Income Taxation, Political Accountability and the Provision of Public Goods

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Abstract

Using a voting-agency model with heterogeneous voters and different tax schedules, we analyze whether an increment in income taxes—understood as an increment in either marginal tax rates, or tax progressivity—positively affects voters' political demands, the provision of public goods (PPG), and incumbent's efforts. We show that this outcome can be only observed under particular circumstances. Results depend on the combination of three factors: whether rich voters' demands for public goods are larger or smaller than respective poor voters' demands; whether the pivotal voter's disposable income increases or decreases as taxes increase (i.e., voters' income level and its distribution); and whether total tax revenues increase or decrease as taxes increase. Furthermore, which of these factors matter depends on whether the incumbent is able to use a non-confiscatory or a confiscatory policy when he forgoes re-election. Notably, we show that an increment in the PPG generated by an increment in taxes does not necessarily implies an increment in incumbent's efforts.

1 Introduction.

There is a long interest in understanding whether taxation influences or not the degree of political control exerted by citizens over their politicians, and, more important, in understanding whether this political control is actually reflected in a better performance of politicians or not. Two mechanisms have been proposed in the literature to link taxation with political accountability. The first one is a "bargaining" mechanism. This literature argues that modern states emerged as the result of negotiations between autocratic governments who needed tax revenues in order to face inter-state conflicts, and citizens who were willing to consent to taxation in exchange for greater government accountability. This mechanism has been explored in several studies on path developments in modern Europe and Middle East (North and Weingast, 1989; Ross, 2004; Moore 2008, among many others). The second one is a "relative revenues" mechanism. This literature claims that the degree of dependence of governments on general taxation vis-à-vis non-tax incomes affects the degree of political accountability. When state elites are financially independent of citizen-taxpayers they are less responsive and accountable to the citizens, which implies a low provision of public goods (Zhuravskaya, 2000; Eubank, 2012; Gadenne, 2014; Martinez, 2016, among others).

Although these mechanisms are interesting, we do not know yet, however, how income taxation by itself–i.e., regardless of the amount of non-tax revenues available–foster political accountability and, consequently, the incumbent's effort and the provision of public goods in a democratic electoral environment–as opposite to a bargaining environment. Such an analysis has not been addressed in the literature. Since elections are one of the main mechanisms used by voters to exert political accountability in current democracies, exploring this relationship in such an environment is of general interest. By doing this, we are able to obtain novel, interesting and sensible results.

We base our analysis in early and well-established voting-agency works (Barro 1973;

Ferejohn 1986; and subsequent works). Therefore, we consider a situation in which no electoral promise can be enforced and, consequently, all the voters can do is to use elections as a primary mechanism for disciplining politicians. The mechanism we explore in our analysis is the common one explored in these voting-agency models: voters balance their political demands in order to increase the probability of being satisfied by the incumbent and to reduce the probability of obtaining a low utility level if their demands are too high and the incumbent prefers to capture a large amount of resources and to forgo re-election. Unlike any previous study, we analyze how an increment in income taxes affects this balance and, through this, the incumbent's performance.

In our framework, voters pay income taxes accordingly to an exogenous tax schedule. Therefore, similar to previous models, tax schedule is not a policy issue strategically chosen by politicians. Based on the utility level voters perceive, they decide whether to vote for the incumbent re-election or to vote for a challenger. Voters are endowed with heterogeneous income, and derive utility from both private consumption and the provision of public goods. An increase in income taxation is understood as either an increase in the marginal income tax rates (in a linear tax schedule) or, alternatively, an increase in the degree of income tax progressivity (in a non-linear tax schedule). As this is standard in this type of models, the cost of producing public goods is assumed to be only realized by the incumbent, although voters know its distribution. Consequently, the incumbent's effort (or the rents he extracts) cannot be observed by voters.

We concentrate our analysis in the case where voters supply labor inelastically, as they derive no utility from leisure. Nevertheless, as we show, our results can be extended for the case where labor supply is elastic. Furthermore, selection problems are not taking into account (see Besley 2006). In other words, we assume that all politicians perceive the same positive payoff of rent extraction. Assuming this imposes a well-known cost in this type of analysis, namely that an incumbent does not face any serious threat of being replaced by a good politician. Since our aim is to study whether or not taxation is useful to discipline bad politicians, this simplification has no important implications for our analysis.

Our model adds several new elements into the standard voting-agency model. Previous analyses have usually considered a representative voter who pays taxes according to a linear schedule and is threatened by a confiscatory incumbent's deviating policy rule (the so-called "Leviathan" policy rule). Under this rule, if the incumbent decides to forgo re-election, he extracts the total income of voters and provides zero public goods. Opposite to that, we consider voters endowed with heterogeneous income (or skills). This allows us to analyze whether income distribution matters for understanding the relationship between taxes and political accountability. Furthermore, we not only consider a linear tax schedule but also a non-linear tax schedule, which allows us to analyze the role of tax progressivity. Interesting differences emerge when considering one or the other tax schedule. Finally, in our baseline analysis we consider a more sensible non-confiscatory incumbent's deviating policy rule instead of a "Leviathan" policy rule. Nevertheless, we extend our analysis to consider other type of rules, including the "Leviathan" one. As we discuss, which deviating policy rule is available to the incumbent might depend on the quality of both legal institutions and collective action.

Unlike previous literature, we show that only under some particular circumstances an increment in taxes positively affects voters' political demands, the provision of public goods and incumbent's efforts. Whether this happens or not critically depends on three factors: whether rich voters' demands for public goods are larger (voters are *income politically uncompensated*), equal (voters are *income politically invariant*) or smaller (voters are *income politically compensated*) than poor voters' demands; whether the pivotal voter's disposable income increases or decreases as income taxes increase (i.e., income level and its distribution); and whether total tax revenues increase or decrease as income taxes increase. Furthermore, which of these factors play a role in determining the effect of taxes on our outcomes depends on whether the incumbent is able to use a non-confiscatory or a confiscatory policy rule when he forgoes re-election. Notably, we show that regardless of the deviating policy rule available to the incumbent, an increment in the provision of public goods generated by an increment in taxes does not necessarily implies an increment in the incumbent's efforts (i.e., a reduction in the rents extracted by him).

More precisely, under the baseline non-confiscatory deviating policy rule we find that, if voters are *income politically uncompensated*, an increase in income taxes positively affects the provision of public goods if this generates both an increment in the pivotal (median) voter's disposable income–which implies that the pivotal voters is poor enough–and an increment in total tax revenues–which implies that income is unequally distributed across voters. Nevertheless, if voters are *income politically compensated*, this outcome is observed if the increment in income taxes generates both a decrease in the pivotal voter's disposable income–which implies that the pivotal voters is rich enough–and an increment in total tax revenues. Finally, if voters are *income politically invariant*, an increment in income taxes positively affects the provision of public goods if and only if this generates an increment in the total tax revenues, regardless of the pivotal voters' level of income–which implies that income level does not matter under this circumstance.

These results change dramatically when considering a "Leviathan" deviating policy rule. In this case, neither whether rich voters demand more or less public goods than poor voters nor how total tax revenues change as income taxes increase matter. Furthermore, an increment in income taxes will positively affect the provision of public goods if and only if the pivotal voter's is rich enough such that his disposable income is negatively affected by the said increment in taxes. As we claim, since a "Leviathan" rule is more likely to be observed in poor societies (with a poor enough pivotal voter) with bad legal institutions and collective action, this is quite likely that in this case more income taxes are useless to increase the provision of public goods.

Our paper is related to at least two strands of literature. Firstly, it is related to previous studies on political accountability in an agency context (Barro, 1973; Ferejohn, 1986; Seabright, 1996; Persson et. al., 1997; Persson and Tabellini, 2002; Aidt and Magris, 2006;

Besley and Smart, 2007; among others).[1] None of these studies have analyzed how income taxes affect voters' political demands, the provision of public goods and incumbent's efforts. Secondly, our paper is related to the aforementioned literature that has related taxation and political accountability through either a "bargaining" mechanism or a "relative revenues" mechanism. As we said above, we explore here a democratic and non-relative mechanism.[2]

The remainder of the paper is as follows. Section 2 presents the model, and section 3 characterizes the equilibrium. In section 4, we analyze how changes in taxes affect voters' demands, the provision of public goods and the incumbent's efforts. Section 5 presents some extensions of the model. The conclusions are presented in the last section. Appendix A and B contain all our proofs.

2 The Accountability Game.

2.1 Voters.

Consider a mass 1 of voters characterized by their exogenous income level y_i. Income is distributed in the population according to a continuous cumulative distribution function $F(y_i)$ with support $[y_1, y_2]$, and mean y. Voter preferences are represented by $u(x_i, G)$, where x_i denotes private consumption, and G denotes the quantity of the public good publicly provided. The utility function satisfies standard assumptions, i.e., $\frac{\partial u}{\partial x_i} > 0$, $\frac{\partial^2 u}{\partial^2 x_i} < 0$, $\frac{\partial u}{\partial G} > 0$, $\frac{\partial^2 u}{\partial^2 G} < 0$, and $\frac{\partial^2 u}{\partial x_i \partial G} \geq 0$. We assume that voters supply labor inelastically, as they derive no utility from leisure. We relax this assumption in section 5.

Each voter i's disposable income is given by $y_i^d = y_i - \tau(y_i, t)$, where $\tau(.)$ is the tax

[1] Persson et. al. (1997) study how the separation of powers between executive and legislative bodies helps to prevent the abuse of power; Seabright (1996) analyzes the appropriate level of decentralization of power in government; Aidt and Magris (2006) study how political accountability helps to solve the capital levy problem; and Besley and Smart (2007) study how inefficiencies in the tax system (i.e., changes in the marginal cost of rising public funds) and other restraints affect voters welfare.

[2] Gemmell et. al. (2002) is also related to our paper. They analyze how taxation directly determines the degree of political accountability and how it affects the level of local public expenditures. Unlike our model, the degree of political accountability is totally exogenous in their framework. Moreover, they consider lump-sum taxes and property taxes, as opposite to income taxes.

function or schedule. This tax schedule depends on both each voter's income and an exogenous parameter t that specifies the amount of taxes that each voter must pay at each level of income. Similar to previous voting-agency models, t is not a policy issue strategically chosen by politicians, consequently voters and politicians take it as given. The tax function is assumed to be continuous. We will come back on parameter t in Section 4. For the time being, we will say that there is an increment in income taxes if t increases.

The following assumption is imposed on the marginal tax rates.

Assumption 1: $\frac{\partial \tau(y_i,t)}{\partial y_i} < 1$ for all voter i.

Assumption 1 states that the tax schedule is non-confiscatory. We concentrate our analysis in this type of tax schedule, which actually is quite common in current democratic societies.

Voters retrospectively evaluate the incumbent's behavior. Observing the utility level they obtain, each voter decides whether to vote for the incumbent re-election or for a challenger. Each voter i votes for the incumbent re-election if his utility level is larger or equal to an endogenous reservation utility level k_i; otherwise, voter i votes for the challenger.

2.2 Politicians.

There is a risk neutral incumbent who decides the amount of own rents (r) he extracts from the total tax revenues, $T = \int_{y_1}^{y_2} \tau(y_i, t)\, dF(y_i)$. These rents benefit the incumbent but not the general voters. The remaining tax revenues are allocated to the provision of public goods (G). The incumbent's budget constraint is then given by $T = \theta G + r$, where θ is a non-negative random variable that stands for the cost of transforming private output into public goods. We assume that θ is distributed according to a continuous cumulative distribution function $\Phi(\theta)$, with support $[\theta_1, \theta_2]$. θ is only observed by the incumbent, although voters know its distribution.

If the incumbent is re-elected, his payoff is given by $r + R$,[3] where R is the exogenous present value of rents of holding office for the next period.[4] If the incumbent is not re-elected, his payoff is given by r. We keep the standard assumption that both the incumbent and the challenger are similar in all characteristics. This implies that the challenger has the same office payoffs, the same preferences for risk and the same type than the incumbent. The cost of maintaining this assumption is the usual one, namely, that punishing the incumbent by no reappointing him is a weakly optimal strategy for voters in equilibrium. The incumbent is reelected if he secures the support of half of voters.

For our baseline analysis, we consider a non-confiscatory incumbent's deviating policy rule. As said before, previous studies have usually considered a "Leviathan" incumbent's deviating policy rule. Under this rule, voters are fully taxed and the incumbent extracts their total income when he decides to forgo re-election. Consequently, the incumbent extracts rents $\int_{y_1}^{y_2} y_i dF(.)$ for himself, which implies $x_i = 0$ for all i, and $G = 0$. Although this confiscatory rule can be useful to analyze how voters balance their demands under an extreme threat, likely to be observed in very poor societies characterized by bad legal institututions and collective action, we prefer to use in our baseline analysys a rule more consistent with most of the current democracies. Nevertheless, we will come back on this and other rules in section 5. Therefore, opposite to that, we consider a non-confiscatory incumbent's deviating policy rule under which the incumbent extracts neither the total voters' income nor the total tax revenues. As suggested above, several reasons may prevent incumbents from extracting total tax revenues in a democratic society, being the most significant the possibility of being legally punished or the possibility of facing a costly social conflict.

We require of a provision of public goods consistent with this non-confiscatory policy

[3] This payoff is usually assumed to be $\lambda r + R$, where $\lambda \in [0, 1]$ is the transaction cost associated with rents. Since we do not care on λ, we assume, without loss of generality, that $\lambda = 1$.

[4] In our framework, we assume that R is not affected by taxes. How this rents affects political accountability has been analyzed in previous studies (for instance, see Persson and Tabellini, 2002). We will briefly discuss in section 4 how taxes could affect R and, consequently, political accountability.

rule. We claim that in a society where legal system works fairly well, this provision is given by $\widehat{G}(T) = \frac{T}{\theta_2}$, where, as said above, θ_2 is the maximum price of producing public goods in the common known distribution of θ. The reasoning is as follows. On the one hand, if the incumbent provides $G < \widehat{G}(T)$, voters and any third part are able to anticipate with probability one that the incumbent is extracting tax revenues for himself. Since legal system works, in this case the incumbent goes to jail, is expropriated, and receives a very large negative payoff, namely minus infinity. On the other hand, if the incumbent provides $G \geq \widehat{G}(T)$, it is impossible for voters and for any third part to know whether the incumbent is extracting tax revenues or not. We assume that in this case, nobody is able to prove whether or not the incumbent is extracting tax revenues for himself. Consequently, by providing $\widehat{G}(.)$, the incumbent avoid any legal punishment and is able to extract the maximum level of tax revenues, obtaining a non-negative payoff (we specify this payoff below). Therefore, $\widehat{G}(.)$ is the level of public goods that the incumbent provides when he do not satisfies voter's demands and decides to forgo re-election. We refer to $\widehat{G}(.)$ as the deviating provision of public goods.

Remarkably, note that $\widehat{G}(.)$ is an increasing function of total tax revenues ($\frac{\partial \widehat{G}}{\partial T} = \frac{1}{\theta_2} > 0$). In words, when total tax revenues increase, voters must observe an increase in $\widehat{G}$, otherwise they anticipate that the incumbent is extracting tax revenues with probability one and the mentioned costs are imposed.[5]

2.3 Timing.

The timing of the model is as follows: (1) each voter simultaneously and independently chooses a reservation utility level (k_i); (2) θ is realized and only observed by the incumbent; (3) the incumbent decides his effort, i.e., the amount of total tax revenues he captures for

[5] Note also that $\frac{\partial \widehat{G}}{\partial \theta_2} < 0$, which implies that a reduction in the support of the distribution of θ positively affects the deviating provision of public goods. This reduction in the support of the distribution of θ has been related in previous literature with an improvement in the quality of voters' information (see Adserà, et al. 2003).

himself, and; (4) voters observe the provision of public goods, and elections are held.

3 Equilibrium.

In this section, we solve for the sub-game perfect equilibrium of the game introduced in section 2. A strategy for the incumbent is a value of rents, $r^* \in \mathbb{R}$; and a strategy for each voter i is a reservation utility level, $k_i^* \in \mathbb{R}$. We use backward induction to solve for the equilibrium. Consequently, we first analyze how the incumbent allocates the total tax revenues between public goods provision and own rents. After that, we analyze how each voter chooses his reservation utility level k_i.

3.1 The incumbent's rents.

We call p to the pivotal voter. A pivotal voter is a voter such that, if the incumbent pleases his reservation utility (k_p), he secures the support of half of voters, and, consequently, is re-elected with probability 1. We formally state the conditions under which voter p exists latter on. For the time being, we assume that voter p exists.

Using the incumbent's budget constraint and the tax schedule, each voter i's indirect utility function can be written as $u\left(y_i^d, \frac{T-r}{\theta}\right)$. Using this function, we are able to define the incumbent's rents when he just pleases the pivotal voter. These rents (r_p) are implicitly defined as:

$$u\left(y_p^d, \frac{T-r_p}{\theta}\right) = k_p \qquad (1)$$

This follows from Equation 1 that r_p is a continuous decreasing function of θ, with $\frac{\partial^2 r_p(.)}{\partial \theta^2} = 0$.[6] Note that, by replacing k_p by k_i in Equation 1, one can define the corresponding rents (r_i) that incumbent would obtain if he would just satisfy voter i' reservation utility level rather than voter p's reservation utility level. We will use these functions latter on.

[6] Using the implicit function theorem, it follows from Equation 1 that $\frac{\partial r_p(.)}{\partial \theta} = -\frac{(T-r_p)}{\theta} < 0$. Consequently, $\frac{\partial^2 r_p(.)}{\partial \theta^2} = 0$.

Therefore, when the incumbent just satisfies the pivotal voter, he gets a payoff equals to $r_p + R$.

When the incumbent does not satisfy the pivotal voter and decides to forgo re-election, he provides the deviating provision of public goods, $\widehat{G}$. In this case, the incumbent's rents (r_E) can be written as:

$$r_E = T - \theta \widehat{G}\left(T\right) = T\left(1 - \frac{\theta}{\theta_2}\right) \tag{2}$$

This follows from Equation 2 that r_E is also a continuous decreasing function of θ, with $\frac{\partial^2 r_E(.)}{\partial \theta^2} = 0$ and $r_E\left(\theta_2\right) = 0$. The incumbent payoff in this case is given by r_E.

The incumbent will satisfy k_p if and only if $r_p \geq r_E - R$. Otherwise, he will decide to forgo re-election. Since both r_p and r_E are decreasing functions of θ, several possibilities can emerge. First, it can be the case that $r_p > r_E - R$ for all $\theta \in [\theta_1, \theta_2]$. In this case, the incumbent will always satisfy k_p and will be always re-elected. Anticipating that, voter p will demand a reservation utility equals to $u\left(y_p^d, \frac{T}{\theta_1}\right)$. Therefore, the moral hazard problem disappears in this case, and the incumbent's rents are minimized. Second, it can be the case that $r_p < r_E - R$ for all $\theta \in [\theta_1, \theta_2]$. In this case, the incumbent will always provide $\widehat{G}$ and extract rents r_E. By doing this, he decides to forgo re-election. The moral hazard problem is then also irrelevant under this circumstance.

The interesting case emerges when r_p and $r_E - R$ cuts each other at some unique $\theta_p \in [\theta_1, \theta_2]$. Under this circumstance, the moral hazard problem becomes relevant. Following what is standard in previous voting-agency models, we assume that the incumbent will choose just to satisfy the pivotal voter when this is cheap enough, namely when the cost of producing public goods (θ) is low enough. Nevertheless, if θ is high, satisfying the pivotal voter becomes too expensive relatively to forgo-reelection. Assumption 2 formally states this condition, and Lemma 1 describes the conditions under which Assumption 2 holds.

Assumption 2: *There is a unique $\theta_p \in (\theta_1, \theta_2)$ such that $r_p > r_E - R$ if $\theta < \theta_p$, and*

$r_p < r_E - R$ *if* $\theta > \theta_p$.

Lemma 1: *Assumption 2 holds if: (1)* $r_p(\theta_1) > T\left(1 - \frac{\theta_1}{\theta_2}\right) - R$*; and (2)* $r_p(\theta_2) < -R$.

Condition (2) in Lemma 1 imposes that $r_p(\theta_2)$ must be negative. Therefore, the incumbent is better off by satisfying voter p when $\theta \leq \theta_p$, and is better off by forgoing re-election when $\theta > \theta_p$. Importantly, each level of k_p implies a critical state θ_p. We comeback on this relationship below.

Formally, the equilibrium incumbent's rents can be written as:

$$r^* = \begin{cases} r_p + R & \text{if} \quad \theta \leq \theta_p \\ r_E & \text{if} \quad \theta > \theta_p \end{cases} \tag{3}$$

where r_p is implicitly defined as in Equation 1, and r_E is defined as in Equation 2. The remaining tax revenues are used by the incumbent to provide public goods. Consequently, the provision of public goods in equilibrium is given by:

$$G^* = \begin{cases} \frac{T - r_p}{\theta} & \text{if} \quad \theta \leq \theta_p \\ \widehat{G} & \text{if} \quad \theta > \theta_p \end{cases} \tag{4}$$

Notice that when the incumbent does not satisfy the pivotal voter's demands, changes in k_p affect neither the incumbent's rents nor the provision of public goods (this follows from Equations 2 and 4).

3.2 Voters' demands.

We now analyze how each voter chooses his respective reservation utility level k_i. Literature in this field has usually considered homogeneous voters who coordinate on a unique equilibrium political demands. Thus, everybody votes for the incumbent re-election if he satisfies these demands; otherwise, everybody votes for the challenger. This assumption is plausible in a model with homogenous agents, but not necessary in a model with heterogeneous agents as in ours. To deal with the coordination problem that emerges under this circumstance, we use Alesina and Rosenthal's (1995) notion of conditional sincerity, also adopted by other authors in previous studies.[7] Formally, conditional sincerity imposes that in an equilibrium no voter would prefer a decrease in the measure of votes obtained by the candidate he has voted for in an election. This is similar to assume that each voter votes as if he was pivotal. As this has been recognized in previous studies that has adopted this notion, imposing this assumption in a model with a large number of voters gets us on the open discussion that voters should be indifferent between voting or not, and between voting for the incumbent or for the challenger. Nevertheless, solving this puzzle is beyond the scope of this article.

Since voters do not observe θ, the best they can do is to choose a non-state contingent reservation utility level. As anticipating in Section 3.1, we can obtain the rents that the incumbent would extract if he would just satisfy voter i's reservation utility by replacing k_p by k_i and r_p by r_i in Equation 1. Extending Assumption 2 to every voter i, then there exists a θ_i for each voter's reservation utility level k_i. Lemma 2 states how the relationship between k_i and θ_i is in equilibrium.

Lemma 2. *k_i^* increases as θ_i^* decreases.*

Lemma 2 ensures that there is a one-to-one negative relationship between θ_i^* and k_i^* for every voter i. Therefore, we have, $k_i^* = k_i^*(\theta_i^*)$. Furthermore, we can treat the choice of k_i as a choice of θ_i.[8] Consequently, each voter chooses optimal θ_i^* to maximize his expected

[7] For instance, see Caselli and Morelli (2004)

[8] This strategy has been already used in previous studies. See, for instance, Persson and Tabellini, 2002.

utility function:[9]

$$
\begin{aligned}
E(u) &= \int_{\theta_1}^{\theta_i} k_i(\theta_i)\, d\Phi(\theta_i) + \int_{\theta_i}^{\theta_2} u\left(y_i^d, \widehat{G}(T)\right) d\Phi(\theta_i) \\
&= \Phi(\theta_i)\, k_i(\theta_i) + (1 - \Phi(\theta_i))\, u\left(y_i^d, \widehat{G}(T)\right) \qquad (5)
\end{aligned}
$$

where $u\left(y_i^d, \widehat{G}(.)\right)$ is the utility level that voter i obtains when the incumbent decides to forgo re-election and to provide $\widehat{G}$. We refer to this utility as the outside utility level. Objective function in Equation 5 explicitly takes into account that each voter i is choosing his optimal reservation utility level (k_i) as if he was the pivotal voter. This follows from the fact that each voter is considering that the incumbent will decide to forgo re-election if $\theta > \theta_i$.

The first order condition for each voter i is given by:

$$
\frac{\partial k_i^*(\theta_i^*)}{\partial \theta_i^*} \Phi(\theta_i^*) = -\phi(\theta_i^*) \left[k_i^*(\theta_i^*) - u\left(y_i^d, \widehat{G}(T)\right) \right] \qquad (6)
$$

Equation 6 implicitly defines each θ_i^* and, consequently, each voter's reservation utility level. We assume that this condition characterizes a maximum.[10] This follows from Equation 6 that θ_i^* can be written as a function $\theta_i^* = \theta_i^*(y_i, t)$. Since the left-hand side term in Equation 6 is negative (this follows from Lemma 2), in equilibrium, θ_i^* must be such that $k_i^* = u\left(y_i^d, G_i^*\right) > u\left(y_i^d, \widehat{G}\right)$, where G_i^* is the provision of public goods required to just satisfies voter i's reservation utility level. Therefore, we conclude that $G_i^* > \widehat{G}$ for all i. This follows from the previous inequality and the properties of the utility function.

Proposition 1 (Voters' reservation utility and income). *Define* $\left.\frac{\partial k_i^*}{\partial y_i}\right|_T$ *as the*

[9] One could constraint this problem to have $\theta_i \in (\theta_1, \theta_2)$ for every i. Nevertheless, as we explain below, this is only required for voter p.

[10] This is true if $2\frac{\partial k_i(.)}{\partial \theta_i^*}\phi(.) < -\frac{\partial^2 k_i(.)}{\partial \theta_i^{*2}}\Phi(.) - \frac{\partial \phi(.)}{\partial \theta_i^*}\left[k_i(.) - u\left(y_i^d, \widehat{G}\right)\right]$. From Lemma 2, it follows that the left-hand side term of this inequality is negative and that $\frac{\partial^2 k_i^*(.)}{\partial \theta_i^{*2}} > 0$. Nevertheless, since $\frac{\partial \phi(.)}{\partial \theta_i^*}$ can be either positive or negative and, as we explain below, $k_i^*(\theta_i^*) - u\left(y_i^d, \widehat{G}(.)\right) > 0$, the right-hand side term of this inequality can be either negative or positive.

change in voter i's equilibrium reservation utility as income increases, keeping constant the distribution of income and, consequently, total tax revenues. In equilibrium:

a) *The reservation utility of a rich voter is larger than the reservation utility of a poor voter*

b) *The provision of public goods required to satisfy a rich voter is larger than the respective provision required to satisfy a poor voter if and only if voters are "income politically uncompensated"; i.e., if and only if* $\left.\frac{\partial k_i^*}{\partial y_i}\right|_T > \frac{\partial u\left(y_i^d,G\right)}{\partial x_i}\left(1-\frac{\partial \tau(y_i^d,t)}{\partial y_i}\right)$.

c) *The provision of public goods required to satisfy a rich voter is smaller than the respective provision required to satisfy a poor voters if and only if voters are "income politically compensated"; i.e., if and only if* $\left.\frac{\partial k_i^*}{\partial y_i}\right|_T < \frac{\partial u\left(y_i^d,G\right)}{\partial x_i}\left(1-\frac{\partial \tau(y_i^d,t)}{\partial y_i}\right)$.

d) *The provision of public goods required to satisfy a rich voter is the same as the respective provision required to satisfy a poor voter if and only if voters are "income politically invariant", i.e., if and only if* $\left.\frac{\partial k_i^*}{\partial y_i}\right|_T = \frac{\partial u\left(y_i^d,G\right)}{\partial x_i}\left(1-\frac{\partial \tau(y_i^d,t)}{\partial y_i}\right)$.

Assumption 1 is crucial to get the result in Proposition 1(a).[11] Results in statements (b) through (d) in Proposition 1 call the attention that a large reservation utility level of a rich voter vis-à-vis a poor voter does not necessarily imply that the provision of public goods require to satisfy the rich voter is always larger than the respctive provision required to satisfy the poor voter. The difference in the reservation utility level between rich voters and poor voters might just happen because of the income differences between them. Furthermore, this results state the conditions under which the provision of public goods required to satisfy a rich voter is larger, equal or smaller than the provision of public goods required to satisfy a poor voter. Voters' preferences for private consumption are critical to determine this. As said above, $\left.\frac{\partial k_i^*}{\partial y_i}\right|_T$ measures how voter i's equilibrium reservation utility level changes as i becomes richer. If and only if $\left.\frac{\partial k_i^*}{\partial y_i}\right|_T$ is higher than the marginal utility of consumption derived from an increment in the pre-tax income–i.e., an increment

[11]If there is a confiscatory tax schedule, i.e., $\frac{\partial \tau(y_i,t)}{\partial y_i} > 1$, statement (a) in Proposition 1 should say: "The reservation utility of a rich voter is smaller than the reservation utility of a poor voter."

in consumption is not too important for voter i–then the provision of public goods required to satisfy a rich voter is larger than the respective provision required to satisfy a poor voter. Since income is not enough to satisfy the increment in the reservetion utility of a voter as he becomes richer, we call to this type of voters *income politically uncompensated.* The other two cases can be explained by using the same reasoning. Remember that the larger is the provision of public goods required to satisfy voters' reservation utility levels, the smaller are the incumbent's rents.

Proposition 2 (Pivotal voter existence). *Voter p exists if either all voters are "income politically uncompensated", or "income politically compensated", or "income politically invariant". In all cases, the pivotal voter can be defined as the one whose income satisfies $F(y_p) = \frac{1}{2}$, i.e. p is the median voter. In the first case, if the incumbent satisfies voter p, he also satisfies all those voters i with $y_i < y_p$. In the second case, if the incumbent satisfies voter p, he also satisfies all those voters i with $y_i > y_p$. In the last case, if the incumbent satisfies voter p, he also satisfies all voters.*

Proposition 2 states three voter's income political orders under which we can guarantee the existence of a pivotal voter and gives us his identity.[12] Note that, all voters and not only voter p are pivotal when voters are *income politically invariant.* As we show latter on, choosing voter p as pivotal voter in this case does not have any effect on our final results. In other words, we will show that the identity of the pivotal voter does not matter in this case. From now on, we impose the following assumption.

Assumption 3. *All voters are either, income politically uncompensated, or income politically compensated, or income politically invariant.*

We also assume that $\theta_p^* \in (\theta_1, \theta_2)$, i.e., that Equation 6 represents an interior solution for the pivotal voter. We refer to $k_p^*\left(\theta_p^*\right)$ as the voter's political demands.

[12] No property of the model allows us to discard any of these voter's income political orders. In particular, the second order condition that guarantees that expression in Equation 6 represents a maximum for θ_i (see footnote 10) is not violated under any of these orders.

3.3 Equilibrium and outcomes.

Proposition 3 summarizes the sub-game perfect equilibrium of the game and its respective outcomes.

Proposition 3 (Equilibrium and outcomes). *Consider the accountability game presented in section* 2.

a) *The sub-game perfect equilibrium is given by the incumbent's rents* r^**, implicitly defined as in Equation* 3*; and a reservation utility level* $k_i^*(\theta_i^*)$ *for each voter* i*, with* θ_i^* *implicitly defined as in Equation* 6*.*

b) *If* $\theta \leq \theta_p^*$*, the incumbent satisfies voter's political demands,* $k_p^*\left(\theta_p^*\right)$*, where* p *is such that* $F(y_p) = \frac{1}{2}$*, and supplies* $G^* = \frac{T-r_p}{\theta}$*.* θ_p^* *is implicitly given by:*

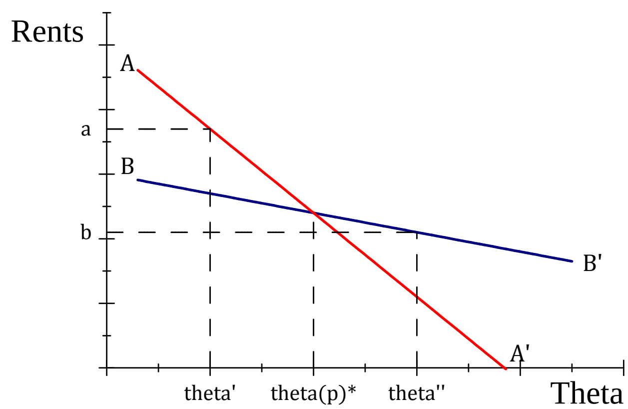
$$\frac{\partial k_p^*(.)}{\partial \theta_p^*}\Phi\left(\theta_p^*\right) = -\phi\left(\theta_p^*\right)\left[k_p^*\left(\theta_p^*\right) - u\left(y_p^d, \widehat{G}(.)\right)\right] \qquad (7)$$

In this case, the incumbent is always re-elected. If voters are income politically uncompensated, those voters with $y_i \leq y_p$ *vote for the incumbent re-election and those voters with* $y_i > y_p$ *vote for the challenger. If voters are income politically compensated,* those *voters with* $y_i \geq y_p$ *vote for the incumbent re-election and those voters with* $y_i < y_p$ *vote for the challenger. If voters are income politically invariant, all voters vote for the incumbent re-election.*

c) *If* $\theta > \theta_p^*$*, the incumbent does not satisfy voter's political demands, provides* $\widehat{G}(.)$*, and is not re-elected.*

Statements (b) and (c) in Proposition 3 take into account the fact that punishing the incumbent is a weakly optimal strategy for voters. Figure 1 depicts the equilibrium. Curve AA' represents r_p and curve BB' represents $r_E - R$ (given Assumption 2). As said above, θ_p^* relates one to one with voter's political demands $k_p^*(.)$, and determines the unique point where curve AA' cuts with curve BB'. When $\theta = \theta' < \theta_p^*$, the incumbent is better off if he satisfies voter p. Consequently, he extracts rents $a + R$, and uses the remaining tax revenues to provide public goods. When $\theta = \theta'' > \theta_p$, the incumbent is better off if he decides to forgo re-election. Consequently, he extracts rents $r_E = b + R$, and provides $\widehat{G}$.

Figure 1: Equilibrium



4 Taxation Analysis.

We concentrate our analysis in the case where $\theta \leq \theta_p^*$, which actually is the interesting one. We briefly discuss the results when $\theta > \theta_p^*$ at the end of this section. We also concentrate our analysis on two tax schedules largely considered in the literature. The first one is a linear tax schedule and the second one is a particular non-linear tax schedule. We describe both schedules below.

1) Tax schedule 1: Linear tax schedule. Consider $\tau(y_i, t) = ty_i - b$, with $t \in (0, 1)$, and $b \in [0, ty)$. This linear tax schedule with in-kind transfers is quite standard in the literature. Voter i's marginal tax rate is given by $\frac{\partial \tau(.)}{\partial y_i} = t$. Therefore, an increase in t implies an increase in voter's marginal tax rates. This tax schedule satisfies Assumption 1. Furthermore, $\frac{\partial \tau(.)}{\partial t} > 0$ for every i. Total tax revenues are given by $T = ty - b$. The interval constraint on b ensures that $T > 0$. An increase in t always implies an increase in total tax revenues ($\frac{\partial T}{\partial t} = y > 0$).

2) Tax schedule 2: Non-linear tax schedule. Consider $\tau(y_i, t) = y_i - by_i^{1-t}$, where $t \in (0,1)$ and $b > 0$. This tax schedule with in-kind transfers has been intensively used in previous literature on taxation (Bénabou 2000, and 2002; Corneo 2002; among others). Parameter $1 - t$ is the elasticity of post-tax income to pre-tax income and measures the degree of progressivity (regressivity) of the tax schedule. The tax schedule is progressive if $1 - t < 1$, and this is regressive if $1 - t > 1$. The larger is t, the more progressive is said to be the tax schedule.[13] Voter i's marginal tax rate is given by $\frac{\partial \tau(.)}{\partial y_i} = 1 - \frac{(1-t)b}{y_i^t}$. Therefore, with $t \in (0,1)$, as assumed above, this tax schedule is progressive and satisfies Assumption 1. Furthermore, $\frac{\partial \tau(.)}{\partial t} < 0$ if $y_i < 1$ (i.e., if voter i is poor enough), and $\frac{\partial \tau(.)}{\partial t} > 0$ if $y_i > 1$ (i.e., if voter i is rich enough). Total tax revenues are given by $T = y - \int_{y_1}^{y_2} by_i^{1-t} dF(.)$. We assume that $T > 0$. Under this tax schedule an increase in t might either positively or negatively affect total tax revenues. In particular, $\frac{\partial T}{\partial t} > 0$ if $\int_{y_1}^{y_2} by_i^{1-t} \ln y_i dF(.) > 0$, and $\frac{\partial T}{\partial t} < 0$ if $\int_{y_1}^{y_2} by_i^{1-t} \ln y_i dF(.) < 0$.

As anticipated in section 2.1., an increment in t in our framework is understood as an increment in income taxation. Note that and increment in t implies an increment in the marginal tax rate for every voter i under the (linear) tax schedule 1, but not necessary under the (non-linear) tax schedule 2. As said above, under this tax schedule an increment in t implies an increment in tax progressivity. Besides this difference, notice that under the tax schedule 1 both $\frac{\partial \tau(.)}{\partial t}$ and $\frac{\partial T}{\partial t}$ are always positive.[14] Nevertheless, under the tax schedule 2, each of these two derivatives can be either negative or positive. A decrease in T as t increases might happen either because the proportion of voters that pay taxes decreases and this is not compensated by the taxes that taxpayer voters pay; or because

[13] In particular, for any given distribution of pre-tax income and a pair of tax schedules with $t_1 > t_2$, the distribution of post-tax income under t_1 Lorenz dominates the one under t_2 (Jakobsson, 1976).

[14] This is not the case when labor supply is elastic. We discuss this in Section 5.3.

although, the proportion of voters that pay taxes increases, the tax schedule become more redistributive.[15]

It is noteworthy to mention that the incumbent's budget constraint introduced in section 2 and the two tax schedules described above impose that the incumbent is only able to capture rents from the total tax revenues after in-kind transfers. In particular, this imposes that the incumbent cannot manipulate these transfers.

We first analyze how voter's political demands (k_p^*) change as t increases. Anticipating this effect, we will be able to analyze how the incumbent's rents, and, consequently, the provision of public goods, are affected by an increment in t.

Proposition 4 (Voters' political demands): *Assume that $\theta \leq \theta_p^*$, and consider an increment in income taxes (t) that still leaves $\theta \leq \theta_p^*$.*

a) The increment in income taxes positively affects voters' political demands if and only if this increment positively affects p's outside utility level $\left(u\left(y_p^d, \widehat{G}(T)\right)\right)$.

b) *p's outside utility level increases as income taxes increases if and only if:*

$$\frac{\partial u\left(y_p^d, \widehat{G}(T)\right)}{\partial x}\frac{\partial \tau(y_p,t)}{\partial t} < \frac{\partial u\left(y_p^d, \widehat{G}(T)\right)}{\partial \widehat{G}}\frac{1}{\theta_2}\frac{\partial T}{\partial t} \qquad (8)$$

where $\frac{1}{\theta_2}\frac{\partial T}{\partial t} = \frac{\partial \widehat{G}}{\partial t}$. Or, alternatively, if and only if:

$$\frac{\partial \tau(y_p,t)/\partial t}{\partial T/\partial t} < \frac{\left|MRS_p\left(y_p^d, \widehat{G}(T)\right)\right|}{\theta_2} \qquad (9)$$

Proposition 4(a) clarifies the mechanism through which taxation affects voter's political demands in our framework. There is a trade-off between the outside utility of voter p and the probability of being pleased by the incumbent. If p's outside utility level decreases as t

[15] Under the tax schedule 2, the break-even income level is $\widetilde{y} = b^{1/t}$. If $b > 1$, an increase in t negatively affects $\widetilde{y}$. Consequently, the proportion of voters that pay taxes increases, but the poorest voters receive more transfers. If $b < 1$, an increase in t positively affects $\widetilde{y}$. Consequently, the proportion of voters that pay taxes decreases.

increases, voters are willing to reduce their political demands ($k_p^*(.)$) in order to reduce the probability of not being pleased by the incumbent. Nevertheless, when this outside utility level increases as t increases, voters will increase their political demands. In other words, voter p (an in general, every voter) places himself in the worst situation–i.e., the situation in which the incumbent decides to forgo re-election and to expropriate the maximum amount of tax revenues–and evaluates how his outside utility level changes as t changes. If p's outside utility level increases then voters' political demands increase and vise-versa.

Proposition 4(b) states the condition under which an increment in t positively affects p's outside utility level, and consequently, equilibrium voters' political demands. First of all, since voter put themselves in the worse situation, notice that all marginal utilities in Inequality 8 are evaluated at $\widehat{G}(.)$. The left-hand side term in Inequality 8 is the change in p's outside utility level due to the change in his private consumption generated by the increment in income taxes. If $\frac{\partial \tau(.)}{\partial t} > 0$, p's disposable income decreases and his outside utility level decreases as a consequence of a small level of consumption. If $\frac{\partial \tau(.)}{\partial t} < 0$, the opposite happens. The right-hand side term in Inequality 8 is the change in p's outside utility level due to the change in $\widehat{G}(.)$ generated by the change in total tax revenues as t increases. Notice that $\frac{\partial \widehat{G}}{\partial t} > 0$ if and only if $\frac{\partial T}{\partial t} > 0$ and vise-versa.

Therefore, if $\frac{\partial \tau(.)}{\partial t} > 0$, and $\frac{\partial T}{\partial t} > 0$, p's outside utility level decreases due to his consumption loss and increases due to the increment in $\widehat{G}$. If p's marginal outside utility loss is smaller than his respective marginal gain, voters' political demands increase. The case where $\frac{\partial \tau(.)}{\partial t} < 0$, and $\frac{\partial T}{\partial t} < 0$ is just the opposite one. In the two remaining cases p's outside utility level decreases or increases unambiguously. If $\frac{\partial \tau(.)}{\partial t} > 0$ and $\frac{\partial T}{\partial t} < 0$, p only perceives a marginal utility loss from an increment in t and, consequently, voters' political demands decrease. If $\frac{\partial \tau(.)}{\partial t} < 0$ and $\frac{\partial T}{\partial t} > 0$, p only perceives a marginal utility gain from an increment in t and, consequently, voters' political demands increase. As discussed before, the sign of $\frac{\partial \tau(.)}{\partial t}$ and $\frac{\partial T}{\partial t}$ depend on the tax schedule. Here the importance of considering not only a linear tax schedule but also a non-linear tax schedule for the analysis.

Inequality 8 can also be written in terms of p's marginal rate of substitution (MRS)–see Equation 9. This condition says that voters' political demands increases as t increases if and only if p's MRS (valuated in terms of θ_2) is larger than his contribution to the change in the total tax revenues; or, in other words, if and only if p's relative valuation for public goods is larger than his relative tax contribution.[16]

We now analyze how incumbent's efforts (rents) are affected as t increases. In order to control for the change in total tax revenues, we analyze how the incumbent's rents as proportion of total tax revenues–defined as $\gamma^* = \frac{r_p}{T}$–change as t changes. Proposition 5 states the result.

Proposition 5 (Incumbent's efforts): *Assume that $\theta \leq \theta_p^*$, and consider an increment in income taxes (t) that still leaves $\theta \leq \theta_p^*$. The increment in income taxes positively affects the incumbent's efforts (negatively affects γ^*) if and only if:*

$$\frac{\partial k_p^*\left(\theta_p^*\right)}{\partial t} > -\frac{\partial u\left(y_p^d, G^*\right)}{\partial x}\frac{\partial \tau\left(y_p, t\right)}{\partial t} + \frac{\partial u\left(y_p^d, G^*\right)}{\partial G}\left(1-\gamma^*\right)\frac{1}{\theta}\frac{\partial T}{\partial t} \qquad (10)$$

The left-hand side term in Inequality 10 corresponds to the change in voters' political demands as t increases. As explained in Proposition 4, this term can be either positive or negative. The right-hand side term corresponds to the change in p's utility level–evaluated at the equilibrium utility level (i.e. at $G^* = \frac{T-r_p}{\theta}$) rather than at the outside utility level (i.e., at $\widehat{G}$)–as t increases. The term $\left(1-\gamma^*\right)\frac{1}{\theta}\frac{\partial T}{\partial t}$ corresponds to the change in the provision of public goods that an increment in taxes would generate if the incumbent would keep

[16] Two comments on condition in Inequality 9. First, it can be verified that for voters i and j with $y_i > y_j$, $\left|MRS_i\left(y_i^d, \widehat{G}\left(T\right)\right)\right| > \left|MRS_i\left(y_j^d, \widehat{G}\left(T\right)\right)\right|$. Furthermore, under the (linear) tax schedule 1, $\frac{\partial \tau(y_i,t)}{\partial t} > \frac{\partial \tau(y_j,t)}{\partial t}$, and under the (non-linear) tax schedule 2 this always happens if $y_i > 1$. Thus, since both expressions in Inequality 9 are (in general) increasing functions of y_i, we are not able to ensure that this condition is always satisfied if the pivotal voter's income is above or below a certain threshold. Second, under the tax schedule 1, Inequality 9 reduces to $\frac{y_p}{y} < \frac{\left|MRS_p\left(y_p^d, \widehat{G}(.)\right)\right|}{\theta_2}$. Therefore, if the price of the public good was known and this was θ_2, the preferred tax rate of voter p in an interior solution (t^*) would be implicitly given by $\frac{y_p}{y} = \frac{\left|MRS_p\left(y_p^d, \widehat{G}(.)\right)\right|}{\theta_2}$. It can be verified that if the exogenous tax parameter $t < t^*$, then Inequality 9 always holds.

unchanged the initial proportion of tax revenues he expropriates for himself. The right-hand side term in Inequality 10 can be either positive or negative. Besides the magnitude of the marginal utilities, once again, the sign of this right-hand side term depends on how both pivotal voter's disposable income and total tax revenues are affected by an increment in t. Result in Proposition 5 says that an increase in taxation positively affects the incumbent's efforts if and only if the change in voters' political demands as t increases is larger than the change in p's equilibrium utility level as t increases.

Although the condition in Inequality 10 can be satisfied under different possibilities, some conclusions can be obtained from this. First, a positive effect of t on voters' political demands is always useful to eventually observe a decrease in γ^*. Nevertheless, this is neither a necessary nor a sufficient condition to observe this outcome. Second, a positive effect of t on p's tax function (i.e. a negative effect on his disposable income) can be also useful to eventually observe a decrease in γ^*. Nevertheless, we already know from Proposition 4 that if this effect is high enough, then voters' political demands might decrease.

Whether voters are *income political compensated*, *uncompensated* or *invariant* has some implication on the condition in Inequality 10. We come back on this after analyzing how an increment in taxes affects the provision of public goods.

Proposition 6 (Public goods provision): *Assume that $\theta \leq \theta_p^*$, and consider an increment in income taxes (t) that still leaves $\theta \leq \theta_p^*$.*

a) *The increment in income taxes positively affects the provision of public goods if and only if:*

$$\frac{\partial k_p^*\left(\theta_p^*\right)}{\partial t} + \frac{\partial u\left(y_p^d, G^*\right)}{\partial x}\frac{\partial \tau\left(y_p, t\right)}{\partial t} > 0 \qquad (11)$$

b) *If voters are income politically uncompensated, the increment in income taxes*: (i) *positively affects the provision of public goods if both* $\frac{\partial \tau(y_p,t)}{\partial t} < 0$, *and* $\frac{\partial T}{\partial t} > 0$; (ii) *negatively affects the provision of public goods if both* $\frac{\partial \tau(y_p,t)}{\partial t} > 0$, *and* $\frac{\partial T}{\partial t} < 0$. *Otherwise, the effect of the increment in income taxes on the provision of public goods is ambiguous.*

c) *If voters are income politically compensated, the increment in income taxes*: (i) *positively affects the provision of public goods if both* $\frac{\partial \tau(y_p,t)}{\partial t} > 0$, *and* $\frac{\partial T}{\partial t} > 0$; (ii) *negatively affects the provision of public goods if both* $\frac{\partial \tau(y_p,t)}{\partial t} < 0$, *and* $\frac{\partial T}{\partial t} < 0$. *Otherwise, the effect of the increment in income taxes on the provision of public goods is ambiguous.*

d) *If voters are income politically invariant, the increment in income taxes positively affects the provision of public goods if and only if* $\frac{\partial T}{\partial t} > 0$.

The first term in Inequality 11 corresponds to the change in voters' political demands due to an increment in income taxes, and the second one corresponds to the change in p's marginal utility of consumption–evaluated at $G^* = \frac{T-r_p}{\theta}$ rather than at $\widehat{G}$–due to the said increment. Once again, result in Proposition 6(a) suggests that a positive effect of t on voters' political demands is always useful to eventually observe an increment in the provision of public goods. Nevertheless, this is neither a necessary nor a sufficient condition to observe this outcome. Contingent to observe an increment in voter's political demands as a consequence of an increment in income taxes, the provision of public goods increases if either pivotal voter's disposable income is negatively affected by the increment in taxes (i.e., p's tax function is positively affected), or, if this is positively affected, its change is small enough such that Inequality 11 holds. However, if this change is high, the incumbent does not need to compensate the increment in voters' demands by increasing the provision of public goods. Furthermore, if this happens, the incumbent will reduce this provision and capture more rents.

Proposition 6(b) through 6(d) show that voters' income political order plays an important role to determine how income taxes affects the provision of public goods. First of all, notice that to guarantee an increment in the provision of public goods after an increment in income taxes under any of the three possible voters' income political orders, this is always required to observe a positive effect of t on total tax revenues. Actually, this is the only required condition when voters are *income political invariant* (Proposition 6(d)). For the other orders, how income taxation affects p's disposable income matters.

Proposition 6(b) states that if voters are *income politically uncompensated* an increase in taxes positively affects the provision of public goods if both the pivotal voter is poor enough–such that he perceives an increment in his disposable income after the increment in taxes–and total tax revenues increase as taxes increase. Under any other circumstances, the effect of an increment in taxes on the provision of public goods is either negative or ambiguous. Importantly, we already know from Proposition 4 that when this is the case (i.e., $\frac{\partial \tau(.)}{\partial t} < 0$ and $\frac{\partial T}{\partial t} > 0$), voters' political demands also increase as t increases. The intuition behind the result in Proposition 6(b) is simple, since voters are *income politically uncompensated,* increasing the disposable income of the pivotal voter guarantees an increase in his demands for public goods. If the incumbent has incentives to be re-elected, he will satisfy these larger demands if total tax revenues increase after the increment in taxes.

Some comments on this result. The required condition that $\frac{\partial \tau(.)}{\partial t} < 0$ can never be observed under a linear tax schedule, but only under a non-linear tax schedule. Furthermore, since a negative effect of taxes on p's tax function requires of a poor enough pivotal (median) voter, observing $\frac{\partial T}{\partial t} > 0$ is more likely if income is unequally distributed across voters, such that rich voters (tax payers) not only compensate for the increment in in-kind transfers to poor voters, but also contribute to increase T. Therefore, our result suggests that in a poor society where income is unequally distributed and voters are *income politically uncompensated*, income redistribution through a more progressive tax system is useful to increase voters' political demands and the provision of public goods.

Proposition 6(c) states that if voters are *income politically compensated* an increase in income taxes positively affects the provision of public goods if both the pivotal voter is rich enough–such that he perceives a decrease in his disposable income after the increment in taxes–and total tax revenues increase as taxes increase. Under any other circumstances, the effect of an increment in taxes on the provision of public goods is either negative or ambiguous. We cannot guarantee from Proposition 4 that in this case (i.e., $\frac{\partial \tau(.)}{\partial t} > 0$

and $\frac{\partial T}{\partial t} > 0$) voters political demands also increase as t increases. However, this can be guaranteed from Inequality 11 that if voters' political demands decrease, this drop must be small vis-à-vis the p's marginal utility of consumption. The intuition behind the result in Proposition 6(c) is also simple, since voters are *income politically uncompensated,* decreasing the disposable income of the pivotal voter guarantees an increase in his demand for public goods. If the incumbent has incentives to be re-elected, he will satisfy these larger demands if total tax revenues increase after the increment in taxes.

Some comments on this result. The required condition that $\frac{\partial \tau(.)}{\partial t} > 0$ can be observed under either a linear tax schedule or a non-linear tax schedule. Furthermore, since this situation do not requires of a poor pivotal voter, but of a non-poor (tax payer) pivotal voter, observing $\frac{\partial T}{\partial t} > 0$ does not requires of any particular distribution of income. This can be the case of a middle or high income society with *income politically uncompensated* voters.

Finally, Proposition 6(d) states that the identity of the pivotal voter does not matter to anticipate the effect of an increment in income taxes on the provision of public goods when voters are *income politically invariant.* In other words, how behaves $\frac{\partial \tau(.)}{\partial t}$ does not have any influence on this relationship. As we anticipate in section 3.2 (see Proposition 2), this implies that choosing voter p as the pivotal voter rather than choosing any other voter as pivotal (remember than in this case every voter is pivotal) does not have any implication on our results when voters are *income politically invariant.* As said above, the provision of public goods in this case is only affected by the change in the total tax revenues as t increases. This provision increases after an increment in taxes if and only if total tax revenues increase as t increases. Once again, we are not able to ensure whether voters' political demands increase or decrease after an increment in taxes in this case.

We can use the result in Proposition 6(a) to rewrite Proposition 5. Corollary 1 does it.

Corollary 1. (Incumbent's efforts). *Assume that $\theta \leq \theta_p^*$, and consider an increase* *in income taxes (t) that still leaves $\theta \leq \theta_p^*$. The increment in income taxes positively affects the incumbent's efforts (i.e., negatively affects γ^*) if and only if:*

$$\frac{\partial G^*(T)}{\partial t} > (1-\gamma^*)\frac{1}{\theta}\frac{\partial T}{\partial t} \tag{12}$$

Corollary 1 writes in a more compact way the condition required to observe an increment in incumbent's efforts after an increment in income taxes, and shows the link between voters' income political order and this result (through the results stated in Proposition 6). Remember that the right-hand side term in Inequality 12 corresponds to the change in the provision of public goods that an increment in taxes would generate if the incumbent would keep unchanged the initial proportion of tax revenues captured by him. Therefore, if the change in the demands for public goods generated by an increment in taxes is larger than the former change, incumbent's efforts will increase, and vise-versa. The main message in Corollary 1 is that this is possible to observe a decrease in incumbent's efforts (i.e. an increment in γ^*) after an increment in income taxes even if there is an increment in the provision of public goods.

To end this section, let us briefly mention a couple of things related with two open issues. The first one is how an increment in t affects voters' political demands, incumbent's efforts and the provision of public goods when $\theta > \theta_p^*$. In this case, an increase in t (that still leaves $\theta > \theta_p^*$) affects voters' political demands accordingly with the results stated in Proposition 4. However, since in this case the incumbent always choose to provide $\widehat{G}(.)$, changes in voters' political demands do not affect the provision of public goods. Furthermore, total incumbent's rents keep unchanged and the provision of public goods changes accordingly to $\frac{\partial \widehat{G}(.)}{\partial t}$.

The second one is related to our assumption that the present value of rents of holding office for the second period (R) is not affected by total tax revenues. How R affects political accountability has been analyzed in previous studies (for instance, see Persson and Tabellini, 2002). Since an increment in R implies an increment in the incumbent's payoff of holding offices, this gives the incumbent more incentives to satisfy voters' political demands. Therefore, as this has been suggested in previous works, an increment in R can be useful to discipline politicians. Since the amount of total tax revenues probably makes more attractive holding an office, an increment in income taxes (i.e., in t) that positively affects total tax revenues might be useful to discipline politicians. However, the effects discussed in this section must be taken into acount for the final result.

5 Extensions.

5.1 A "Leviathan" deviating policy rule.

We analyze in this section how our results change when one considers a "Leviathan" deviating policy rule for the incumbent rather than a non-confiscatory policy rule. As said above, if this is the case, the incumbent extracts the total income of voters and provides zero public goods. Even this is an extreme situation, imposing this rule is a plausible way to consider societies with really bad institutions and collective action, where neither legal system nor social conflicts are likely to prevent the incumbent of extracting a large amount of rents. The rest of the model and its assumptions keep exactly the same.

The first change in the model is that the incumbent's rents when he does not satisfy the pivotal voter an decides to forgo re-election are now given by $r_E = \int_{y_1}^{y_2} y_i dF(.)$, i.e., the total income of voters. Notice that these rents are not longer a function of θ. The incumbent's rents when he satisfies the pivotal voter (r_p) are still defined as in Equation 1. Furthermore, we assume that r_p still cuts $r_E - R$ in a $\theta_p \in (\theta_1, \theta_2)$, which actually, given the negative relation between r_p and θ, must be unique. Equilibrium rents (Equation 3) remains the same, but now r_E are defined as above. The provision of public goods in equilibrium (Equation 4), remains the same when $\theta \leq \theta_p$, but now $G^* = 0$ otherwise.

Voters' reservation utility levels in equilibrium (k_i^*) change dramatically. If the incumbent follows a "Leviathan" deviating policy rule each voter receives a constant utility $u(0,0)$ when he decides to forgo re-elections. Replacing $u\left(y_i^d, \widehat{G}(.)\right)$ by $u(0,0)$ in Equation 5 and 6, this immediately follows that θ_i^*, and, consequently, each equilibrium voter's reservation utility, only depends on the distribution of θ. Therefore, this follows that $\left.\frac{\partial k_i^*}{\partial y_i}\right|_T = 0$, which implies that all voters have the same reservation utility level in equilibrium, regardless of their level of income–i.e., $k_i^* = k^*$ for every i. Notice that this is different to say that voters are *income politically invariant*. Furthermore, this also follows that $\frac{\partial k^*}{\partial t} = 0$, which implies that a change in income taxes does not affect voters' political demands.

Although income taxes do not affect voters' political demands (k^*), an increment in these taxes do affect voters' indirect utility and, through this, incumbent's rents and the provision of public goods. Proposition 7 summarizes the results.

Proposition 7. *Assume that the incumbent follows a "Leviathan" deviating policy rule when he decides to forgo re-election.*

a) *Pivotal voter is defined as the one whose income satisfies* $F(y_p) = \frac{1}{2}$.

Assume that $\theta \leq \theta^*$. *Consider an increment in income taxes* (t) *that still leaves* $\theta \leq \theta^*$.

b) *Voters political demands* (k^*) *are not affected by changes in income taxes.*

c) *The increment in income taxes*: (i) *positively affects the provision of public goods if and only if* $\frac{\partial \tau(y_p,t)}{\partial t} > 0$; (ii) *negatively affects the provision of public goods if and only if* $\frac{\partial \tau(y_p,t)}{\partial t} < 0$.

d) *Corollary 1 still holds.*

Results in Proposition 7 says that the median voter is still the pivotal voter under a "Leviathan" deviating policy rule. Although every voter has the same equilibrium reservation utility level in this case, each of them requires of a different provision of public goods to be satisfied. Actually, this provision increases as the level of income increases.

Three main novelties emerge under a "Leviathan" deviating policy rule. First, voters' political demands are not affected by a change in income taxes. This follows from the fact that the outside utility level is not a function of taxes. Second, only the change in the pivotal voter's disposable income matters to determine how taxes affects the provision of public goods. Therefore, neither voters' income political order nor total tax revenues matter. This provision will increase if and only if the pivotal voter is rich enough, such that his disposable income is negatively affected by the increment income taxes. Since observing a "Leviathan" rule is more likely in a poor society with bad legal institutions and collective action, this is also likely that the pivotal voter, in such a context, should be a poor individual who probably receives in-kind transfers. Consequently, this is difficult to think that more taxes can be useful to increase the provision of public goods under these circumstances. Finally, the change in total tax revenues due to an increment in income taxes only matters to know how incumbent's efforts change after an increment these taxes (statement in Proposition 7(d)). Same as before, an increment in the provision of public goods generated by an increment in income taxes does not guarantee that incumbent's efforts will increase.

5.2 An intermediate deviating policy rule.

A key characteristics of the baseline non-confiscatory policy rule is that $\widehat{G}$ is an increasing function of total tax revenues. We relax in this section this assumption and assume that there is a minimum fixed level of public goods $\widetilde{G} > 0$ that the incumbent provides when he decides to forgo re-election. In particular, $\widetilde{G}$ depends on neither income taxes nor total tax revenues. This provision of public goods still allows us to satisfy the non-confiscatory policy rule. $\widetilde{G}$ must be understood as the minimum level of public goods that allows the incumbent to avoid any costly social conflict, regardless of the amount of total tax revenues risen. This rule can represent the case of a society where the legal system does not work appropriately and is unable to punish the incumbent even if this can be proved that he is extracting rents. We still assume that if the incumbent provides $G < \widetilde{G}$, he receives a negative and large enough payoff, namely caused in this case for a costly social conflict. The rest of the model and its assumptions keep exactly the same.

Some small changes arise in the equilibrium of the model under this intermediate rule. First, incumbent's rents when he does not satisfy the pivotal voter are now given by $r_E = T - \theta\widetilde{G}$, which is still a decreasing function of θ. Except for this change, equilibrium rents (Equation 3) remains the same. The provision of public goods in equilibrium (Equation 4), remains the same when $\theta \leq \theta_p$, but now $G^* = \widetilde{G}$ otherwise. Each voter's reservation utility level in equilibrium (k_i^*) is obtained by replacing $u\left(y_i^d, \widehat{G}\left(T\right)\right)$ by $u\left(y_i^d, \widetilde{G}\right)$ in Equation 5 and 6. It can be verified that the relationship between voters' reservation utility levels and their income levels is still the same (i.e., Proposition 1 and 2 still hold). The novelty is that p's outside utility level is now only affected by t through his disposable income, but not through the minimum level of public goods consistent with the deviating policy rule. This introduces some interesting changes in the effect that an increment in income taxes has on the provision of public goods and the incumbent's efforts. Proposition 8 states these results.

Proposition 8. *Assume that there is an exogenous and fixed level of public goods $\widetilde{G} > 0$ that the incumbent provides when he decides to forgo re-election, and that $\theta \leq \theta_p^*$. Consider an increment in income taxes (t) that still leaves $\theta \leq \theta_p^*$.*

a) *The increment in income taxes positively affects voters political demands (k_p^*) if and only if $\frac{\partial\tau(y_p,t)}{\partial t} < 0$, and negatively affects voters political demands if and only if $\frac{\partial\tau(y_p,t)}{\partial t} > 0$.*

b) *If voters are income politically uncompensated, the increment in income taxes*: (i) *positively affects the provision of public goods if and only if* $\frac{\partial\tau(y_p,t)}{\partial t} < 0$; (ii) *negatively affects the provision of public goods if and only if* $\frac{\partial\tau(y_p,t)}{\partial t} > 0$.

c) *If voters are income politically compensated, the increment in income taxes*: (i) *positively affects the provision of public goods if and only if* $\frac{\partial\tau(y_p,t)}{\partial t} > 0$; (ii) *negatively affects the provision of public goods if and only if* $\frac{\partial\tau(y_p,t)}{\partial t} < 0$.

d) *If voters are income politically invariant, an increment in income taxes does not affect the provision of public goods.*

e) *Corollary 1 still holds.*

Three main novelties emerge under the current intermediate deviating policy rule. First, voters' political demands are positively affected by an increment in income taxes if and only if the pivotal voter is poor enough such that his disposable income increases as t increases. This happens because the only effect of taxes on p's outside utility level is through his disposable income. Second, whether total tax revenues increase or decrease after an increment in taxes is irrelevant to anticipate how the provision of public goods is affected by such an increment. This happens because under the current deviating policy rule, voters do not update the minimum level of public goods $\widetilde{G}$ when income taxes change. Consequently, only voters' political order and whether p's disposable income increases or decreases after the increment in income taxes matter. Except for the requirement on total tax revenues, the results and the intuition behind these are similar to that obtained and explained under the baseline non-confiscatory policy rule. Finally, the change in total tax revenues due to an increment in income taxes only matters to know how incumbent's efforts change after an increment these taxes. Same as before, an increment in the provision of public goods generated by an increment in income taxes does not guarantee that incumbent's efforts will increase.

5.3 Elastic labor supply.

Up to now, we have assumed that voters derive no utility from leisure. We relax this assumption in this section. Our labor supply analysis is based on previous works that have studied individuals' labor supply in the presence of public goods (Wildasin, 1984; Gahvari, 1986 and 1991; Sknow and Waren, 1989). We exhaustively develop the model and its results in Appendix B. Here, we present the main changes in the model and the main results.

Consider now that each voter i is characterized by his skill level s_i. Voters' skills are continuously distributed in the population according to a continuous cumulative distribution function $\Gamma(s_i)$ with support $[s_1, s_2]$. Each voter is endowed with a unit of time to allocate between leisure (l_i) and labor supply ($h_i = 1 - l_i$). Voters' preferences are now represented by $u(x_i, l_i, G)$, with $\frac{\partial u}{\partial l_i} > 0$, $\frac{\partial^2 u}{\partial^2 l_i} < 0$. The other properties of the utility function keep the same. Voter i's budget constraint is similar as before, $x_i = y_i - \tau(y_i, t)$. Nevertheless, now $y_i = s_i h_i$, and, consequently, the tax function is now a function of labor supply. Total tax revenues are given by $T = \int_{s_1}^{s_2} \tau(s_i h_i, t)\, d\Gamma(s_i)$. The rest of the model remains the same as before.

The interior equilibrium condition for each i's labor supply is given by $s_i \frac{\partial u\left(y_i^{d*}, G\right)}{\partial x_i}\left(1 - \frac{\partial \tau}{\partial y_i}\right) = \frac{\partial u\left(y_i^{d*}, G\right)}{\partial l_i}$, where $y_i^{d*} = s_i h_i^* - \tau(.)$, and h_i^* is represents each voter's optimal labor supply. To simplify the exposition, we assume that $h_i^* > 0$ for every i, thus each i's labor supply is characterized by this interior condition. Therefore, each voter i's labor supply in equilibrium can be written as $h_i^* = h(s_i, t, G)$. We impose the following important assumption.

Assumption 4. Labor supply and the provision of public goods are "ordinary independent" (Wildasin, 1984; and Sknow and Waren, 1989). This implies that $\frac{\partial h_i^*}{\partial G} = 0$.

We impose this assumption to concentrate ourselves in the effect of taxation on our outcomes of interest, when labor supply is elastic. Imposing any extra assumptions on whether the provision of public goods positively or negatively affects both individual and aggregate labor supply is beyond the scope of this extension. Clearly, imposing this assumption simplifies a lot the individuals' labor supply decisions in our framework. In particular, "ordinary independence" implies that h_i^* is the same regardless of whether the incumbent satisfies or not voters' political demands. Furthermore, this implies that total collected tax revenues T are not affected by the incumbent's provision of public goods, as labor supply is not affected by this provision. Proposition 9 states the main result.

Proposition 9. *Assume that labor supply and the provision of public goods are ordinary* *independent and that* $\theta \leq \theta_p^*$. *Consider an increment in income taxes* (t) *that still leaves* $\theta \leq \theta_p^*$. *The effects of an increase in* t *on voters' political demands, incumbent's efforts, and the provision of public goods are the same as those described in Propositions* 4 *through* 6.

Proposition 9 shows that, under Assumption 4, the results obtained in section 4 still hold when labor supply is elastic. The novelty in this case is that now $\tau(y_i^*, t)$ and T can decrease even if the tax schedule is linear. Whether this happens or not depends on how aggregate labor supply changes as t increases.

6 Conclusions

Using a voting-agency model with heterogeneous voters and both a linear and a non-linear tax schedules, we have shown that only under particular circumstances an increment in income taxes positively affects voters' political demands, the provision of public goods, and the incumbent's efforts. Final results depend on the combination of three factors: whether voters are *income politically compensated*, *uncompensated* or *invariant*; whether the pivotal voter's disposable income increases or decreases as income taxes increase, which implies that voters' income level and its distribution matter; and whether total tax revenues increase or decrease as income taxes increase. Furthermore, the deviating policy rule the incumbent is able to use determines whether each of these factors plays an active role or not in determining the effect of an increment in income taxes on the aforementioned three outcomes. As we have discussed, which deviating policy rule is available to the incumbent might depend on the particular characteristics of the society regarding legal institutions and collective action.

More precisely, we obtained three main results. First, we showed that an increment in income taxes does not necessarily positively affects voters' political demands. When evaluating how to change their political demands after an increment in taxes, voters put themselves in the worst situation, i.e., that where the incumbent decides to forgo re-election and provides the minimum level of public goods according to the deviating policy rule available. If the utility voters receive in this situation (outside utility) decreases after the increment in taxes, voters reduce their political demands in order to reduce the probability of not being pleased by the incumbent. The opposite happens when this outside utility level increases.

Under a non-confiscatory policy rule, the change in this outside utility depends on the combination of both how the pivotal voter's disposable income changes, and how the minimum level of public good provided by the incumbent under this rule changes as income taxes increase. The former can increase or decrease depending on whether the pivotal voter is poor enough or not, and the former increase if and only if the total tax revenues increase after the increment in taxes. These results are different if the deviating policy rule available to the incumbent changes. On the one hand, if the incumbent is able to use a "Leviathan" deviating policy rule, income taxes have no effect on voters' political demands. This happens because in this case voters' outside utility is always constant and does not depend on income taxes. On the other hand, if the incumbent is able to use an intermediate deviating policy rule in which the minimum provision of public goods is not affected by income taxes, an increment in these taxes will positively affect voters' political demands if and only if the pivotal voter's is poor enough such that his disposable income is positively affected by the change in taxes.

Second, we show that under a non-confiscatory deviating policy rule voters' political order critically determines how an increment in income taxes affects the provision of public goods. Nevertheless, voters' income political order does not matter for this result under a "Leviathan" policy rule. Under the former rule, if voters are *income politically uncompensated*, an increment in income taxes positively affects the provision of public goods if both the pivotal voter is poor enough, such that his disposable income increases as income taxes increase; and the total tax revenues increase as income taxes increase. As we claimed, this two conditions are more likely to be observed in a poor and unequally distributed society. Therefore, tax progressivity through in-kind transfers to poor voters can be useful to improve the provision of public goods in these societies. Whether rich voter's demands for public goods are larger or smaller than respective poor voter's demands in this type of societies is an open issue that should be empirically addressed. Nevertheless, if voters are *income politically compensated*, an increment in income taxes positively affects the provision of public goods if both the pivotal is rich enough, such that his disposable income decreases as income taxes increase; and the total tax revenues increase as income taxes increase. As we claimed, this can be the case of a middle or high income society with not particularities in its income distribution. Finally, if voters are *income politically invariant*, an increment in income taxes positively affects the provision of public goods if and only if total tax revenues increase after the increment in income taxes, regardless of the pivotal voters' level of income. This implies that in this case neither income level nor its distribution matter. These results are similar when the deviating policy rule available to the incumbent is an intermediate one, except that in this case how total tax revenues change as income taxes increase does not play any role.

As said above, voters' income political order does not matter to anticipate the effect of taxes on the provision of public goods under a "Leviathan" deviating policy rule. Actually, only how pivotal voters' disposable income changes as income taxes increase matters under this rule. The provision of public goods will increase if and only if the pivotal voter is rich enough, such that his disposable income decreases after the increment in taxes. Since a "Leviathan" rule is more likely to observe in poor societies (with a poor enough pivotal voter), this is quite likely that in this case more income taxes are useless to increase the provision of public goods.

Finally, we show that an increment in the provision of public goods generated by an increment in income taxes does not necessarily imply an increment in the incumbent's efforts (i.e., a decrease in the rents extracted by incumbents). If the increment in income taxes generates an increment in total tax revenues, the incumbent might increase his rents (relative to total tax revenues) even if he decides to provide more public goods. This result holds regardless of the deviating policy rule available to the incumbent.

Our findings put forward an important issue that should be taking into account when designing national income tax policies. If there are suitable conditions, more income tax progressivity not only will reduce the degree of inequality but also might positively affect the provision of public goods. However, if the conditions are not suitable, more taxation not only implies a loss in efficiency but also a cost in terms of less provision of public goods. These benefits of progressivity have not been taken into account in the literature on optimal taxation.

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Appendix A

Proof of Lemma 1. Condition (1) follows from the fact that at price θ_1, this is required that $r_p(\theta_1) > r_E(\theta_1) - R$. Condition (2) follows from the fact that at price θ_2, this is required that $r_p(\theta_2) < r_E(\theta_2) - R$. Since $\frac{\partial^2 r_p}{\partial \theta^2} = \frac{\partial^2 r_E}{\partial \theta^2} = 0$, these two conditions imply that $\frac{\partial r_p}{\partial \theta} < \frac{\partial r_E}{\partial \theta}$. Therefore, there is a unique $\theta_p \in (\theta_1, \theta_2)$ such that $r_p > r_E - R$ if $\theta < \theta_p$, and $r_p < r_E - R$ if $\theta > \theta_p$.

Proof of Lemma 2. Evaluating each voter's optimal reservation utility level in his indirect utility function, we get $u\left(y_i^d, \frac{T-r_i}{\theta_i^*}\right) = k_i^*$. Using envelop arguments, it follows that $\frac{\partial k_i^*}{\partial \theta_i^*} = -\frac{\partial u(.)}{\partial G} \frac{T-r_i}{\theta_i^{*2}} < 0$.

Proof of Proposition 1.

a) Keeping constant the distribution of income and, consequently, T; this follows from Equation 6 that:

$$\left.\frac{\partial \theta_i^*}{\partial y_i}\right|_T = \frac{\phi\left(\theta_i^*\right)}{\partial^2 E(u)/\partial \theta_i^{*2}} \frac{\partial u\left(y_i^d, \widehat{G}\right)}{\partial x_i}\left(1 - \frac{\partial \tau}{\partial y_i}\right) \qquad (1A)$$

Since $\frac{\partial^2 E(u)}{\partial \theta_i^{*2}} < 0$ at the optimal point (see footnote 10), and, by Assumption 1, $\frac{\partial \tau}{\partial y_i} < 1$, this follows that $\left.\frac{\partial \theta_i^*}{\partial y_i}\right|_T < 0$. Therefore, this follows from Lemma 2 that $\left.\frac{\partial k_i^*}{\partial y_i}\right|_T = \frac{\partial k_i^*}{\partial \theta_i^*}\left.\frac{\partial \theta_i^*}{\partial y_i}\right|_T >$ 0.

b) If the incumbent just satisfies voter i's reservation utility level, his rents r_i are implicitly defined as:

$$u\left(y_i^d, \frac{T - r_i}{\theta}\right) = k_i^* \qquad (2A)$$

Define $G_i = \frac{T - r_i}{\theta}$, i.e., G_i is the provision of public goods required to just satisfy voter i. Keeping constant the distribution of income, and, consequently, T; it follows from Equation $2A$ that $\left.\frac{\partial r_i}{\partial y_i}\right|_T = \frac{\theta}{\partial u\left(y_i^d, G_i\right)/\partial G}\left[\frac{\partial u\left(y_i^d, G_i\right)}{\partial x_i}\left(1 - \frac{\partial \tau(y_i,t)}{\partial y_i}\right) - \left.\frac{\partial k_i^*}{\partial y_i}\right|_T\right]$. Since $\frac{\theta}{\partial u(.)/\partial G} > 0$, the sign of $\left.\frac{\partial r_i}{\partial y_i}\right|_T$ depends on the sign of the term in brackets. Therefore, $\left.\frac{\partial r_i}{\partial y_i}\right|_T < 0$, and, consequently, $\left.\frac{\partial G_i}{\partial y_i}\right|_T > 0$, if and only if $\left.\frac{\partial k_i^*}{\partial y_i}\right|_T > \frac{\partial u\left(y_i^d, G_i\right)}{\partial x_i}\left(1 - \frac{\partial \tau(y_i,t)}{\partial y_i}\right)$.

c) Using the result in (b), this follows that $\left.\frac{\partial r_i}{\partial y_i}\right|_T < 0$, and, consequently, $\left.\frac{\partial G_i}{\partial y_i}\right|_T > 0$, if and only if $\left.\frac{\partial k_i^*}{\partial y_i}\right|_T < \frac{\partial u\left(y_i^d, G_i\right)}{\partial x_i}\left(1 - \frac{\partial \tau(y_i,t)}{\partial y_i}\right)$.

d) Using the result in (b), this follows that $\left.\frac{\partial r_i}{\partial y_i}\right|_T = 0$, and, consequently, $\left.\frac{\partial G_i}{\partial y_i}\right|_T = 0$, if and only if $\left.\frac{\partial k_i^*}{\partial y_i}\right|_T = \frac{\partial u\left(y_i^d, G_i\right)}{\partial x_i}\left(1 - \frac{\partial \tau(y_i,t)}{\partial y_i}\right)$.

Proof of Proposition 2.

Since $F(.)$ is a continuous function, there exists a voter with income y_p, such that $F(y_p) = 1/2$. Furthermore, if the incumbent just satisfies voter p, he must provide G_p such that $u\left(y_p^d, G_p\right) = k_p^*$.

First, assume that all voters are *income politically uncompensated.* This follows from Proposition 1(b) that $G_p > G_i$ for all voters i with $y_i < y_p$. From the properties of the utility function, this follows that $u\left(y_i^d, G_p\right) > u\left(y_i^d, G_i\right) = k_i^*$ for all these voters. Therefore, if the incumbent just satisfies voter p's reservation utility level, he also satisfies all those voters i with $y_i < y_p$. Then voter p is pivotal.

Second, assume that all voters are *income politically compensated.* This follows from Proposition 1(c) that $G_p > G_i$ for all voter i with $y_i > y_p$. From the properties of the utility function, this follows that $u\left(y_i^d, G_p\right) > u\left(y_i^d, G_i\right) = k_i^*$ for all these voters. Therefore, if the incumbent just satisfies voter p's reservation utility level, he also satisfies those voters i with $y_i > y_p$. Then voter p is pivotal.

Finally, assume that all voters are *income politically invariant.* This follows from Proposition 1(d) that $G_p = G_i = G$ for all voters. Therefore, if the incumbent just satisfies p's reservation utility level, he also satisfies all voters. Then voter p, and actually, all voters, are pivotal.

Proof of Proposition 3. It follows from the analysis in the text.

Proof of Proposition 4.

a) Assume that $\theta \leq \theta_p^*$, and consider an increase in t that still leaves $\theta \leq \theta_p^*$. Equation 7 implicitly defines θ_p^* as a function of t. This follows from this equation that:

$$\frac{\partial \theta_p^*}{\partial t} = \frac{\phi\left(\theta_p^*\right)}{\partial^2 E(u)/\partial^2 \theta_p^*} \frac{\partial u\left(y_p^d, \widehat{G}\left(T\right)\right)}{\partial t} \tag{3A}$$

Since $\frac{\partial^2 E(u)}{\partial^2 \theta_i^*} < 0$ at the optimal point, it follows that $\frac{\partial \theta_p^*}{\partial t} < 0$, and, consequently, $\frac{\partial k_p^*\left(\theta_p^*\right)}{\partial t} > 0$, if and only if $\frac{\partial u\left(y_p^d, \widehat{G}(.)\right)}{\partial t} > 0$.

b) Inequality 8 follows from the fact that:

$$\frac{\partial u\left(y_p^d, \widehat{G}\left(T\right)\right)}{\partial t} = -\frac{\partial u\left(y_p^d, \widehat{G}\left(T\right)\right)}{\partial x} \frac{\partial \tau(y_p, t)}{\partial t} + \frac{\partial u\left(y_p^d, \widehat{G}\left(T\right)\right)}{\partial \widehat{G}} \frac{\partial \widehat{G}}{\partial T} \frac{\partial T}{\partial t} \tag{4A}$$

where $\frac{\partial \widehat{G}}{\partial T}=\frac{1}{\theta_2}\frac{\partial T}{\partial t}$. Reorganizing terms in Inequality 8, we obtain Inequality 9.

Proof of Proposition 5. The equilibrium incumbent's rents when $\theta \leq \theta_p^*$ are given by Equation 3. Applying the implicit function theorem and manipulating algebraically, it follows that:

$$\frac{\partial r_p^*}{\partial t}=\frac{\theta}{\partial u\left(y_p^d, G^*\right)/\partial G^*}\left(-\frac{\partial k_p^*\left(\theta_p^*\right)}{\partial t}-\frac{\partial u\left(y_p^d, G^*\right)}{\partial x}\frac{\partial \tau(y_p,t)}{\partial t}\right)+\frac{\partial T}{\partial t} \qquad (5A)$$

Define $\gamma^*=\frac{r_p^*}{T}$. Then, $\frac{\partial \gamma^*}{\partial t}=\frac{\frac{\partial r_p^*}{\partial t}T-\frac{\partial T}{\partial t}r_p^*}{T^2}$. Plugging Equation $5A$ into this derivative and reorganizing terms, we obtain:

$$\frac{\partial \gamma^*}{\partial t}=\frac{\frac{\theta}{\partial u\left(y_p^d,G^*\right)/\partial G}\left(-\frac{\partial k_p^*\left(\theta_p^*\right)}{\partial t}-\frac{\partial u\left(y_p^d,G^*\right)}{\partial x}\frac{\partial \tau(y_p,t)}{\partial t}\right)+\left(1-\gamma^*\right)\frac{\partial T}{\partial t}}{T} \qquad (6A)$$

The sign of $\frac{\partial \gamma^*}{\partial t}$ is the same as the sign of the term in the numerator of Equation $6A$. Inequality 10 follows from this fact.

Proof of Proposition 6.

a) when $\theta \leq \theta_p^*$, this follows from Equation 4 that:

$$\frac{\partial G^*}{\partial t}=\frac{1}{\theta}\left[\frac{\partial T}{\partial t}-\frac{\partial r_p^*}{\partial t}\right] \qquad (7A)$$

Plugging Equation $5A$ into Equation $7A$, we get:

$$\frac{\partial G^*}{\partial t}=\frac{1}{\partial u\left(y_p^d, G^*\right)/\partial G}\left(\frac{\partial k_p^*\left(\theta_p^*\right)}{\partial t}+\frac{\partial u\left(y_p^d, G^*\right)}{\partial x}\frac{\partial \tau(y_p,t)}{\partial t}\right) \qquad (8A)$$

Thus, $sign\left(\frac{\partial G^*}{\partial t}\right)=sign\left(\frac{\partial k_p^*(.)}{\partial t}+\frac{\partial u\left(y_p^d,G^*\right)}{\partial x}\frac{\partial \tau(y_p,.)}{\partial t}\right)$. Inequality 11 follows from this fact.

b) By definition, we know that if voters are *income politically uncompensated* then $\left.\frac{\partial k_p^*}{\partial y_p}\right|_T>\frac{\partial u\left(y_p^d,G^*\right)}{\partial x_p}\left(1-\frac{\partial \tau}{\partial y_p}\right)$. Using the chain rule, this follows that $\left.\frac{\partial k_p^*}{\partial y_p}\right|_T=\frac{\partial k_p^*(.)}{\partial \theta_p^*}\left.\frac{\partial \theta_p^*}{\partial y_p}\right|_T$.

Plugging Equation $1A$ into this derivative we obtain:

$$\left.\frac{\partial k_p^*}{\partial y_p}\right|_T = A\frac{\partial u\left(y_p^d, \widehat{G}\right)}{\partial x_p}\left(1 - \frac{\partial \tau(y_p, t)}{\partial y_p}\right) \qquad (9A)$$

where $A = \frac{\partial k_p^*(.)}{\partial \theta_p^*}\frac{\phi\left(\theta_p^*\right)}{\partial^2 E(u)/\partial \theta_p^{*2}}$. Since $\frac{\partial k_p^*(.)}{\partial \theta_p^*} < 0$, and $\frac{\partial^2 E(u)}{\partial \theta_p^{*2}} < 0$, then, $A > 0$. Plugging the right-hand side term in Equation $9A$ into the inequality that defines *income politically uncompensated* voters and reorganizing terms, this follows that voters are *income politically uncompensated* if $B = -A\frac{\partial u\left(y_p^d, \widehat{G}\right)}{\partial x_p} + \frac{\partial u\left(y_p^d, G^*\right)}{\partial x_p} < 0$.

Consider now the term in parentheses in Equation $8A$, which as said above, determines the sign of $\frac{\partial G^*}{\partial t}$. Using the chain rule, this follows that $\frac{\partial k_p^*(.)}{\partial t} = \frac{\partial k_p^*(.)}{\partial \theta_p^*}\frac{\partial \theta_p^*(.)}{\partial t}$. Plugging Equation $4A$ into Equation $3A$, and plugging the resulting expression in this derivative, this follows that $\frac{\partial k_p^*(.)}{\partial t} = A\left[-\frac{\partial u\left(y_p^d, \widehat{G}(T)\right)}{\partial x}\frac{\partial \tau(y_p^d, t)}{\partial t} + \frac{\partial u\left(y_p^d, \widehat{G}(T)\right)}{\partial \widehat{G}}\frac{1}{\theta_2}\frac{\partial T}{\partial t}\right]$. Reorganizing terms in this expression, we get:

$$\frac{\partial k_p^*\left(\theta_p^*\right)}{\partial t} + \frac{\partial u\left(y_p^d, G^*\right)}{\partial x}\frac{\partial \tau(y_p, t)}{\partial t} = B\frac{\partial \tau(y_p^d, t)}{\partial t} + A\frac{1}{\theta_2}\frac{\partial T}{\partial t} \qquad (10A)$$

The left-hand side term in Equation $10A$ corresponds to the term in parentheses in Equation $8A$. The results in Proposition 6(b) follow from Proposition 6(a), the right-hand side term in Equation $10A$, the fact that $B < 0$ if voters are *income politically uncompensated,* and $A > 0$.

c) By definition, we know that if voters are *income politically compensated* then $\left.\frac{\partial k_p^*}{\partial y_p}\right|_T < \frac{\partial u\left(y_p^d, G^*\right)}{\partial x_p}\left(1 - \frac{\partial \tau}{\partial y_p}\right)$. Following the same reasoning used in (b), this follows that $B > 0$ if voters are *income politically compensated.* The results in Proposition 6(c) follow from Proposition 6(a), the right-hand side term in Equation $10A$, the fact that $B > 0$ if voters are *income politically uncompensated,* and $A > 0$.

d) By definition, we know that if voters are *income politically invariant* then $\left.\frac{\partial k_p^*}{\partial y_p}\right|_T = \frac{\partial u\left(y_p^d, G^*\right)}{\partial x_p}\left(1 - \frac{\partial \tau}{\partial y_p}\right)$. Following the same reasoning used in (b), this follows that $B = 0$ if voters are *income politically invariant.* The results in Proposition 6(d) follow from Proposition 6(a), the right-hand side term in Equation $10A$, fact that $B = 0$ if voters are *income politically invariant*, and $A > 0$.

Proof of Corollary 1. Using Equation $8A$, Equation $6A$ can be written as:

$$\frac{\partial \gamma^*}{\partial t} = \frac{-\theta \frac{\partial G^*(.)}{\partial t} + (1-\gamma^*)\frac{\partial T}{\partial t}}{T} \tag{11A}$$

Therefore, the sign of $\frac{\partial \gamma^*}{\partial t}$ is the same as the sign of the right-hand side term in the numerator of Equation $11A$. The result in Corollary 1 follows from this.

Proof of Proposition 7. Assume that the incumbent follows a "Leviathan" deviating policy rule when he decides to forgo re-election.

a) We know from the discussion in the text that in this case $k_i^* = k^*$ for every i. This does not imply that every voter requires of the same provision of public goods to be satisfied. Assume that there is a voter p such that $u\left(y_p^d, G_p\right) = k^*$. Consider a voter i with $y_i^d > y_p^d$. From the properties of the utility function and from Assumption 1, this follows that $u\left(y_i^d, G_p\right) > u\left(y_p^d, G_p\right) = k^*$. Thus, all those voters i with $y_i^d > y_p^d$ vote for the incumbent re-election if he satisfies voter p. Following the same reasoning, all those voters i with $y_i^d < y_p^d$ vote for the challenger. Therefore, incumbent must satisfies voter p, defined as the one whose income satisfies $F(y_p) = \frac{1}{2}$, to guarantee his re-election.

Assume that $\theta \leq \theta^*$. Consider an increase in t that still leaves $\theta \leq \theta^*$.

b) It follows from the analysis in the text.

c) Using the result in the proof of Proposition 5 and the result in Proposition 7(b), Equation $5A$ reduces to $\frac{\partial r_p^*}{\partial t} = -\frac{\theta}{\partial u\left(y_p^d, G^*\right)/\partial G}\frac{\partial u\left(y_p^d, G^*\right)}{\partial x}\frac{\partial \tau(y_p, t)}{\partial t} + \frac{\partial T}{\partial t}$. Using this expression and Equation $7A$, this follows that $\frac{\partial G^*}{\partial t} = \frac{1}{\partial u\left(y_p^d, G^*\right)/\partial G}\frac{\partial u\left(y_p^d, G^*\right)}{\partial x}\frac{\partial \tau(y_p, t)}{\partial t}$. Since all marginal utilities in $\frac{\partial G^*}{\partial t}$ are positive, this follows that $sign\left(\frac{\partial G^*}{\partial t}\right) = sign\left(\frac{\partial \tau(y_p, t)}{\partial t}\right)$.

d) The result follows from using the expression for $\frac{\partial G^*}{\partial t}$ in (c) and the same reasoning used in the proof of Corollary 1.

Proof of Proposition 8. Assume that the incumbent provides a fixed level of public goods $\widetilde{G} > 0$ when he decides to forgo re-election, and that $\theta \leq \theta_p^*$. Consider an increase in t that still leaves $\theta \leq \theta_p^*$.

a) The effect of an increment in t on θ_p^* is given by:

$$\frac{\partial \theta_p^*}{\partial t} = -\frac{\phi\left(\theta_p^*\right)}{\partial^2 E(u)/\partial^2 \theta_p^*} \frac{\partial u\left(y_p^d, \widehat{G}\left(T\right)\right)}{\partial x} \frac{\partial \tau(y_p, t)}{\partial t} \qquad (12A)$$

Since $\frac{\partial^2 E(u)}{\partial^2 \theta_i^*} < 0$ at the optimal point, this follows that $\frac{\partial \theta_p^*}{\partial t} < 0$, and, consequently, $\frac{\partial k_p^*\left(\theta_p^*\right)}{\partial t} > 0$, if and only if $\frac{\partial \tau(y_p,t)}{\partial t} < 0$, and vise-versa.

b) It can be verified that the effect of t on G^* is still given by Equation $8A$. The only difference is that now, $\frac{\partial \theta_p^*}{\partial t}$ is given by Equation $12A$ rather than by Equation $3A$ (plugging $4A$ into this). This is also true that if voters are *income politically uncompensated* then, $B = -A\frac{\partial u\left(y_p^d, \widehat{G}\right)}{\partial x_p} + \frac{\partial u\left(y_p^d, G^*\right)}{\partial x_p} < 0$. Following same steps used in the proof of Proposition 6(b), we have now that:

$$\frac{\partial k_p^*\left(.\right)}{\partial t} + \frac{\partial u\left(y_p^d, G^*\right)}{\partial x} \frac{\partial \tau(y_p, t)}{\partial t} = B \frac{\partial \tau(y_p^d, t)}{\partial t} \qquad (13A)$$

From Equation $8A$ this follows that $\frac{\partial G^*}{\partial t} > 0$ if and only if $\frac{\partial \tau(y_p^d,t)}{\partial t} < 0$, and vise-versa.

c) This is still true that if voters are *income politically compensated* then, $B > 0$. From Equations $8A$ and $13A$, this follows that $\frac{\partial G^*}{\partial t} > 0$ if and only if $\frac{\partial \tau(y_p^d,t)}{\partial t} > 0$, and vise-versa.

d) This is still true that if voters are *income politically invariant* then, $B = 0$. From Equations $8A$ and $13A$, this follows that $\frac{\partial G^*}{\partial t} = 0$.

e) The result follows from using Equation $8A$ and the same reasoning used in the proof of Corollary 1.

Proof of Proposition 9. See Appendix B, proof of Proposition 3B.

Appendix B: Model with elastic labor supply.

Continuing with the model presented in section 5.3, when incumbent just satisfies the pivotal voter's reservation utility level his rents are now implicitly defined by:

$$u\left(y_p^{d*}, 1-h_p^*, \frac{T-r_p}{\theta}\right) = k_p \qquad (1B)$$

where $y_p^{d*} = y_p^* - \tau\left(y_p^*, t\right)$, and $y_p^* = s_p h_p^*$. Incumbent's rents when he does not satisfy the pivotal voter's reservation utility level (r_E) are still defined as in Equation (2). Both r_p and r_E are still decreasing functions of θ. Therefore, by imposing Assumption 2, Equations 3 and 4 still represent r^* and G^*, with r_p implicitly defined as in Equation $1B$.

Lemma 2 still ensures that there is a one-to-one negative relationship between θ_i and k_i for every i. Therefore, same as before, each voter chooses θ_i to maximize his expected utility function. This objective function is now given by:

$$E(u) = \Phi\left(\theta_i\right) k_i\left(\theta_i\right) + \left(1-\Phi\left(\theta_i\right)\right) u\left(y_i^{d*}, 1-h_i^*, \widehat{G}\left(T\right)\right) \qquad (2B)$$

where $y_i^{d*} = y_i^* - \tau\left(y_i^*, t\right)$, and $y_i^* = s_i h_i^*$. The equilibrium condition that determines θ_i^* for each voter in an interior solution is now given by:

$$\frac{\partial k_i^*\left(.\right)}{\partial \theta_i^*}\Phi\left(\theta_i^*\right) = -\phi\left(\theta_i^*\right)\left[k_i^*\left(\theta_i^*\right) - u\left(y_i^{d*}, 1-h_i^*, \widehat{G}\left(T\right)\right)\right] \qquad (3B)$$

Proposition 1B. *Define* $\left.\frac{\partial k_i^*}{\partial s_i}\right|_T$ *as the change in voter i's equilibrium reservation utility as skills increase, keeping constant the distribution of skills and, consequently, total tax revenues. In equilibrium:*

a) *The reservation utility of a voter with high skills is larger than the reservation utility of a voter with low skills.*

b) *Results in Proposition* 1*(b) through* 1*(c) still hold. Now voter* i *is "income politically uncompensated" if and only if* $\left.\frac{\partial k_i^*}{\partial s_i}\right|_T > h_i^* \frac{\partial u\left(y_i^d, G\right)}{\partial x_i}\left(1 - \frac{\partial \tau(y_i^*, t)}{\partial y_i^*}\right)$*; "income politically compensated" if and only if* $\left.\frac{\partial k_i^*}{\partial s_i}\right|_T < h_i^* \frac{\partial u\left(y_i^d, G\right)}{\partial x_i}\left(1 - \frac{\partial \tau(y_i^*, t)}{\partial y_i^*}\right)$*; and "income politically invariant" if and only if* $\left.\frac{\partial k_i^*}{\partial s_i}\right|_T = h_i^* \frac{\partial u\left(y_i^d, G\right)}{\partial x_i}\left(1 - \frac{\partial \tau(y_i^*, t)}{\partial y_i^*}\right)$.

c) *Results in Proposition* 2 *still hold. Now the pivotal voter is defined as the one whose skill level satisfies* $F(s_p) = \frac{1}{2}$*. If all voters are "income politically uncompensated" and the incumbent just satisfies voter* p*, he also satisfies all those voters* i *with* $s_i < s_p$*. If all voters are "income politically compensated" and the incumbent satisfies voter* p*, he also satisfies all those voters* i *with* $s_i > s_p$*. If all voters are "income politically invariant" and the incumbent just satisfies voter* p*, he also satisfies all voters.*

Proof.

a) Keeping constant the distribution of skills and, consequently, T; it follows from Equation $3B$ that:

$$\left.\frac{\partial \theta_i^*}{\partial s_i}\right|_T = \frac{\phi(\theta_i^*)}{\partial^2 E(u)/\partial \theta_i^{*2}}\left[\frac{\partial u(.,.,.)}{\partial x_i}\frac{\partial y_i^*}{\partial s_i}\left(1 - \frac{\partial \tau(y_i^*, t)}{\partial y_i}\right) - \frac{\partial u(.,.,.)}{\partial l_i}\frac{\partial h_i^*}{\partial s_i}\right] \qquad (4B)$$

where $u(.,.,.) = u\left(y_i^{d*}, 1 - h_i^*, \widehat{G}(T)\right)$, and $\frac{\partial y_i^*}{\partial s_i} = h_i^* + s_i \frac{\partial h_i^*}{\partial s_i}$. Reorganizing terms and using voter i's optimal labor supply condition, Equation $4A$ reduces to:

$$\left.\frac{\partial \theta_i^*}{\partial s_i}\right|_T = \frac{\phi(\theta_i^*)}{\partial^2 E(u)/\partial \theta_i^{*2}}\frac{\partial u(.,.,.)}{\partial x_i} h_i^*\left(1 - \frac{\partial \tau(.)}{\partial y_i}\right) \qquad (5B)$$

This follows from Assumption 1 that $\phi(\theta_i^*)\frac{\partial u(.)}{\partial x_i} h_i^*\left(1 - \frac{\partial \tau(.)}{\partial y_i}\right) > 0$ for $h_i^* > 0$. Since $\frac{\partial^2 E(u)}{\partial \theta_i^{*2}} < 0$ at the optimal point, this follows that $\left.\frac{\partial \theta_i^*}{\partial s_i}\right|_T < 0$. Furthermore, this follows from Lemma 2 that $\left.\frac{\partial k_i^*}{\partial s_i}\right|_T > 0$.

b) If the incumbent just satisfies voter i's equilibrium reservation utility level, his rents

(r_i) are given by:

$$u\left(y_i^{d*}, 1-h_i^*, \frac{T-r_i}{\theta}\right) = k_i^* \qquad (6B)$$

Keeping constant the distribution of skills and, consequently, T; it follows from Equation $6B$ that:

$$\left.\frac{\partial r_i}{\partial s_i}\right|_T = \frac{\theta}{\partial u/\partial G}\left[\frac{\partial u\,(.)}{\partial x_i}\frac{\partial y_i^*}{\partial s_i}\left(1-\frac{\partial \tau\,(y_i^*, t)}{\partial y_i}\right) - \frac{\partial u}{\partial l_i}\frac{\partial h_i^*\,(.)}{\partial s_i} - \left.\frac{\partial k_i^*}{\partial s_i}\right|_T\right] \qquad (7B)$$

Reorganizing terms and using the optimal labor supply, Equation $7B$ reduces to:

$$\left.\frac{\partial r_i}{\partial s_i}\right|_T = \frac{\theta}{\partial u/\partial G}\left[\frac{\partial u\,(.)}{\partial x_i}h_i^*\left(1-\frac{\partial \tau\,(.)}{\partial y_i}\right) - \left.\frac{\partial k_i^*}{\partial s_i}\right|_T\right] \qquad (8B)$$

Since $\frac{\theta}{\partial u/\partial G} > 0$, the sign of $\left.\frac{\partial r_i}{\partial s_i}\right|_T$ depends on the sign of the term in brackets. As before, define $G_i = \frac{T-r_i}{\theta}$, which is the provision of public goods required to just satisfy voter i. Therefore, $\left.\frac{\partial r_i}{\partial s_i}\right|_T < 0$, and, consequently, $\left.\frac{\partial G_i}{\partial s_i}\right|_T > 0$, if and only if $\left.\frac{\partial k_i^*}{\partial s_i}\right|_T > \frac{\partial u(.)}{\partial x_i}h_i^*\left(1-\frac{\partial \tau}{\partial y_i}\right)$. The opposite is true if and only if $\left.\frac{\partial k_i^*}{\partial s_i}\right|_T < \frac{\partial u(.)}{\partial x_i}h_i^*\left(1-\frac{\partial \tau}{\partial y_i}\right)$. Finally, $\left.\frac{\partial r_i}{\partial s_i}\right|_T = 0$, and, consequently, $\left.\frac{\partial G_i}{\partial s_i}\right|_T = 0$, if and only if $\left.\frac{\partial k_i^*}{\partial s_i}\right|_T = \frac{\partial u(.)}{\partial x_i}\left(1-\frac{\partial \tau}{\partial y_i}\right)$.

c) The result is obtained by using the distribution of s_i rather than the distribution of y_i and following the same steps used in the proof of Proposition 2.

QED.

Interestingly, result in Proposition $1B$(a) is true regardless of whether y_i^* is an increasing or decreasing function of s_i.[17]. As in the baseline case, we assume that Assumption 3 holds. The equilibrium and outcomes are summarized in Proposition 2B.

Proposition 2B. *In the accountability game with elastic labor supply*:

a) *The sub-game perfect equilibrium is given by the incumbent's rents* r^*, *defined as*

[17] Literature on optimal taxation usually impose that y_i is an increasing function of s_i. This holds under the "agent monotonicity" assumption, i.e. under the assumption that $-\frac{\partial u(.)/\partial y_i}{\partial u(.)/\partial x_i}$ is a decreasing function of s_i (see Myles, 2002, pages 136-138.)

in Equation 3*, with* r_p *defined as in Equation* 1*B; and reservation utility* $k_i^*(\theta_i^*)$ *for each voter* i*, with* θ_i^* *implicitly defined as in Equation* 3*B.*

b) *If* $\theta \leq \theta_p^*$*, the incumbent satisfies the voter* p*'s demands,* $k_p^*\left(\theta_p^*\right)$*, where* p *is such that* $F(s_p) = \frac{1}{2}$*, and supplies* $G^* = \frac{T - r_p}{\theta}$*.* θ_p^* *is implicitly given by:*

$$\frac{\partial k_p^*(.)}{\partial \theta_p^*}\Phi\left(\theta_p^*\right) = -\phi\left(\theta_p^*\right)\left[k_p^*\left(\theta_p^*\right) - u\left(y_p^{d*}, 1 - h_p^*, \widehat{G}(.)\right)\right] \tag{9B}$$

In this case, the incumbent is always re-elected. If voters are income politically uncompensated, those voters with $s_i \leq s_p$ *vote for the incumbent re-election and those voters with* $s_i > s_p$ *vote for the challenger. If voters are income politically compensated,* those *voters with* $s_i \geq s_p$ *vote for the incumbent re-election and those voters with* $s_i < s_p$ *vote for the challenger. If voters are income politically invariant, all voters vote for the incumbent re-election.*

c) *If* $\theta > \theta_p^*$*, the incumbent does not satisfy voter's political demands, provides* $\widehat{G}(.)$*, and is not re-elected.*

Proof. It follows from the analysis in the text. *QED.*

As in the baseline model, to analyze how an increment in t affects voters' political demands, incumbent's efforts and the provision of public goods, we concentrate ourselves in the case where $\theta \leq \theta_p^*$.

Proposition 3B. *Assume that* $\theta \leq \theta_p^*$*, and consider an increase in income taxes* (t) *that still leaves* $\theta \leq \theta_p^*$*. The effects of this increment in taxes on voters' political demands, incumbent's efforts, and public goods provision are the same as those described in Propositions* 4 *through* 6*.*

Proof. Assume that $\theta \leq \theta_p^*$, and consider an increase in t that still leaves $\theta \leq \theta_p^*$.

Using Equation $3B$, it follows that:

$$\frac{\partial\theta_p^*}{\partial t} = \frac{\phi\left(\theta_p^*\right)}{\partial^2 E(u)/\partial^2\theta^*} \frac{\partial u\left(y_p^{d*}, 1-h_p^*, \widehat{G}\left(T\right)\right)}{\partial t} \qquad (10B)$$

where,

$$\frac{\partial u\left(.\right)}{\partial t} = \frac{\partial u\left(.\right)}{\partial x}\left[s_p \frac{\partial h_p^*}{\partial t}\left(1-\frac{\partial\tau}{\partial t}\right) - \frac{\partial\tau}{\partial t}\right] - \frac{\partial u\left(.\right)}{\partial l_p}\frac{\partial h_p^*}{\partial t} + \frac{\partial u\left(.\right)}{\partial\widehat{G}}\frac{\partial\widehat{G}}{\partial T}\frac{\partial T}{\partial t} \qquad (11B)$$

Reorganizing terms and using the equilibrium labor supply, Equation $11B$ reduces to Equation $3A$. Consequently, results in Proposition 4 still hold when individuals' labor supply is elastic.

Using Equation $6B$ to compute $\frac{\partial\gamma^*}{\partial t}$ and Equation $7A$ to compute $\frac{\partial G^*}{\partial t}$, reorganizing terms in each of these derivatives and using the equilibrium condition for labor supply, these derivatives reduce to Equations $6A$ and $8A$ respectively. Therefore, results in Propositions 5, 6 and Corollary 1 still hold when individuals' labor supply is elastic.

QED.