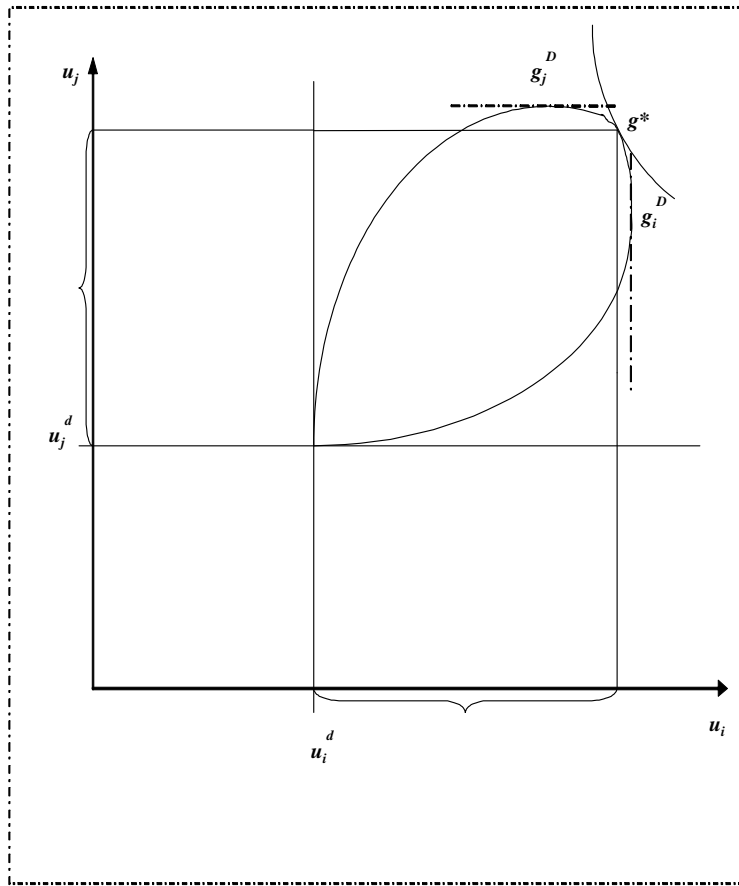


Figure 2: Comparing the negotiated outcome with that of the non-benevolent dictator.