Transparency and Economic Policy\textsuperscript{1}

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Abstract

We provide a multiperiod model of political competition in which voters imperfectly observe the electoral promises made to other voters. Imperfect observability generates an incentive for candidates to offer excessive transfers even if voters are homogeneous and taxation is distortionary. Government spending is larger than in a world of perfect observability. Transfers are partly financed through government debt, and the size of the debt is higher in less transparent political systems. The model provides an explanation of fiscal churning, and of the choice of inefficient tools of redistribution. Furthermore, groups whose transfers are less visible receive higher transfers. The model also suggests that imperfect transparency may lead to underprovision of public goods. An implication of the model is that increasing the transparency of the political system does not unambiguously improve efficiency: transparency of transfers is beneficial but transparency of revenues can be counterproductive.
1 Introduction

The issue of (the lack of) transparency of government activity has recently received a lot of attention beyond academic circles. For instance, the IMF published a book in 2001 titled Manual on Fiscal Transparency containing recommendations on how budgetary institutions and national accounts should be organized in order to enhance transparency. The OECD published a similar volume in 2000 titled Best Practices for Budget Transparency. Fiscal transparency is perceived to be essential for informed decision making, for guaranteeing a minimal accountability, and for maintaining fiscal discipline.

The problems that may arise because of lack of transparency were recently highlighted by the major discrepancies associated with Greek fiscal accounts that appear to have been manipulated in order to gain entry into the Eurozone. Eurostat recently announced that the Greek budget deficit in 2000 was 4.1 percent of output, 3.7 percent in 2001 and 2002, and 4.6 percent in 2003. This stands in stark contrast with the figures given by Athens and relayed by Eurostat as recently as March which were 2.0 percent for 2000, 1.4 percent in 2001 and 2002, and 1.7 percent in 2003. Similar discrepancies were revealed in the case of Italy. If Eurostat can be fooled by clever accounting, what hope do ordinary voters have of making informed choices among competing parties with respect to their fiscal platforms? What are the consequences of this lack of information?

The purpose of this paper is to undertake a systematic analysis of the effects of transparency on several dimensions of government activity, and to use this analysis to provide some insights on the optimal design of fiscal institutions.1 In addition to the effect on budget deficits, we study the impact of transparency on the size and composition of government spending, for the timing, and (in)efficiency of taxation, for the distribution of transfers across interest groups in the population, and for the kind of transfers that are offered. We also investigate the question of optimal transparency of fiscal institutions. We show that the design of the optimal transparency of a fiscal system is more delicate than might be expected from the recommendations made by the IMF and by the OECD. We show that, consistently with these recommendations, the transparency of public spending is desirable. However, as long as the transparency of transfers is imperfect, we show that the transparency of revenues may be counterproductive. We also show that inefficient transfer or taxation instruments may be chosen by politicians if these instruments have transparency properties that allow for more effective campaign strategies. Furthermore, we provide a potential explanation for the puzzling phenomenon of fiscal churning. Finally, we show that lack of transparency may lead to the underprovision of public goods, and that an improvement in the transparency of transfers leads to an increase in spending on public goods and a decrease in spending on transfers.

1 Several papers have recently investigated the links between (lack of) transparency and budget deficits. For instance, see Milesi-Ferretti (2003), Shi and Svensson (2002) and Alt and Lassen (2005).
The idea that voters’ imperfect information may have an effect on policy goes back at least to Downs (1957), and has received a lot of recent attention. We focus on a basic form of imperfect information that has been largely ignored. In our model, a voter is uncertain about the amounts the transfers and taxes offered to other groups of voters. In a static environment this uncertainty need not affect voting decisions: a voter’s welfare is unaffected by what other voters receive. However, in a dynamic setting, the resources committed to other voters determine the size of government debt and hence future taxes and transfers. Therefore, current voting decisions are affected by information about the magnitude of the resources devoted to other groups in the current period. This simple channel generates a rich set of implications about government policy.

To see how imperfect information of this type may have an impact, suppose that all voters are identical, that taxation creates distortions, and that there are two identical periods. In such a world, there is no scope for government and, if voters are perfectly informed, candidates would promise to do nothing. However, if voters cannot observe what others are offered, promising nothing is no longer an equilibrium. When transfers are not observable, candidates cannot be held politically accountable for the cost of such transfers. Thus, a candidate has an incentive to secretly offer transfers to some groups: this increases the chance that the recipients vote for the candidate without affecting the voting behavior of other groups. In equilibrium then, all voters are offered transfers, and voters understand that these transfers result in deficits. When voters observe an imperfect signal of transfers made to other groups, this effect is still present but the size of these transfers and deficits decreases with the precision of the signal. Thus, more transparent governments have lower deficits and transfers.

More subtle and novel effects arise when voters’ information is of a more disaggregated nature. The first case we consider is one in which, in addition to a signal of transfers, voters receive a separate signal about taxes. We show that, due to improved smoothing of tax distortions across periods, enhanced transparency of taxes leads to more efficient financing of any exogenously fixed amount of transfer spending. However, paradoxically, the overall effect of enhanced transparency of taxes is to increase inefficiencies. This is due to the fact that transfers endogenously increase in response to the more efficient financing because of the reduction in the marginal political cost of offering such transfers. Indeed, in our model, while first period taxes are increasing in the

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2See Persson and Tabellini (2000) for a survey and Grossman and Helpman (2001) for a discussion of the literature. Several recent papers are concerned with the effects of inferior information on the ability of politician to shirk or to extract rents (e.g., Besley and Burgess (2002)). Other papers consider models with an agent of uncertain ability and discuss the effect of imperfect information on the incentives of the agent, and on screening (e.g. Prat, 2005). Stromberg (2004) discusses the role of mass media in informing voters, and shows that more informed voters obtain higher transfers. Particularly related are Shi and Svensson (2002), and Alt and Lassen (2005) that are discussed below.
transparency of revenues, the size of the deficit is independent of the transparency of revenues. Thus, in equilibrium, first period wasteful transfers rise in response to increased revenue transparency. This implication of our model should of course be interpreted with caution, but the analysis does point out a basic asymmetry in the political incentives generated by the lack of transparency of taxes, and those generated by the lack of transparency of spending.

The model also provides an explanation and an evaluation of the phenomenon of fiscal churning, i.e., “useless tax and expenditure flows which increase the size of the budget but which are mutually offsetting and thus impose an unnecessary burden.” (Musgrave and Musgrave 1988). In other words, many individuals are simultaneously taxpayers and recipients of government transfers (in various forms). These two way transactions between individuals and the public sector are inefficient since both taxes and transfers generate distortions. A Pareto-improving fiscal reform would involve netting-out these taxes and transfers so that those who are net recipients of resources would pay no taxes, and those who are net payers of resources would receive no transfers. The OECD has recently calculated the amount of fiscal churning that takes place in eleven selected OECD countries (OECD Economic Outlook 1998). According to these calculations, fiscal churning varies from 6.5% of GDP in Australia to 34.2% for Sweden. On average, the OECD reports that churning constitutes one third of all government expenditure in these countries. In our model fiscal churning emerges as an equilibrium outcome when voters are imperfectly informed. Thus, the model can explain why netting-out does not take place.

The model also allows an investigation of politicians’ incentives to choose among several alternative means of offering transfers. Different means may come with varying degrees of transparency, as well as varying degrees of inefficiency. Direct lump sum transfers are most efficient, but relatively transparent. In contrast, distorting the construction of public projects in a way that leads to rents

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3These numbers are not entirely reliable definitions of churning because they do not properly account for social insurance. However, it appears that churning is an important phenomenon. PaI (1997) made similar calculations for Canada and he estimates churning of 15.2% to 49.2% of government spending. Lindbeck (1985) and Musgrave and Musgrave (1988) note that a characteristic of modern fiscal systems is that gross transfers are much larger than net transfers. See also Tanzi and Schuknecht (2000) for a discussion of fiscal churning.

4In median voter models of redistributive politics (Roberts 1977, Meltzer and Richard 1981) netting-out of voters’ fiscal positions is not feasible by construction because very limited fiscal tools are available to the government. Everyone is a recipient of transfers and anyone with an income is a tax payer. However, these assumptions are made for reasons of tractability, and it is not clear that all churning can be attributed to constraints on fiscal tools available to governments. It seems useful to understand whether churning could emerge in a model that does not impose it via constraints on the feasible set of policies available to the government. Furthermore, it seems implausible to argue that the large degree of variation in churning across countries that has been discussed by the OECD could be explained exclusively by different constraints on the fiscal instruments. By investigating whether churning can emerge absent such constraints, we can begin to understand the role of the political process in generating such different outcomes.
for some groups is a less efficient way to transfer resources to such groups but it is probably harder for voters to figure out the true cost of these transfers. In our model, politicians favor transfers that are less transparent even if they are more inefficient. However, politicians have an incentive to choose relatively transparent means of taxation because this guarantees that each group is more easily convinced that other groups are paying a substantial amount and that therefore, the deficit is relatively small. Thus, transparency introduces an additional dimension to optimal taxation in the eyes of the politician.\textsuperscript{5} Thus, our model also delivers the prediction that politicians favor the most transparent means of raising revenues and the least transparent means of offering transfers. The reason is that both are ways to try to convince other voters that the deficit - and hence future taxes - is small.

The model also allows a study of the consequences of differential transparency across groups. If transfers to some groups are more easily detectable, such groups receive lower transfers in equilibrium. An interesting feature of this analysis is that political systems with the same \textit{average} transparency may have markedly different outcomes: candidates’ incentives are affected by the marginal groups, those with the lowest transparency. We show that this feature of the model is also consistent with the finding by Palda (1997) that fiscal churning rises with income.

Finally, we extend the model to allow for spending on public goods in order to study the effects of transparency on the composition of government spending between socially wasteful transfers and beneficial public goods. We find that imperfect transparency may lead to the underprovision of public goods. An empirical prediction of the model is that more transparent fiscal systems should have a smaller fraction of spending on transfers along with smaller deficits.

This paper contributes to the large literature on the link between fiscal institutions and fiscal performance.\textsuperscript{6} Many contributions to this literature do not provide formal models. There is however a growing formal and empirical literature that examines the link between constitutions and economics policy. See Persson and Tabellini (2003) for a survey of this literature. This paper also contributes to the literature on the political economy of budget deficits. Persson and Tabellini (2000) provide a detailed survey of this literature. Recently, a small strand of the literature has connected economic policy with the transparency of the political process. Milesi-Ferretti (2003), Shi and Svensson (2002) and Alt and Lassen (2005) obtain that higher transparency reduces incentives to accumulate debt. We discuss these papers further in Section 4.1.

\textsuperscript{5}This extension of the model is related to Coate and Morris (1995). This paper is discussed in Section 4.3.

2 Model

We build on the model of redistributive politics provided by Lindbeck and Weibull (1987) and Dixit and Londregan (1996). We depart from these authors in three ways. First, we introduce endogenous labor supply, because we must allow for distortionary taxation. Second, we study a model with two elections with an intertemporal linkage provided by debt. Finally, we introduce imperfect voter information.

We first describe the structure of the model in a static environment, and then we describe the intertemporal links between periods.

2.1 Economy

There is a unit measure of voters living in an economy where there is a single consumption good. Each voter has the same utility function $u(c - \gamma(l))$ over consumption $c$ and labor $l$, where $u$ is, strictly increasing and concave, $\gamma$ is strictly increasing and convex. Both $u$ and $\gamma$ are assumed to be differentiable three times.7 We assume that all workers receive the same wage which is normalized to 1.8

A voter who receives a lump-sum transfer $y$ and pays taxes on labor income according to a proportional rate $t$ faces the following budget constraint

$$c = y + (1 - t)l.$$  

(1)

Each voter chooses $c$ and $l$ to maximize $u(c - \gamma(l))$ subject to (1). Thus, labor supply $l(t)$ is given by

$$\gamma'(l(t)) = 1 - t$$

Let $U(y, t) = u(c - \gamma(l(t)))$ be the voter’s indirect utility function over taxes and transfers. Note that taxes are distortionary, as they are levied on the labor income.9

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7 This specific form of separability between consumption and labor is assumed mainly because it simplifies the derivation of some properties of the equilibrium. A more general utility function would complicate the analysis but should not change the substance of the results.

8 Extending the model to heterogenous wages is straightforward. Most of our results would not be substantially affected by heterogeneous wages.

9 Assuming that taxes are proportional to income simplifies the analysis. All that is needed for the substance of our results is that distortions from taxation are convex in the amount that is raised from a given group. To allow for nonlinear taxes, we would have to enrich the taxation side of the model with privately observed abilities for voters, and with choices of optimal taxes a’ la Mirlees for politicians.
2.2 Politics

Voters are divided into groups indexed by \( i \in \{1,2,...,N\} \). We assume for simplicity that each group has the same mass of individuals \( 1/N \).10 In addition to ‘material’ preferences, voters also have ideological preferences over two candidates, denoted by \( R \) and \( L \). Each voter in group \( i \) is endowed with a personal ideological parameter \( x \), which captures the additional utility that the citizen enjoys if party \( R \) is elected. For each individual, \( x \) is the realization of an independent draw of a random variable \( X_i \). This ideological parameter is meant to capture additional elements of the political platforms of the two parties which is not related to economic policy. An example would be the parties’ attitudes towards issues such as foreign policy or religious values. Candidates do not observe the ideological parameter of individual voters; they only know the distribution \( F_i \) and the density \( f_i \) of the ideology in group \( i \). Thus, candidate promises cannot depend on \( x \), although they can depend on \( i \). We assume that candidates are office motivated, so they have no interest in policy per se. Each candidate aims to maximize his vote share11 by making binding promises of taxes \( t_i \) and transfers \( y_i \) to each group of voters \( i \), subject to an aggregate balanced budget constraint. We thus assume that candidates can commit to transfers and taxes. This is an extreme assumption that simplifies the analysis. Very similar results would obtain in a model with no commitment if we instead considered an incumbent government faced with a challenger.12

We now obtain candidates’ vote shares as a function of platforms. Suppose a voter in group \( i \) with ideological preference \( x \) is promised tax rate \( t_i^L \) and transfer \( y_i^L \) by candidate \( L \) and tax rate \( t_i^R \) and transfer \( y_i^R \) by candidate \( R \). Then this voter votes for candidate \( L \) if and only if

\[
U\left(y_i^L, t_i^L\right) - U\left(y_i^R, t_i^R\right) > x
\]

Thus, the probability that voter \( i \) votes for candidate \( L \) given \( \left(y_i^L, t_i^L\right) \) and \( \left(y_i^R, t_i^R\right) \) is

\[
F_i \left(U\left(y_i^L, t_i^L\right) - U\left(y_i^R, t_i^R\right)\right).
\]

Because there are infinitely many voters in each group, \( F_i \left(U\left(y_i^L, t_i^L\right) - U\left(y_i^R, t_i^R\right)\right) \) is also the fraction of group \( i \) voters who vote for candidate \( L \). Adding up across groups, we obtain candidate \( L \)’s total vote share

\[
S_L = \frac{1}{N} \sum_{i=1}^{N} F_i \left(U\left(y_i^L, t_i^L\right) - U\left(y_i^R, t_i^R\right)\right) \tag{2}
\]

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10 This assumption simplifies the algebra but is inconsequential.

11 For the purpose of our analysis, it does not matter whether candidates only care about winning or they care about the share of the vote.

12 The model would be more complex because we would then have to introduce one of the reasons that are commonly assumed in the literature (such as inferring the government’s ability) for voters to base their decisions on the choices of the incumbent government. This additional dimension makes calculations more complex. The basic logic of our analysis should apply to such a model.
Party $R$’s vote share is $1 - S_L$.

Given candidate $R$’s platform $\left( y^R_i, t^R_i \right)_{i=1}^N$, candidate $L$ chooses $\left( y^L_i, t^L_i \right)_{i=1}^N$ that maximizes $S_L$ subject to the non-negativity constraints

$$y^L_i, t^L_i \geq 0 \text{ for all } i$$

and the aggregate budget constraint

$$\sum_{i=1}^N t^L_i \left( t^L_i \right) \geq \sum_{i=1}^N y^L_i. \tag{3}$$

As in Lindbeck and Weibull (1987), in order to guarantee existence of a pure strategy equilibrium we assume that the objective function of both candidates is strictly concave. A sufficient condition is that, for all $i$, $F_i \left( U \left( y^L_i, t^L_i \right) - U \left( y^R_i, t^R_i \right) \right)$ is concave in $y^L_i, t^L_i$, and convex in $y^R_i, t^R_i$. We refer the reader to Lindbeck and Weibull (1987) to details.

### 3 Benchmarks

#### 3.1 One Election

Let us order the group indices $i = 1, \ldots, N$ so that $f_i(0) > f_j(0)$ if and only if $i < j$. Lindbeck and Weibull (1987) show that $f_i(0)$ provides a measure of the responsiveness of group $i$ to monetary promises: the return in terms of vote share of offering one more dollar to voters in group $i$ is high if the group has a relatively high $f_i(0)$. Our ordering assumption means that lower indexed groups are more responsive. This in turn implies that parties make better promises to voters with lower $i$.

**Proposition 1** There exists a group $h > 1$ such that, all groups with $i < h$ receive positive transfers and pay no taxes, while all groups with $i \geq h$ receive no transfers and pay positive taxes.

**Proof.** See Appendix. ■

The intuition for this result is the following. As in Lindbeck and Weibull (1987), candidates have the incentive to appeal to voters who are more responsive (as measured by $f_i(0)$). Given the balanced budget constraint, the only way to offer something to highly responsive groups is to tax other voters. Thus, candidates tax groups who are not very responsive.

**Remark 1.** Note that for any given group, in this single period model, candidates either offer a transfer to a group of voters, or they tax this group; candidates never engage in fiscal churning. The reason is that if a group pays positive taxes and receives positive transfers, it is possible to increase this group’s welfare and therefore the vote share gained by the candidate from this group.
without affecting any other group. This can be done by reducing transfers and tax revenue from this group by the same amount, i.e., by netting-out the fiscal position of the group. Because taxes are distortionary, the group benefits by this netting out.

**Remark 2.** An interesting special case of Proposition 1 arises when groups are homogeneous: $f_i = f$ for all $i$. In this case, the model generates no government activity. The intuition is that, because voters are identical, and because candidates objective functions are concave in transfers, there is no gain to offering different transfers to different voters. Because taxation distorts labor supply decisions, candidates choose zero taxes and hence zero transfers.

**Remark 3.** The equilibrium outcome in a single period election is unaffected by information about offers made to other voters because conditional on the offer received by a voter, this voter’s welfare (and hence his voting decision) is independent of what is being offered to others.

### 3.2 Two elections with perfect transparency

We now move to a two period environment. Intertemporal considerations, in particular the possibility of deficit financing, are essential for an analysis of the role of transparency. In an intertemporal setting, information about offers made to other voters is important because aggregate promises have implications for the size of government debt, and debt has to be repaid out of future taxes. Thus, each voter prefers small promises to other groups as these imply lower debt. We assume that there are two periods; each period is the same as the one described in Section 2: preferences are the same in both periods, the set of voters and the set of candidates are the same at both dates and elections are held in both periods. From now on we assume that $f_i = f$ for all $i$, and that $f$ is symmetric around zero so that ideology is symmetrically distributed in the population. We assume that the government finances the debt by borrowing from abroad and we rule out the possibility of default on the debt. For expositional simplicity we assume that the interest rate is zero and there is no discounting.

The equilibrium of the second period subgame is analogous to the equilibrium of the static game described in Section 2, with the exception that budget balance requires that the debt $D$ accumulated in the first period is repaid:

$$\sum_{i=1}^{N} t_{i2}^j I \left( t_{i2}^j \right) = D + \sum_{i=1}^{N} y_{i2}^j \text{ for } j = L, R.$$ 

For the same reasons as in the static game (see Remark 3), the extent of information available to voters has no effect in this subgame. As argued in Remark 2, because groups are homogeneous, candidates transfers are zero in the second period, and the burden of the debt is divided equally
among the N homogenous groups. Thus, taxes in the second period are given by

$$t_{i2}^j \left( t_{i2}^j \right) = \frac{D}{N} \text{ for } j = L, R \text{ and for all } i$$

(4)

In the first period, the voting decision is not only based on the first period offer, but also on the total debt resulting from all offers. Suppose that a voter in group $i$ receives a first period offer \( (y_{i1}^j, t_{i1}^j) \) from party $j$. Suppose also that the voter expects his second period tax rate to be $t_{i2}^j$ if party $j$ wins in the first period (because the debt implied by candidate $j$’s first period platform has to be repaid). Given these politically determined variables, this voter chooses savings and labor supply in the two periods to maximize his intertemporal payoff. This implies that the voter equalizes utility across the two periods and that labor supply in the two periods maximizes

$$\max_{l_{i1}, l_{i2}} 2u \left( \frac{1}{2} \left( y_{i1}^j + (1 - t_{i1}^j) l_{i1}^j - \gamma \left( l_{i1}^j \right) \right) + \left( 1 - t_{i2}^j \right) l_{i2}^j - \gamma \left( l_{i2}^j \right) \right).$$

Thus, labor supply $l \left( t_{i2}^j \right)$ in period $k$ is given by

$$\gamma' \left( l \left( t_{i2}^j \right) \right) = 1 - t_{i2}^j$$

(5)

The value to a voter over two periods can be written as

$$U \left( y_{i1}^j, t_{i1}^j, t_{i2}^j \right) = 2u \left( \frac{1}{2} \left( y_{i1}^j + (1 - t_{i1}^j) l \left( t_{i1}^j \right) - \gamma \left( l \left( t_{i1}^j \right) \right) \right) + \left( 1 - t_{i2}^j \right) l \left( t_{i2}^j \right) - \gamma \left( l \left( t_{i2}^j \right) \right) \right)$$

(6)

By denoting $T_{ik}^j = t_{ik}^j l \left( t_{ik}^j \right)$, the intertemporal budget constraint can be written as:

$$\sum_{i=1}^{N} T_{i1}^j + \sum_{i=1}^{N} T_{i2}^j = \sum_{i=1}^{N} t_{i1}^j l \left( t_{i1}^j \right) + \sum_{i=1}^{N} t_{i2}^j l \left( t_{i2}^j \right) = \sum_{i=1}^{N} y_{i1}^j \text{ for } j = L, R$$

or, using the fact that, in equilibrium, second period taxes are the same for all groups,

$$\sum_{i=1}^{N} T_{i1}^j + NT_{i2}^j = \sum_{i=1}^{N} t_{i1}^j l \left( t_{i1}^j \right) + NT_{i2}^j l \left( t_{i2}^j \right) = \sum_{i=1}^{N} y_{i1}^j$$

Thus, given promises \( (y_{i1}^L, t_{i1}^L) \) and \( (y_{i1}^R, t_{i1}^R) \) a voter in group $i$ votes for candidate $L$ whenever

$$U \left( y_{i1}^L, t_{i1}^L, t_{i2}^L \right) - U \left( y_{i1}^R, t_{i1}^R, t_{i2}^R \right) > x.$$ 

(7)

Candidate $L$’s vote share is therefore given by

$$S_{L1} = \frac{1}{N} \sum_{i=1}^{N} F \left( U \left( y_{i1}^L, t_{i1}^L, t_{i2}^L \right) - U \left( y_{i1}^R, t_{i1}^R, t_{i2}^R \right) \right)$$

(8)
where $t_{L2}^i, t_{R2}^i$ are the tax rates that voters expect are necessary in the second period given the promises made by the two candidates in the first period.

When voters perfectly observe all promises made by the two candidates, and groups are homogeneous, the best thing that a candidate can promise is nothing: no transfers and no taxes.

**Proposition 2** Under perfect information, equilibrium platforms imply no government activity in both periods and no debt accumulation $(y_{Lk}^i, t_{Lk}^i) = (y_{Rk}^i, t_{Rk}^i) = (0, 0)$ for all groups $i = 1, ..., N$, and both time periods $k = 1, 2$.

Because Proposition 2 is special case of Proposition 3 we delay the proof of this result to the proof of Proposition 3. This result is a useful benchmark because it allows us to show that in our model, any government activity and debt accumulation must be due to information imperfections.\(^{13}\)

### 4 Imperfect Transparency

We now assume that for each group $i$, voters in group $i$ observe perfectly the promises made to group $i$ but only observe an imperfect signal of promises to voters in groups $j \neq i$.

#### 4.1 Transparency of expenditures: deficits and inefficiency

We first consider the case in which voters only receive an imperfect signal of expenditures, and no information about revenues. We model this imperfect signal as follows. With probability $p$ voters in group $i$ observe perfectly transfers to all other groups, and with probability $1 - p$ they receive no information about promises to other groups. Note that the only thing that matters to a voter is the aggregate debt resulting from offers to other groups and not the precise composition of those offers. Thus, this subsection we refer interchangeably to the signal revealing debt or transfers.

In the event that voters do not observe all the offers, voting decisions depend on beliefs about offers that the two candidates made to other voters (because these determine the deficit). In our simple model, without introducing some refinement, there are few restrictions that can be made on out-of-equilibrium beliefs. Thus, there are multiple equilibria. In order to eliminate this indeterminacy, we have proceeded in two complementary directions. The first direction is the one used in this section and in the rest of the paper: we make an assumption about off-equilibrium beliefs that is commonly made in the literature on vertical contracting. Specifically, from now on,\(^{13}\)

\(^{13}\)With heterogeneous groups, Proposition 1 is easily extended to two periods: if there is perfect information, the one election equilibrium characterized in Proposition 1 is replicated in both periods; in particular, there are no deficits in this case either.
we assume that all voters hold passive beliefs off equilibrium (e.g., McAfee and Schwartz, 1996; Segal, 1999): given an equilibrium platform in the first period for candidate \( J \) \( \left( \hat{y}_{i1}^j, \hat{t}_{i1}^j \right) \), if a voter in group \( k \) receives an out-of-equilibrium promise \( \left( y_{k1}^j, t_{k1}^j \right) \) from this candidate, he still believes that candidate \( J \) offers \( \left( \hat{y}_{i1}^j, \hat{t}_{i1}^j \right) \) to all other groups \( i \neq k \). We do not wish to argue that this is a particularly realistic assumption. However, it is a very convenient assumption because it delivers a unique equilibrium in a very simple way, which is useful given the fact that the focus of the analysis is on the effect of alternative information structures (the role of transparency). Furthermore, our results are robust to departures from this assumption.\(^{14}\)

The second direction we have explored in order to eliminate the indeterminacy generated by multiple equilibria is to extend the model to an environment where candidates’ platforms are communicated to voters with noise. Under a full support assumption, all relevant offers by candidates are on the equilibrium path, and therefore no refinements are necessary. Although the analysis is more elaborate, we have solved an example of this alternative model and obtained very similar results.

Denote by \( U^j \) the equilibrium utility of candidate \( j \)’s platform, and denote by \( d^j = \frac{p_i}{N} \) the per capita debt associated with candidate \( j \)’s platform. Consider the putative equilibrium platforms \( \left( y_{i1}^L, t_{i1}^L \right) \), \( \left( y_{i1}^R, t_{i1}^R \right) \) and suppose that candidate \( L \) deviates and offers a transfer of \( y_{i1}^L \) to group 1.\(^{15}\) Following the deviation, the incremental material payoff to voters in group 1 if candidate \( L \) is elected is \( U \left( y_{11}^L, t_{11}^L, t_{12}^L \left( d^L \right) \right) - U^R \), where \( d^L \) is the tax rate that ensues in the period two subgame. Thus, a voter in group 1 votes for candidate \( L \) whenever the difference in material payoffs is larger than their ideological attachment \( x \), namely, if and only if, \( U \left( y_{11}^L, t_{11}^L, t_{12}^L \left( d^L \right) \right) - U^R > x \).

For voters in groups 2, ..., \( N \), behavior depends on the realization of the signal. With probability \( 1 - p \) these voters do not observe the deviation and therefore their perceived payoffs are unchanged and voting behavior is as in the equilibrium, i.e., they vote for candidate \( L \) whenever \( U^L - U^R > x \). With probability \( p \), however, these voters observe the deviation, in which case, the difference in payoffs between the platforms offered by the two candidates is \( U \left( y_{11}^L, t_{11}^L, t_{12}^L \left( d^L \right) \right) - U^R \).

In each of these events the vote share of candidate \( L \) following the deviation is given by the fraction of voters whose ideology \( x \) is lower than the difference in the material payoffs. Thus, the expected vote share to candidate \( L \) following the deviation is proportional to

\[
F \left( U \left( y_{11}^L, t_{11}^L, t_{12}^L \left( d^L \right) \right) - U^R \right) + \left( N - 1 \right) \left( pF \left( U \left( y_{11}^L, t_{11}^L, t_{12}^L \left( d^L \right) \right) - U^R \right) + \left( 1 - p \right) F \left( U^L - U^R \right) \right)
\]

\(^{14}\)For most of our results, all that is necessary is a weaker version of passive beliefs, namely beliefs that are non pessimistic: voters should not conclude from the fact that they receive a higher than expected promise, that other groups are being promised even larger amounts.

\(^{15}\)Note that if a deviation to a single group does not pay, then a deviation to several groups does not pay either.
The first term is the vote share obtained from group 1: the group that receives the additional transfer. The second term is the vote share from the remaining $N-1$ groups in the event that they observe the deviation (with probability $p$) and the last term is the vote share when they instead do not observe the deviation (with probability $1-p$).

In period 1, candidate $L$ maximizes the expression in equation (9). As in the static model, an equilibrium can only be symmetric-symmetric, so that both candidates make the same offers to all groups in the population.

**Proposition 3** In equilibrium, candidates platforms are identical, and all voters receive the same offers.

When transparency is imperfect:

(i) For any $p < 1$ equilibrium debt is positive: $D\left(p\right) > 0$.

(ii) In the first period, transfers are positive and taxes are zero: $y_1 > 0$ and $t_1 = 0$. In the second period, transfers are zero and taxes are positive: $y_2 = 0$ and $t_2 > 0$.

(iii) If $\gamma'' > 0$, then debt and first period transfers are decreasing in $p$: more transparent systems have smaller governments, lower debt and are more efficient.

**Proof.** Throughout this and subsequent proofs, we drop the index $L$ on the deviating candidate. Whenever a variable appears without index it refers to candidate $L$.

Observe first that in equilibrium, first period taxes must be zero. To prove this, note first that the statement is obviously true if transfers are zero (it is clear that there is no gain from budget surpluses). Assume now transfers and first period taxes are strictly positive. But then a candidate could obtain more votes by reducing transfers and taxes while keeping debt unchanged. Recall that the value to the voter over two periods $U(y, t_1, t_2)$ is given by equation (6) and that aggregate revenue in period $i$ is given by $T_i = t_i l_i\left(t_i\right)$. Thus, when debt is $d$, a voter’s value function over the two periods is defined by

$$U(y, 0, t_2(y)) = 2u\left(\frac{1}{2} (y + l_1 (0) + (1 - t_2) l_2 (t_2 (d)) - \gamma (l_1 (0)) - \gamma (l_2 (t_2 (d))))\right)$$

where $y = t_2 l_2\left(t_2 (y)\right)$.

Consider a debt $d = y$ and a deviation of an additional transfer $z$ to group 1. The vote share gain for a deviating candidate is proportional to

$$F\left(U\left(y + z, 0, t_2\left(y + \frac{z}{N}\right)\right) - U^R\right) + p(N-1)F\left(U\left(y, 0, t_2\left(y + \frac{z}{N}\right)\right) - U^R\right).$$

Differentiating with respect to $z$, we obtain

$$\left(\frac{\partial U\left(y + z, 0, t_2\left(y + \frac{z}{N}\right)\right)}{\partial y} + \frac{1}{N} \frac{\partial U\left(y + z, 0, t_2\left(y + \frac{z}{N}\right)\right)}{\partial t_2} \frac{\partial t_2}{\partial y}\right) f\left(U\left(y + z, 0, t_2\left(y + \frac{z}{N}\right)\right) - U^R\right)$$

12
\[ + \frac{p(N - 1)}{N} \frac{\partial U(y, 0, t_2(y + \frac{z}{N})}{\partial t_2} \frac{\partial t_2}{\partial y} f \left( U(y, 0, t_2(y + \frac{z}{N}) - U(y, 0, t_2(y)) \right). \]

In equilibrium, this expression must be zero at \( z = 0 \). Thus, given the symmetry of platforms, the equilibrium condition can be written as:

\[ \left( \frac{\partial U(y, 0, t_2(y))}{\partial y} + \frac{1}{N} \frac{\partial U(y, 0, t_2(y))}{\partial t_2} + \frac{p(N - 1)}{N} \frac{\partial U(y, 0, t_2(y))}{\partial t_2} \right) f(0) = 0 \]

rearranging we obtain

\[ \frac{\partial U(y, 0, t_2(y))}{\partial y} = - \left( p + \frac{1 - p}{N} \right) \frac{\partial U(y, 0, t_2(y))}{\partial t_2} \frac{\partial t_2}{\partial y} \quad (11) \]

For \( p < 1 \), equation (11) requires that

\[ \frac{\partial U(y, 0, t_2(y))}{\partial y} < \left| \frac{\partial U(y, 0, t_2(y))}{\partial t_2} \right| \frac{\partial t_2}{\partial y}. \quad (12) \]

The Appendix shows that this inequality can only hold if \( t_2 > 0 \). This shows that the deficit and first period transfers are positive and therefore concludes the proof of parts (i) and (ii). Part (iii) requires more calculations and is discussed in the Appendix.

Note that for \( p = 1 \), equation (11) simplifies to

\[ \frac{\partial U(y, 0, t_2(y))}{\partial y} = - \frac{\partial U(y, 0, t_2(y))}{\partial t_2} \frac{\partial t_2}{\partial y} \]

which implies that \( y = 0 \) proving Proposition 2.  

To build an intuition for this result, let us first argue that, when \( p < 1 \), zero transfers cannot be part of an equilibrium. If transfers were zero for all groups, then each candidate would have the incentive to give a small positive transfer to one group, gaining an increase in vote share of, say, \( \Delta_1 \) from this group. This deviation is only detected with probability \( p < 1 \) by the other groups, implying a decrease in vote share in this event of some \( \Delta_2 \). For any deviation, \( \Delta_1 < \Delta_2 \) because of distortions from future taxes. However, at zero transfers, and for a small deviation, \( \Delta_1 \approx \Delta_2 \) because the distortions are of second order at zero taxes. Furthermore, the vote loss \( \Delta_2 \) ensues with probability \( p < 1 \) while the vote gain \( \Delta_1 \) occurs with probability 1, implying that transfers have to be positive in equilibrium. This reasoning lies behind the fact that equation (12) implies positive transfers. This effect captures the idea that candidates are only held partially accountable for the losses from transfers that are not perfectly observable to voters, and therefore candidates do not fully internalize such losses. This leads to an incentive for candidates to “overpromise”. In equilibrium transfers have to be such that they lead to future taxes that are sufficiently high that distortions from an additional transfer balance this incentive to overpromise. It is then clear that less transparent systems lead to larger transfers and distortions.
The result that debt is higher in less transparent political systems has recently emerged in the literature. Milesi-Ferretti (2003), Shi and Svensson (2002) and Alt and Lassen (2005) also provide models in which higher transparency reduces incentives to accumulate debt. Shi and Svensson, Alt and Lassen, and Alesina et al. (1999) also provide an empirical analysis of transparency. They look at cross-sections of countries and show that indices of transparency help predict fiscal outcomes: lower deficits are associated with better transparency.

4.2 Transparency of revenues

The previous subsection has focused on a particularly simple notion of transparency. This has allowed us to highlight the inefficiency of elections conducted without full transparency, and to obtain an interesting comparative statics result concerning debt accumulation. We now enrich the model by considering more disaggregated information. This will allow a novel analysis of optimal transparency of institutions and deliver an explanation of the phenomenon of fiscal churning. Specifically, we now assume that voters observe separate signals about aggregate transfers and aggregate taxes. Namely, voters in each group observe two signals. The first signal is the same as in the previous subsection: it reveals aggregate transfers perfectly with probability \( p \) and reveals nothing with probability \( 1 - p \). The second signal reveals aggregate tax revenues with probability \( q \) and nothing with probability \( 1 - q \).

This richer, more disaggregated information structure can give candidates an incentive to smooth taxes across periods. This is the main force that gives rise to fiscal churning.

**Proposition 4** When voters observe spending with probability \( p \) and revenues with probability \( q \), in equilibrium,

(i) Candidates’ platforms are identical, and all voters receive the same offers.

(ii) Debt and second period taxes \( t_2 \) are independent of revenue transparency \( q \).

(iii) If revenues are more transparent than transfers (i.e., \( p < q < 1 \)), then debt, first period taxes, and first period transfers are positive: \( D > 0, y_1 > 0, t_1 > 0 \). If \( q = 1 \), then \( t_1 = t_2 \). If \( q < p \), then \( t_1 = 0 \).

(iv) If \( \gamma'' \geq 0 \), then \( t_2 > t_1 > 0 \), \( t_1 \) and \( y_1 \) are increasing in \( q \), and social welfare is decreasing in \( q \).

**Proof.** See Appendix.

Relative to Proposition 3, three main phenomena highlighted by Proposition 4 are particularly worthy of elaboration. First, the possibility of fiscal churning; second, the fact that debt is independent of \( q \); third, the fact that social welfare is decreasing in the transparency of revenues.
Fiscal churning arises because of a combination of wasteful transfers and efficient tax smoothing. Consider for simplicity the case in which \( q = 1 \), i.e., the case of perfect observability of revenues. As long as \( p < 1 \), wasteful transfers arise in equilibrium for the same reason as in Proposition 3: candidates do not fully internalize the future cost of transfers since deviations are only detected with probability \( p \). Given that voters understand that candidates offer positive transfers, it cannot be the case that first period taxes are zero: for any given level of aggregate transfers, candidates have an incentive to raise first period taxes to reduce the deficit and smooth the distortions from taxation across the two periods. This is because distortions from taxation in each period are convex in the tax rate. When \( q = 1 \), tax smoothing is complete, so that taxes are the same in the two periods. When \( q < 1 \), smoothing is imperfect because first period taxes are lower than second period taxes. A necessary condition for fiscal churning to arise is that revenues are more observable than expenditures. This may seem demanding. However, Proposition 5 below shows that such a condition is likely to be endogenously satisfied when candidates can choose among several instruments of taxation and of transferring resources: candidates have the incentive to choose transparent instruments of taxation and non transparent tools for transfers.

When revenues are perfectly observable, transfers are efficiently financed by smoothing out the distortions. However, voters would clearly be better off if first period taxes could be reduced to zero and the transfers reduced accordingly. Despite this, part (ii) of Proposition 4, the equilibrium size of the debt is unaffected by \( q \) despite the fact that first period taxes are increasing in \( q \). This may be counterintuitive but there is a simple force behind this phenomenon. As in Proposition 3, for any given \( p \) the equilibrium size of the debt is determined by the necessity of sufficiently large marginal second period distortions to balance the marginal incentive for candidates to overpromise because of imperfect transparency of transfers. When revenues are observable, the possibility of smoothing taxes reduces the marginal distortion associated with any given level of aggregate transfers. Thus, to maintain equilibrium, aggregate transfers must rise to restore a sufficiently high marginal distortion.

The main policy conclusion of Proposition 4 is that, while transparency of spending is beneficial, transparency of revenues may end up being counterproductive because it reduces the marginal political cost of offering wasteful transfers. This may sound perverse: after all, the transparency of revenues leads to efficient intertemporal financing of any given pattern of expenditures. However, as we have shown in Proposition 4, this leads to even large wasteful transfers, and hence an increase in current taxation without any benefit of reduction in future taxation.

Proposition 4 may also be useful for empirical analyses of transparency. For instance, Alesina et al. (1999), Shi and Svensson (2002), and Alt and Lassen (2005) study the impact of transparency on various fiscal outcomes for a number of countries. These papers measure transparency via several
alternative indices. The logic of Proposition 4 suggests that it would be useful to decompose the indices into sub-indices of revenue transparency and spending transparency because aggregate transparency indices may lead to weaker results due to the aggregation of opposite effects from revenue and spending transparency. Unfortunately, the indices used by Alesina et al. (1999), Shi and Svensson (2002), and Alt and Lassen (2002) do not easily lend themselves to such a decomposition.

4.3 Choice of (inefficient) means of redistribution

Consider now the possibility that candidates may choose different ways of transferring resources to voters, and different ways of taxing them. Specifically, there may be some ways to transfer resources that are more transparent than others: e.g., cash versus subsidies. Analogously some taxes may be more transparent than others e.g., a sales tax may be relatively transparent while a tax on corporate profits may be quite non transparent. We now show that candidates have an incentive to choose transparent taxes and non transparent transfers.

Assume that candidates can transfer resources to each group via $J$ different tools $\{(y_1, p_1), \ldots, (y_J, p_J)\}$. Thus, each tool $y_j$ is associated with a transparency level $p_j$. Analogously there is a set of taxation instruments $\{(t_1, q_1), \ldots, (t_K, q_K)\}$, where each each tax instrument $t_k$ is associated with a transparency level $q_k$. For simplicity, we assume that each of the taxation instruments reduce to tax rates on income, otherwise we would have to introduce other factors of production which would needlessly complicate the model. Assume without loss of generality that both the set of transfer and tax instruments are ordered in increasing order of transparency, that it, $p_1 < p_2 < \cdots < p_J$, $q_1 < q_2, \cdots < q_K$. Note that we are assuming that the set of tools is the same for all groups. This assumption is relaxed in the next subsection.

Proposition 5 In equilibrium, for all groups, candidates choose $y_1$ and $t_K$: the least transparent transfer and the most transparent taxation instrument.

The proof of this result is trivial: for each group $i$, a candidate wants to minimize other groups’ perceptions of the amount of transfer offered to group $i$ and to maximize their perceptions of the revenue raised from group $i$ because these choices lead to the lowest perceived deficits.

It is easy to extend the analysis to allow for different efficiency of the instruments of taxation and transfers. For instance, one could assume that for transfer instrument $j$, every dollar invested in transfer $j$ results in $\lambda_j$ dollars received by a group. It is possible to show that relatively inefficient transfer instruments may be chosen if they have an advantage in lack of transparency. Analogously it is possible to show that inefficient taxation instruments may be chosen if they are especially
transparent. Thus, this analysis adds a transparency dimension to the calculus of optimal taxation and transfers.

Coate and Morris (1995) provide a related explanation for the choice of inefficient means of redistribution. In their model voters are uncertain about whether the incumbent is honest. If the incumbent chooses to transfer money to an interest group, then voters infer that the politician is dishonest and he is voted out of office. If instead the incumbent chooses to build a public project that might benefit an interest group, then voters remain uncertain about the incumbent’s honesty because it is assumed that there is a chance that it is in fact efficient to build the public project. Thus, politicians may choose to redistribute resources via wasteful public projects.

4.4 Heterogenous transparency across groups

We now assume that groups are characterized be different degrees of transparency. Offers to some groups are observed with a higher probability than offers to other groups. For simplicity, assume that there are two types of groups: \( N_1 \) groups are type 1 and \( N - N_1 \) are type 2. Transfers to type 1 groups are observed with probability \( p_1 \). Transfers to type 2 groups are observed with probability \( p_2 > p_1 \). Assume further that taxes are observed perfectly for all groups, i.e. \( q_1 = q_2 = 1 \). Candidates now have an incentive to offer higher transfers to type 1 groups, because these transfers are observed with lower probability, and therefore candidates are less likely to be held accountable for the costs of such transfers.

Proposition 6 In equilibrium, type 1 and type 2 voters are treated differently.

Taxes are identical for all voters. However, there is an \( M \) such that, if \( N_1 \geq M \), then, in the first period type one groups receive larger transfers \( y_{i1}(p_1) > y_{i1}(p_2) \).\(^{16}\)

Proof. See Appendix. □

This result provides an interesting interpretation of a puzzling phenomenon discussed in Palda (1997). Palda finds that in Canada fiscal churning rises with income deciles: higher income individuals face more churning. Palda argues that this phenomenon is puzzling because it is reasonable to expect that higher income individuals are more informed about fiscal policy and the political process, and that therefore they should be faced with less distortionary policies. A consequence of Proposition 6 is that there is more churning for groups whose transfers are observed with lower probability. Since higher income individuals are better informed, lower income individuals have worse information about transfers offered to high income people. Therefore, Proposition 1 suggests

\(^{16}\) A related result holds when groups are heterogeneous with respect to the probability of observing taxes \( q_i \). Candidates tax more heavily groups that are observed with a higher probability \( q_i \).
that an explanation of higher churning for higher income individuals is that, precisely because these individuals have better information, transfers offered to them are relatively hard to observe by the rest of the population, leading candidates to favor offering higher transfers to these voters.

Another interesting implication of Proposition 6 involves a comparison of two societies with the same level of average aggregate transparency that differ in the extent of heterogeneity of transparency across groups. For instance, assume that one society has the same level of transparency $p$ for all groups, whereas in the second society transfers to $N_1$ groups are observed with probability $p_1$, and transfers to $N_2$ groups are observed with probability $p_2$, with $\frac{p_1 N_1 + p_2 N_2}{N} = p$. A corollary of Proposition 6 is that the size of government, taxes, transfers, and deficits are larger in the second, more heterogeneous society. The intuition is that what determines the size of government is the marginal incentive to offer transfers to a group. In the heterogenous society this incentive is determined by the least transparent group. Thus total future distortions have to be sufficiently high to deter sneaky transfers to such a group. This emerges very starkly if $u$ is linear: in this case, all that matters for determining the size of the deficit is the transparency of the least transparent group: all other groups receive nothing.

5 Public Goods: Transparency and the Composition of Government Spending

In all our previous analysis the only type of government spending was wasteful transfers. Thus, any government spending was wasteful. This has colored some of our discussion of the welfare effects of transparency. We now introduce (possibly) beneficial public goods. The analysis of this extension has two purposes. First, we want to examine the robustness of our results to the introduction of socially useful government spending. Second, some novel issues arise once public goods are introduced. We can now discuss the consequences of transparency for the composition of public spending between socially useful public projects and socially wasteful transfers. We find that underprovision of public goods may be a consequence of imperfect transparency of transfers, and that more transparent fiscal systems devote more resources to public goods as opposed to transfers.

We assume that, if $G$ is spent on the public good, a voter who receives a transfer $y$ and works $l$ has utility given by $u(v(G) + y - \gamma(l))$ where $v$ is concave and $u$ and $\gamma$ satisfy the assumptions stated in section 2. Denote by $G^{eff}$ the efficient level of provision of $G$. Note that, because spending on the public good is financed via distortionary taxes, it must be the case that $v'(G^{eef}) > 1$.

It no longer true that transparency of revenues is necessarily harmful. However, it is possible to show that our prior analysis is robust: as long as there are positive transfers in equilibrium, it is beneficial to have imperfect revenue transparency. Assume first that there is an exogenous value
Proposition 7 Assume that aggregate transfers are observed with probability $p$ and aggregate revenues with probability $q$. If $\gamma'' > 0$ then there is a $\overline{G} > G^{eff}$ such that, for any $G < \overline{G}$,

(i) There exists $p(G,q)$ such that, for $p < p(G,q)$, in equilibrium there are positive transfers and a positive deficits.

(ii) For any $p < p(G,1)$, the socially optimal level of revenue transparency is lower than 1.

Proof. See Appendix. ■

In order to gain an intuition for this result, note first that distortionary taxes are positive because some spending $G$ will have to be undertaken by any candidate who gets elected. The exact distribution of these taxes across the two periods depends on the level of revenue transparency $q$. This already points to the potential for qualifying our previous analysis of revenue transparency: if transfers are zero (e.g., because $p = 1$). In this case, lowering $q$ below one is inefficient because it leads to imperfect tax smoothing without a reduction in transfers. Furthermore, the fact that future taxes are positive even absent transfers implies that the marginal distortion of transfers is first order even for very small transfers. This means that $p < 1$ is no longer sufficient for guaranteeing positive first period transfers. The intuition for part (i) is that if spending on the public good is not too high, then, if transfers are sufficiently non-transparent, candidates have the incentive to offer positive transfers because the distortions from second period taxes due to spending on the public good are not sufficiently high to deter transfers. The intuition for part (ii) is that, given that positive transfers are offered in equilibrium, at the margin, the same reasoning as in part (iv) of Proposition 4 holds: lowering $q$ does not change the equilibrium level of second period taxes but lowers the equilibrium level of first period taxes by reducing transfers.

We now consider how transparency affects the equilibrium composition of spending between socially useful spending on public goods and socially wasteful spending on transfers. For the rest of this analysis we fix $q = 1$ and focus on the effects of $p$. Let $G(p)$ denote the equilibrium value of spending on the public good.

Proposition 8 Assume that $q = 1$ and that $\gamma'' > 0$. There are two regions defining the equilibrium behavior of transfers, deficits, and spending on the public good.

(i) If $p \geq \hat{p} = p\left(G^{eff},1\right)$, then transfers are zero, there is no deficit, and spending on the public good is efficient: $G(p) = G^{eff}$.

(ii) If $p < \hat{p}$, then, transfers and deficits are positive, and there is underprovision of the public good $G(p) < G^{eff}$. Furthermore, in this region, $G(p)$ is increasing in $p$, and transfers and deficits are decreasing in $p.$
(iii) For any \( p \), taxes are perfectly smoothed across the two periods, and for \( p < \hat{p} \), there is fiscal churning.

Proof. See Appendix.

Part (i) of Proposition 8 says that when transparency of transfers is sufficiently high, then government activity is efficient. This has a simple intuition. Second period taxes are positive in this environment even absent a first period deficit because of second period spending on the public good. Thus, if transparency is sufficiently high, second period distortionary taxes to finance the public good generate marginal distortions that are large enough to deter candidates from increasing first period transfers. Furthermore, absent transfers, given that spending on the public good is observable, candidates have no incentive to choose any level of spending on the public good that is different from the efficient level \( G^{eff} \).

The intuition for part (ii) is the following. Suppose that transfers were zero, and that spending on the public good were \( G^{eff} \). Then, second period spending on the public good would also be \( G^{eff} \). When transparency is low enough \( (p < p \left( G^{eff}, 1 \right)) \), by Proposition 7, this profile cannot be an equilibrium: candidates have an incentive to choose positive transfers in the first period. Just as in Proposition 3, transfers have to be sufficiently large to induce marginal distortions from taxation that deter any additional increase. This leads to a further dimension of inefficiency. The presence of transfers increases the marginal distortions of taxes that finance spending on the public good. Since spending on the public good is observable, candidates internalize this cost by reducing spending on the public good below \( G^{eff} \). This is the force behind underprovision. The intuition for part (iii) is simply that, given that revenues are perfectly observable, candidates finance any spending by efficiently allocating taxes across the two periods.

Proposition 8 thus highlights the fact that the lack of transparency of transfers is an electoral force that may push toward the underprovision of public goods. Recent literature (e.g., Lizzeri and Persico 2001) has suggested other reasons why elections may lead to underprovision of public goods. Specifically, this literature emphasizes the idea that transfers may be favored by candidates because they are more targetable to subgroups of the population leading to excessive use of transfers relative to non-targetable public goods. These effects are complementary to the effect highlighted here.

6 Appendix

Proof of Proposition 1. It is clear that, for each group \( i \), either \( t_i = 0 \) or \( y_i = 0 \). Otherwise, the candidate can reduce both taxes and transfers to group \( i \) by the same amount, without affecting any other group. This increases the utility of group \( i \) because taxes are distortionary. Furthermore, a straightforward adaptation of the arguments in
Lindbeck-Weibull show that, in equilibrium,

\[ f_i(0) \frac{\partial U}{\partial y_i} = f_j(0) \frac{\partial U}{\partial y_j} \quad \text{if} \quad y_i > 0, y_j > 0, \]

\[ f_i(0) \frac{\partial U}{\partial y_i} = f_j(0) \frac{\partial U}{\partial y_j} \quad \text{if} \quad y_i > 0, t_j > 0, \]

\[ f_i(0) \frac{\partial U}{\partial T_i} = f_j(0) \frac{\partial U}{\partial T_j} \quad \text{if} \quad t_i > 0, t_j > 0. \]

where \( T_j(t_j) = t_j I(t_j) \) is the tax revenue obtained from tax rate \( t_j \). Suppose that \( i < j \). Recall that we have ordered indices so that \( f_1(0) > f_j(0) \). These equations imply that if group \( j \) receives positive transfers (and therefore pays no taxes), group \( i \) must also receive transfers, and pay no taxes. Analogously, if group \( i \) pays positive taxes (and therefore receives no transfers) then group \( j \) must pay positive taxes as well. Note also that \( (y_i^L, t_i^L) = (y_i^R, t_i^R) = (0, 0) \) to all \( i = 1, \ldots, N \) cannot be an equilibrium, since

\[ f_1(0) \frac{\partial U(0, 0)}{\partial y_1} > f_2(0) \frac{\partial U(0, 0)}{\partial y_2} \]

because \( \frac{\partial U(0, 0)}{\partial y_1} \approx \frac{\partial U(0, 0)}{\partial y_2} \). This implies that each candidate can increase his vote share by offering a small transfer to group 1 financed with a small tax to group 2. Hence, the only possibility is that there exists an \( h > 1 \) such that groups \( i < h \) receive positive transfers and pay no taxes, while all groups with \( i \geq h \) receive no transfers and pay positive taxes.

**Deferred arguments in the Proof of Proposition 3.**

From equation (10), we obtain

\[ \frac{\partial U(y, 0, t_2(y))}{\partial y} = u' \] (13)

\[ \frac{\partial U(y, 0, t_2(y))}{\partial t_2} = \left( -l_2 + \frac{\partial U}{\partial t_2} \left( 1 - t_2 - \gamma \right) \right) u' = -l_2u' \] (14)

where the second equality holds because of optimality of labor supply. In addition, we have that

\[ \frac{\partial U}{\partial t_2} = \frac{l_2(t_2(y))}{(l_2(t_2(y)))^\gamma} + \frac{l_2}{l_2 + l_2} = \frac{l_2}{l_2 + \frac{l_2}{l_2}} = \frac{1}{l_2 + \frac{l_2}{l_2}}. \] (15)

Thus,

\[ \frac{\partial U(y, 0, t_2(y))}{\partial t_2} \frac{\partial t_2}{\partial y} = -\frac{l_2u'}{l_2 + \frac{l_2}{l_2}}. \]

By differentiating implicitly equation (5) we obtain \( \frac{\partial U}{\partial t_2} = -\frac{1}{\gamma' \ell_2(t_2)} \). Thus,

\[ \frac{\partial U(y, 0, t_2(y))}{\partial t_2} \frac{\partial t_2}{\partial y} = -\frac{l_2u'}{l_2 - \frac{l_2}{l_2}}. \] (16)

Combining equations (13) and (16) we obtain

\[ \frac{\partial U(y, 0, t_2(y))}{\partial y} = u' < \frac{l_2u'}{l_2 - \frac{l_2}{l_2}} = \frac{\partial U(y, 0, t_2(y))}{\partial t_2} \frac{\partial t_2}{\partial y} \]

which is equation (12).

Substituting equations (13) and (16) into equation (11) and simplifying we obtain

\[ l_2(t_2(y)) = \frac{1}{\gamma' \ell_2(t_2(y))} \frac{l_2(y)}{(1 - \frac{p(N-1)+1}{N})}. \] (17)
Since we always have that 
Substituting in this expression from equations (13), and (16) we can rewrite the equilibrium condition as

\[ \gamma'' \left( 1 - \frac{p(N-1)+1}{N} \right) - \left( \gamma'' + t_2 \frac{\gamma'''}{\gamma''} \right) \frac{\partial}{\partial y} \left( \frac{\gamma''}{\gamma''} \right) < 0 \]

which holds if and only if

\[ \gamma'' \left( 2 - \frac{p(N-1)+1}{N} \right) + t_2 \frac{\gamma'''}{\gamma''} > 0 \]

Since \( \gamma'' > 0 \), inequality (18) holds if \( \gamma'' > 0 \).

**Proof of Proposition 4.** (ii) Denote period 1 per capita tax revenues by \( T_1 \) and consider a deviation consisting of an additional transfer \( z \) to group 1. Let \( t_i(x) \) be the tax rate necessary to raise revenue \( x \). The vote share of a deviating candidate is equal to

\[ F \left( U \left( y + z, t_1(T_1), t_2(y - T_1 + \frac{z}{N}) \right) - U^R \right) + p(N-1)F \left( U \left( y, t_1(T_1), t_2(y - T_1 + \frac{z}{N}) \right) - U^R \right) \]

Differentiating with respect to \( z \), and imposing the equilibrium condition \( z = 0 \) we obtain

\[ \left( \frac{\partial U (y, t_1(T_1), t_2(y - T_1))}{\partial y} \right) \frac{\partial U (y, t_1(T_1), t_2(y - T_1))}{\partial t_2} + p(N-1) \frac{\partial U (y, t_1(T_1), t_2(y - T_1))}{\partial t_2} \frac{\partial U (y, t_1(T_1), t_2(y - T_1))}{\partial y} f(0) = 0 \]

Rearranging, we obtain the equilibrium condition

\[ \frac{\partial U (y, t_1(T_1), t_2(y - T_1))}{\partial y} = -p(N-1) + \frac{\partial U (y, t_1(T_1), t_2(y - T_1))}{\partial t_2} \frac{\partial U (y, t_1(T_1), t_2(y - T_1))}{\partial y} \]

Substituting in this expression from equations (13), and (16) we can rewrite the equilibrium condition as

\[ 1 = \frac{p(N-1) + t_2}{N} \frac{\partial}{\partial t_2} + \frac{\partial}{\partial t_2} t_2 \]

or

\[ t_2 = \frac{1}{\gamma''} \left( 1 - \frac{p(N-1)+1}{N} \right) \]

which is the same as equation (17). Thus, \( t_2 \) is independent of \( q \).

(iii) Let us now show that when \( p < q, t_1 > 0 \). Note that since debt and \( t_2 \) are independent of \( q \), when \( p < 1 \) we always have that \( y_1 > 0 \) and \( D > 0 \). Consider a candidate equilibrium \( y^*, t_1^*, t_2^* \) in which per capita debt is \( d^* = y^* - t_1^*l_1(t_1^*) \) and suppose a candidate deviates and increases \( t_1 \) on group 1 to \( t_1 = t_1^* + z \). Then, the needed (and equilibrium) per capita tax revenue in period 2 falls by \( \Delta d = \frac{t_1(t_1^*) - t_1(t_1^*)}{N} \), leading to a new tax rate for everybody in period 2 of \( t_2 = t_2(d^* - \Delta d) \). Thus, the vote share for candidate \( L \) is:

\[ F \left( U \left( y^*, t_1^*, t_2(d^* - \Delta d) \right) - U^R \right) + q(N-1)F \left( U \left( y^*, t_1^*, t_2(d^* - \Delta d) \right) - U^R \right) \]

Differentiating this expression with respect to \( z \) we obtain:

\[ \left( \frac{\partial U}{\partial t_1} + \frac{1}{N} \frac{\partial U}{\partial t_2} \frac{\partial T_1}{\partial t_1} \right) f \left( U \left( y^*, t_1^*, t_2(d^* - \Delta d) \right) - U^R \right) + q(N-1) \frac{\partial U}{\partial t_2} \frac{\partial T_1}{\partial t_1} f \left( U \left( y^*, t_1^*, t_2(d^* - \Delta d) \right) - U^R \right) \]
which, in equilibrium, should be zero at $z = 0$. Thus, this expression simplifies to

$$
\left( \frac{\partial U}{\partial t_1} + \frac{q(N-1)+1}{N} \frac{\partial U}{\partial t_2} \frac{\partial T_1}{\partial t_1} \right) f(0) = 0
$$

or, using $\frac{\partial t_3}{\partial t_2} = -\frac{\partial t_3}{\partial t_1}$,

$$
\frac{\partial U}{\partial t_3} \frac{\partial T_1}{\partial t_1} = \frac{q(N-1)+1}{N} \frac{\partial U}{\partial t_2} \frac{\partial T_2}{\partial t_2}
$$

(20)

Let us now show that $t_1 < t_2$ for $p < q < 1$. Substituting equations (14) and (15) into equation (20), we obtain

$$
\frac{l_1(t_1(q))}{l_1(t_1(q)) + \frac{\partial t_1}{\partial t_2}(t_1(q)) t_2(q)} = \frac{q(N-1)+1}{N} \frac{l_2(t_2(q))}{l_2(t_2(q)) + \frac{\partial t_2}{\partial t_2}(t_2(q)) t_2(q)}
$$

(21)

The result that $t_1 < t_2$ for $q < 1$ follows if we show that $\frac{l_1(t_1)}{l_2(t_2)}$ is decreasing in $t$. Differentiating $\frac{l_1(t_1)}{l_2(t_2)}$ with respect to $t$ we obtain:

$$
\frac{\partial l_1(t_1(q))}{\partial t} = \left( 1 + \frac{\partial t}{\partial t} \right) \left( \frac{\partial l_2(t_2(q))}{\partial t} - t \left( \frac{1}{\gamma'} + \frac{1}{\gamma''} + \frac{1}{\gamma'''} t \right) \right)
$$

Substituting into this equation the following expressions

$$
\frac{\partial l_2(t_2)}{\partial t} = -\frac{1}{(\gamma'(l_2(t_2)))^2} \quad \text{and} \quad \frac{\partial^2 l_2(t_2)}{\partial t^2} = \frac{\gamma'''(l_2(t_2))}{(\gamma'(l_2(t_2)))^3} - \frac{\gamma''(l_2(t_2))}{(\gamma'(l_2(t_2)))^2}
$$

we obtain

$$
\frac{\partial l_1(t_1(q))}{\partial t} = \frac{t \left( \frac{1}{\gamma'} \right)^2 - t \left( \frac{1}{\gamma'} - \frac{\gamma''}{(\gamma')^2} \right)}{(1 + \frac{\partial t}{\partial t})^2}
$$

The right-hand side of this expression is positive if and only if $t \gamma'' + t (\gamma')^2 + t \gamma''' t > 0$ which holds because $\gamma'' > 0$.

When $q = 1$, equation (21) reads

$$
\frac{l_1(t_1(q))}{l_1(t_1(q)) + \frac{\partial t_1}{\partial t_2}(t_1(q)) t_1(q)} = \frac{l_2(t_2(q))}{l_2(t_2(q)) + \frac{\partial t_2}{\partial t_2}(t_2(q)) t_2(q)}
$$

which holds if and only if $t_1 = t_2$.

We know show that $t_1 = 0$ when $p > q$. Suppose not, i.e. $t_1 > 0$. Then the first order conditions already derived hold and we can combine equations (19) and (20) to obtain

$$
\frac{\partial U(y, t_1(T_1), t_2(y-T_1))}{\partial y} = -\frac{p(N-1)+1}{N} \frac{\partial U(y, t_1(T_1), t_2(y-T_1))}{\partial t_2} > 0
$$

However, this cannot be an equilibrium since it implies $u' > \frac{l_2 u'}{l_2 - \frac{\partial u}{\partial t}}$. Hence $t_1 = 0$ when $p > q$.

(iv) We now show that $t_1(q)$ is increasing in $q$. Differentiate equation (21) with respect to $q$ to obtain

$$
\frac{N-1}{N} \frac{l_2}{l_2 + \frac{\partial l_2}{\partial t_2} t_2} + \frac{q(N-1)+1}{N} \frac{(l_2)^2 t_2 - l_2 \left( t_2 \frac{\partial^2 l_2}{\partial t_2^2} \right)}{(l_2 + \frac{\partial l_2}{\partial t_2} t_2)^2} = \frac{(t_1')^2 t_1 - t_1 \left( t_1' + \frac{\partial l_2}{\partial t_2} t_1 \right)}{(t_1 + \frac{\partial l_2}{\partial t_2} t_1)^2}
$$

But, $t_2 = 0$ in equilibrium. Thus,

$$
t_1' (q) = \frac{(t_1')^2 t_1 - t_1 \left( t_1' + \frac{\partial l_2}{\partial t_2} t_1 \right)}{(t_1 + \frac{\partial l_2}{\partial t_2} t_1)^2}
$$

23
Thus, \[
\text{sign}\left(t'_1\right) = \text{sign}\left(\frac{\left(\frac{1}{\gamma''}\right)^2 t_1 - l_1 \left(-\frac{1}{\gamma''} - \frac{1}{\gamma''} t_1\right)}{l_1 - \frac{1}{\gamma''} t_1}\right)
\]
Rearranging, the sign of the above expression is
\[
\left(\frac{1}{\gamma''}\right)^2 t_1 - l_1 \left(-\frac{1}{\gamma''} - \frac{1}{\gamma''} t_1\right) = t_1 \gamma'' + l_1 \left(\gamma''\right)^2 + l_1 t_1 \gamma'' > 0
\]
which is positive because \(\gamma'' > 0\). ■

**Proof of Proposition 6.** Assume \(q = 1\) and assume without loss of generality that \(p_1 < p_2\). Denote by \(y_1\) and \(y_2\) the equilibrium transfers to groups \(N_1\) and \(N_2 = N - N_1\), respectively, and by \(T\) the tax revenues, equal for all groups. Since \(q = 1\) we know \(y_1 N_1 + y_2 N_2 = 2T\) in equilibrium. The deviation is financed with higher taxes in period 2 only. Hence, candidate \(L\) offering an extra transfer of \(x\) to one of the groups in \(N_1\) gains a vote share equal to
\[
F\left(U\left(y_1 + x, t_1(T), t_2\left(T + \frac{x}{N}\right)\right) - U^R\right) + p_1 (N_1 - 1) F\left(U\left(y_1, t_1(T), t_2\left(T + \frac{x}{N}\right)\right) - U^R\right) + p_1 N_2 F\left(U\left(y_2, t_1(T), t_2\left(T + \frac{x}{N}\right)\right) - U^R\right)
\]
while offering the same extra transfer to one of the groups in \(N_2\) gives him a vote share equal to
\[
F\left(U\left(y_2 + x, t_1(T), t_2\left(T + \frac{x}{N}\right)\right) - U^R\right) + p_2 (N_2 - 1) F\left(U\left(y_2, t_1(T), t_2\left(T + \frac{x}{N}\right)\right) - U^R\right) + p_2 N_1 F\left(U\left(y_1, t_1(T), t_2\left(T + \frac{x}{N}\right)\right) - U^R\right)
\]
Maximizing the above equations with respect to \(x\) and imposing the equilibrium condition \(x = 0\) we obtain
\[
f(0) \left(\frac{\partial U(y_1, t_1(T), t_2(T))}{\partial x} + \frac{1}{N} \frac{\partial U(y_1, t_1(T), t_2(T))}{\partial T}\right) + p_1 N_1 \frac{\partial U(y_2, t_1(T), t_2(T))}{\partial T} + p_2 (N_2 - 1) \frac{\partial U(y_2, t_1(T), t_2(T))}{T} = 0
\]
\[
f(0) \left(\frac{\partial U(y_2, t_1(T), t_2(T))}{\partial x} + \frac{1}{N} \frac{\partial U(y_2, t_1(T), t_2(T))}{\partial T}\right) + p_1 (N_1 - 1) \frac{\partial U(y_2, t_1(T), t_2(T))}{\partial T} + p_2 N_1 \frac{\partial U(y_1, t_1(T), t_2(T))}{T} = 0
\]
Since \(\frac{\partial U(y_1, t_1(T), t_2(T))}{\partial x}\) enters in both equations, we can combine the two first order conditions to obtain
\[
\frac{\partial}{\partial x} U\left(y_2, t_1(T), t_2(T)\right) + \frac{1}{N} \frac{\partial U\left(y_2, t_1(T), t_2(T)\right)}{\partial T} + p_1 \frac{\partial U\left(y_2, t_1(T), t_2(T)\right)}{\partial T} + p_2 (N_2 - 1) \frac{\partial U\left(y_2, t_1(T), t_2(T)\right)}{\partial T} = \frac{\partial}{\partial x} U\left(y_1, t_1(T), t_2(T)\right) + p_1 \frac{\partial U\left(y_1, t_1(T), t_2(T)\right)}{\partial T} + p_2 N_1 \frac{\partial U\left(y_1, t_1(T), t_2(T)\right)}{\partial T}
\]
\[
= \frac{\partial}{\partial x} U\left(y_1, t_1(T), t_2(T)\right) + p_1 \frac{\partial U\left(y_1, t_1(T), t_2(T)\right)}{\partial T} + p_2 N_1 \frac{\partial U\left(y_1, t_1(T), t_2(T)\right)}{\partial T}
\]
Rearranging the above equation, we obtain
\[
\frac{\partial}{\partial x} U\left(y_2, t_1(T), t_2(T)\right) = \frac{\partial}{\partial x} U\left(y_1, t_1(T), t_2(T)\right)
\]
Note that the right-hand side is positive, since \(\frac{\partial U\left(y_2, t_1(T), t_2(T)\right)}{\partial x} < 0\) and
\[
\frac{p_1 N_2}{p_1 (N_1 - 1)} - \frac{1}{p_2 N_1} \frac{N_2 - 1}{p_2 N_1} = \frac{-\left(1 - p_1\right) (1 - p_2) - N_2 p_1 (1 - p_2) - N_2 p_2 (1 - p_1)}{N (N_1 p_1 - p_1 + 1) N_2 p_2} < 0
\]
Hence
\[
\frac{\partial}{\partial x} U(y_2, t_1(T), t_2(T)) > \frac{\partial}{\partial x} U(y_1, t_1(T), t_2(T)).
\]
Since \( U \) is concave this implies that \( y_1 > y_2 \). ■

**Proof of Proposition 7.** Let us construct the equilibrium first solving the second period election. Consider a putative equilibrium platform \((G_1, G_2, y, t_1, t_2)\) with an equilibrium deficit \(D\). In the second period there are no transfers and the sum of deficit and second period expenditure on the public good is paid out of taxes:
\[
D + G_2 = t_2 I(t_2(D + G)).
\]
Let \(V(G_2, t_2(D + G_2))\) be voters’ indirect utility from period 2 only. Candidate L’s vote share in period 2 is then
\[
NF V(G_2, t_2(D + G_2)) - V(G_2, y, t_2(D + G_2)).
\]
The first order condition implies
\[
\frac{\partial V}{\partial G_2} + \frac{\partial V}{\partial t_2} \frac{\partial t_2}{\partial G_2} = 0 \tag{22}
\]
We now construct the necessary and sufficient conditions for the equilibrium to exhibit positive transfers and positive deficits. Let \(U(G_1, G_2, y, t_1, t_2)\) be each voter’ sum of indirect utility from the two periods. Consider candidate L’s deviating from the equilibrium platform in the first period increasing the equilibrium transfer \( y \) by \( z \). Candidate L’s vote share is
\[
F \left(U \left(G_1, G_2, y + z, t_1 \left(y + G_1 - D\right), t_2 \left(D + G_2 + \frac{z}{N}\right)\right) - U^R\right)
\]
\[
+ (N - 1) \left(p F \left(U \left(G_1, G_2, y, t_1 \left(y + G_1 + \frac{z}{N} - D\right), t_2 (D + G_2)\right) - U^R\right) + (1 - p) F \left(U^L - U^R\right)\right)
\]
Maximizing with respect to \( z \) and imposing the equilibrium condition \( z = 0 \) we obtain
\[
\frac{\partial U}{\partial y} + \left(p + \frac{1 - p}{N}\right) \frac{\partial U}{\partial t_2} \frac{\partial t_2}{\partial G_2} = 0 \tag{23}
\]
Since \( \frac{\partial U}{\partial z} \frac{\partial z}{\partial t_2} = \frac{\partial V}{\partial G_2} \frac{\partial G_2}{\partial t_2} \) and \( \frac{\partial V}{\partial G_2} = u'(\cdot) v'(G_2) \), we can combine equations (23) and (22) to obtain \( \left(p + \frac{1 - p}{N}\right) v'(G_2) = 1 \). We can rewrite this last equation as
\[
v'(G_2) = \frac{1}{p \left(1 - \frac{p}{N}\right) + \frac{1}{N}} \tag{24}
\]
Since \( v(G_2) \) is concave, \( v'(G_2) \) is decreasing. Therefore, the left-hand side is decreasing in \( G_2 \) and the right-hand side decreases in \( p \). For \( p \) close to 0, the Right-hand side is close to \( N \) and the equality implies \( v'(G_2) \approx N \). Note that for \( p \) close to 1, the Right-hand side is close to one and the equality requires that \( v'(G_2) \approx 1 \). However, equation (22) implies \( v'(G_2) = \frac{\frac{t_2}{t_2 + \frac{1}{N}}}{t_2 + \frac{1}{N}} > 1 \).

Since \( \gamma'' > 0 \) the Right-hand side increases in \( t_2 \) and therefore in \( G_2 \), while the left-hand side decreases in \( G_2 \). Since \( v'(0) = +\infty \), any candidate offers some public good in period 2, for any level of deficit. But this implies that, for \( p \) close to 1 transfers cannot be offered in equilibrium, as their marginal political benefit \( \frac{\partial U}{\partial y} = u' \), is lower than their marginal political cost \( \left(p + \frac{1 - p}{N}\right) \frac{\partial V}{\partial G_2} \frac{\partial G_2}{\partial t_2} \approx \frac{\partial V}{\partial G_2} \frac{\partial G_2}{\partial t_2} = \frac{\partial V}{\partial G_2} \frac{\partial G_2}{\partial t_2} = u'(\cdot) v'(G_2) > u'(\cdot) \). A continuity argument then implies that there exists a \( p(G, q) \) such that for \( p < p(G, q) \) there are positive transfers in equilibrium. This proves (i).
To prove part (ii), note that by the same argument of Proposition 4, for a fixed \( p \), the higher is \( q \), the higher are candidates’ incentives to offer transfers. Hence for \( q = 1 \) and in the range of \( p \) such that in equilibrium candidates offer transfers \( (p < p(G, 1)) \) voters’ welfare decreases as \( q \) increases.

**Proof of Proposition 8.** The proof follows the arguments of the proof of Proposition 7. To prove (i), note that we already know from the proof of Proposition 7 that there exists an \( \epsilon > 0 \) such that transfers are zero for \( 1 - \epsilon < p = 1 \). For such a \( p \), we obtain that

\[
\frac{\partial U}{\partial y} = u'(\cdot) < \left( p + \frac{1 - p}{N} \right) \frac{\partial U}{\partial t_2} \frac{\partial t_2}{\partial D} = \left( p + \frac{1 - p}{N} \right) \frac{\partial U}{\partial G_2} = \left( p + \frac{1 - p}{N} \right) u'(\cdot) v'(G_i)
\]

since \( v'(G_i) > 1 \). This implies that \( y = 0 \).

Since there are no transfers and expenditures on public goods are perfectly transparent, there is no incentive to run a deficit since a candidate would be better off smoothing taxes across periods.

Since there are no deficits, if candidate \( L \) chooses a level \( G_1^* \) of public good, his vote share is

\[
NF(U(G_1^*, G_2, y, t_1(G_1^*), t_2(G_2)) - U(G_1, G_2, y, t_1(G_1), t_2(G_2)))
\]

Hence \( G_1 \) solves

\[
\frac{\partial U}{\partial G_1} + \frac{\partial U}{\partial t_1} \frac{\partial t_1}{\partial G_1} = 0
\]

which is exactly the condition for maximization of voters’ utility. The problem in period 2 is identical, which implies that spending on the public good is efficient: \( G(p) = G_{eff} \). This proves (i).

To prove (ii), we already know that there are deficits and transfer are positive form Proposition 7. To prove there is underprovision of public good, rewrite equation (24)

\[
v'(G_i) = \frac{1}{p(1 - \frac{1}{N}) + \frac{1}{N}}
\]

and note that for the Right-hand side decreases in \( p \). Since \( v'(G_i) \) is decreasing in \( G_i \), we have that as transparency \( p \) decreases \( G \) decreases. By the same argument of the previous proofs, transfers and deficit increase in \( p \).

To prove (iii), by the same argument of the proof of Proposition 4, we have that taxes are perfectly smoothed across the two periods and since voters receive transfer in the first period if \( p \) is sufficiently low, for \( p < \hat{p} \), there is fiscal churning.

**References**


