Redistributive Politics with Distortionary Taxation*

Benoit S Y Crutzen[†] and Nicolas Sahuguet[‡]

Abstract

This paper proposes a first step towards a positive theory of tax instruments. We present a model that extends models of redistributive politics by Myerson (1993) and Lizzeri and Persico (2001). Two politicians compete in terms of targeted redistributive promises financed through distortionary taxes. We solve for the case of both targetable and non-targetable taxes. We prove that there is an imperfect efficiency-targetability trade off on the tax side. Politicians prefer targetable taxes over non-targetable ones, especially when the latter are less efficient. Yet, targetable taxation is always used even when it is very inefficient compared to non-targetable taxes.

Keywords: Redistributive Politics, Distortionary Taxation

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†Erasmus Universiteit Rotterdam, Department of Economics – H8-11, Erasmus School of Economics and Business Economics, P.O. Box 1738, 3000 DR Rotterdam, The Netherlands. Email: crutzen@few.eur.nl

‡Institut d'Economie Appliquée, HEC Montréal, CEPR and CIRPEE - 3000 chemin de la Côte Sainte- Catherine, Montréal (Québec) H3T 2A7 Canada Email: nicolas.sahuguet@hec.ca

1 Introduction

The questions of the tax level and of the size of government are at the center of the study of political institutions. However, the economic literature on taxes and redistribution is more developed on the normative side, that is the analysis of the optimal tax structure, than on the positive side, that is the study of the tax structure that would arise as an equilibrium of the political process. The main reason is that voting over taxes and redistribution is an example of a vote on a (possibly) multidimensional space, in which case it is not possible to use single dimensional voting equilibrium concepts, such as the median voter theorem.

The positive literature on taxation, starting with Meltzer and Richards (1981), has circumvented this difficulty by studying an environment in which the median voter theorem applies. In their model, the choice of tax is reduced to a country-wide tax rate[1] that applies to everybody and taxes are redistributed uniformly across all citizens. In this environment, the median income citizen is pivotal and chooses the tax rates that he prefers. Yet, since the main insight of the positive theory of income taxation is that politicians use taxes and redistribution to improve their electoral success, it seems odd to leave strategic targeting of individual voters completely out of the picture. Redistribution is clearly used by politicians to target specific groups of voters. Tax exemptions are also very commonly used for the same reason.

In this paper, we propose a model of taxation and redistribution in which politicians behave strategically on both sides of the policy game. Furthermore, we wish to investigate how changes in the distortionary cost of taxation and in its targetability affect the equilibrium.

Whereas the literature on tax policy as an instrument to win elections is scant,[2] the incentives to redistribute to gain electoral success have been studied in some depth. In particular, two strands of the literature have emerged following the seminal contributions of Lindbeck and Weibull (1987)[3] on the one hand and Myerson (1993) on the other. In the first strand of the literature, the so-called probabilistic voting models, some specific type of heterogeneity in voter preferences is imposed to get a continuous and differentiable mapping from policy proposals to vote shares. Equilibria are in pure strategies.

[1] The main results of Meltzer and Richards have been extended since then to somewhat more realistic settings in which the choice of tax instruments is wider. See Section 1.2 .

[2] Recent contributions include Gouveia and David (1996) and Carbonell-Nicolau and Ok (2007).

[3] The probabilitic voting model was first introduced by Hinich, Ledyard and Ordershook (1972).

Instead in models following Myerson (1993), voetrs are all ex-ante identical. This allows to disentangle the welfare effects of strategic policy promises from those that derive from any differences in preferences among voters. The counterpart is that the equilibrium is typically in terms of mixed strategies.

This paper belongs to this second strand of the literature. The model features two candidates competing for a continuum of voters. The two candidates offer individual, binding, credible campaign promises in terms of the level of taxation and a targeted transfer.[4] Taxation is distortionary in the sense that the budget politicians have at their disposal to make transfers is lower than the total of income that is taxed away. Taxation can also be targetable or not.

When taxes are distortionary, the relation between the efficiency of the tax system and the actions of politicians becomes intricate. Indeed, without distortions, it is optimal to fully tax citizens and thus maximize the amount of strategic redistribution.[5] The presence of distortions implies that candidates have incentives to leave voters with part of their income. Viewing the choice of the level of taxation as an index of government size, our analysis also sheds some light on the relationship between the distortionary cost of taxation and the size of government.

Targeting can come through two channels. When taxes are non-targetable, the only channel is targeted redistribution. But when taxes are targetable, both taxes and redistribution are used to target voters and can be interpreted as substitute tools. We first solve for the equilibrium when taxation is not targetable. Politicians choose a tax rate for all citizens and use the collected budget to win votes through targeted redistribution. In equilibrium, politicians randomize over tax rates. Distortions have an impact on the distribution of tax rates. The higher the distortions, the more weight politicians put on low tax rates. Redistributive promises made for a given tax rate are simple: politicians promise nothing to half of the voters – these voters are thus taxed and receive no transfers – and promise the same after-tax transfer to the other half – these voters are also taxed but receive the full per-capita proceeds of taxation.

There is therefore a central trade-off between efficiency and targetability. Taxes are inefficient but give candidates the possibility to target some voters. This is reminiscent of the models of Lizzeri and Persico (2001 and 2005). They analyze

[4]Throughout the paper, we maintain the assumption that redistribution is targetable, as in Myerson (1993).

[5]This is one way to rationalize Myerson's (1993) decision to propose a model of full taxation with redistribution. In a way, taxes can then be interpreted as negative redistributive promises.

the trade-off between targetability and efficiency in an environment on which the provision of a public good is the efficient policy choice but targeted redistribution can be favored by politicians for its targetability. Given the distortions associated with taxation, the efficient policy in our model when taxes are non-targetable is not to tax anyone (it is similar to providing a public good; a policy that benefits everybody but that is not targetable). Taxation is inefficient but enables politicians to have a budget from which they can make targeted promises. The indivisible aspect of public good provision leads in Lizzeri and Persico's analysis to the natural assumption that politicians face a binary choice between full redistribution and provision of a public good. Distortionary taxation is, in this respect, different from public good provision. To account for this difference we extend their analysis to study the equilibrium of the game with a continuous choice set on the tax side too: politicians can choose any tax rate between zero and 100%.

When taxation is targetable, redistribution and taxation become very similar in the sense that, if it was not for distortions, a tax is just a form of negative redistribution. The game is thus best understood as a game of net redistribution. The equilibrium is very closely related to that of Myerson (1993). In equilibrium tax proceeds are constant and independent of the level of distortions and redistribution follows an offer distribution that is very close to Myerson's uniform distribution, Myerson's equilibrium being a special case of it (in which taxes are set to 100% and there are no distortions)

Comparing the equilibrium with targetable taxes to the one with non-targetable taxes is a first step towards a positive theory of tax instruments. The main trade-off we highlight is that between the efficiency and the targetability of tax instruments. In particular, our analysis shows that when taxation is not targetable, there are two sources of inefficiency. Taxes are distortionary, but also unavoidable: the voters who are net beneficiaries of redistribution also pay taxes. In contrast, with targetable taxes, politicians do not need to tax the voters they want to promise more than their initial income. Since in equilibrium, 50% of the voters are net beneficiaries, the inefficiencies linked to non-targetable taxation are twice as large in the case of non-targetable taxation. As a consequence, if the non-targetable instrument is only marginally more efficient, only targetable taxation is used in equilibrium. Targetability can thus be interpreted as a substitute for efficiency. We show, however, that the converse is not true: unless non-targetable taxation if completely efficient, politicians use the targetable tax instrument regardless of its efficiency.

Related Literature

The present paper belongs to the current strand of literature of positive models of redistributive politics. This literature starts with Myerson (1993).

He models redistributive politics as an electoral game between two candidates that make simultaneous, independent and binding redistribution promises to voters. This game is very similar to the well-known Colonel Blotto game[6], that is a game between two players that have to decide simultaneously how to divide their troops among n battle fields. Myerson simplified the analysis by allowing for an infinite number of voters. This simplification made it possible to address the effect of electoral rules on redistribution and inequality. Following Myerson, Lizzeri (1999) used a similar model to explain the persistence of budget deficits. Sahuguet and Persico (2006) and Kovenock and Roberson (2006) built on this model of pure redistribution to analyze situation in which voters' loyalties vary across parties. Laslier and Picard (2002) and Roberson (2006a) study in depth the same game but let number of voters be finite.

Lizzeri and Persico (2001 and 2005) extend Myerson's model of redistributive politics to give politicians the possibility of using the taxed income to provide an economy-wide public good. They focus on the trade-off between an efficient public project (in the sense that its return is greater than unity) but that cannot be targeted to specific voters and pure, targeted, redistribution, whose return is equal to unity. They analyze the inefficiency that arises when redistributive policies targeted to particular subsets of the population are overprovided at the expense of the efficient public good provision. The key determinant of this overprovision is that the targetability of redistribution is valuable to candidates who seek election. Roberson (2006b) develops a similar model in the context of a federal economy with a finite number of voters. In all these models, there is a binary choice between redistribution and public good provisions. Our model can be readily reinterpreted as an extension of these models to allow politicians to choose how much budget to use on a public good project and how much to use on targeted redistribution.

Another related paper is Dekel, Jackson, Wolinsky (2006a)[7]. They analyze a dynamic, alternating offers electoral game between two parties and a population of voters which may have a preference for one of the two parties. The two candidates compete for votes by making alternative public offers. Each candidate can make

[6] The classic on the Colonel Blotto game is Gross and Wagner (1950).

[7] See also Dekel, Jackson and Wolinsky (2006b)

offers only up to the budget it has at its disposal. The main difference is thus that promises are not made in a simultaneous way. They show that the outcome of the game involves substantial spending by parties and that this outcome is affected by the voters' preferences. The key behind the derivation of this equilibrium is that each candidate, when called to make a new offer, is constrained to make an offer that is higher or equal to the one he made in his previous round. This immediately implies that the extension of their game to one like the one analyzed in this paper, in which parties compete in terms of both spending promises and tax rates is problematic, as the authors acknowledge themselves (Dekel et al. 2006a, p. 15)

Our paper also contributes to the strand of the literature that analyzes the relationship between the size of government and the efficiency of taxation. As we said above, this strand is relatively narrow. The literature on the determinants and the composition of government spending is relatively larger,[8] but has typically relegated to the sidelines the effects of changes in the efficiency of the government's instruments. Very few papers focus explicitly on the relationship between efficiency and the characteristics of government.

Becker and Mulligan (2003) provide a model that shows that increases in the efficiency of taxation lead to less pressure against the growth of government. Our result about the positive relationship between the efficiency of taxation and the probability that candidates select higher tax rates is consistent with their view. More importantly, Becker and Mulligan use a political economy model with pressure groups to derive the result that an increase in the efficiency of taxation may be welfare reducing (at least for those taxpayers that are unorganized). We do not need to assume the existence of two different types of voters to obtain that increases in the efficiency of taxation are welfare-reducing.

Outline of the paper

Section 2 solves the model with non-targetable taxation. Section 3 analyzes the case with fully targetable taxes. Section 4 analyzes the model in which two instruments can be used by the politician. Section 5 concludes.

[8] Papers in this area include Kau and Rubin (1981), Grossman (1987), Wilson (1990), Persson and Tabellini (1999), Persson, Roland and Tabellini (2000) and Milesi-Ferretti, Rostagno and Perrotti (2002).

2 Non-targetable taxes

2.1 Economy and players

There are two candidates, 1 and 2. The electorate is made of a continuum E of total mass 1. Each voter is endowed with one unit of money. Candidates can tax voters' endowment and make redistributive promises. These promises are subject to an economy-wide budget constraint: candidates must make balanced-budget policy pledges. These promises are binding.

The basic premises of the model are twofold. First, a candidate has to tax everybody the same way (by setting a nation-wide tax rate) but can use the money collected to make individual promises. Second, taxation is distortionary. There is a cost to collect taxes: only part of the taxed income is available for redistribution. When a candidate chooses a tax rate t, every voter is left with $(1-t)$ and the budget for redistribution is $\lambda t \leq t$.[9]

The timing of the game is as follows:

1. Candidates, simultaneously and independently, choose a tax rate and make binding and credible promises to voters with the money collected;
2. After observing the two candidates' offers, voters cast their ballot for the candidate that has offered them the highest utility;
3. Vote shares determine the electoral outcome and payoffs are realized.

We use a reduced-form mapping from the legislature to the executive: the probability that the policy chosen by a candidate is the implemented one is an increasing function of the vote share of that candidate. This justifies in turn the fact that each voter votes sincerely, that is, casts his ballot in favor of the candidate who promises him the greatest utility. We solve the game under proportional representation (PR): candidates maximize their total vote share.

2.2 Game and candidates' strategies

A pure strategy for a candidate specifies the tax rate he chooses, and in the event he chooses a positive tax rate, it also specifies a promise of a transfer to each voter.

[9] λ can be interpreted as collection costs. Other distortions due to taxation, such as those arising from incentive problems impacting individual labor supply decisions, are also of interest. See Crutzen and Sahuguet (2006) for an extension to the case of non-linear distortions.

Formally a pure strategy is a tax rate t and a function $X : E \rightarrow [0, +\infty)$, where $X(e)$ represents the consumption promised to voter e. The function X must satisfy the following balanced budget condition. $\int_e X(e)\, de = (1-t) + \lambda t$ and $X(e) \geq 1-t$, (in that case, $X(e) - (1-t)$ represents the transfer promised to voter e after taxes).

We focus on the case of distortions that are not too large, i.e. $\frac{1}{2} < \lambda \leq 1$. Indeed, for $\lambda \leq 1/2$, politicians would not tax voters. For $\lambda = 1$, politicians would tax all of the voters' income and we the game is similar to Myerson (1993). For the distortions that we are interested in, i.e. $\lambda \in \left(\frac{1}{2}, 1\right)$, there is no equilibrium in pure strategies.[10] The intuition for this is as follows. Suppose one candidate were to play a pure strategy, that is, select a tax rate and an associated redistribution plan with probability 1. Then the other candidate, knowing this, could easily propose a plan that gives him more than half of the vote. In equilibrium candidates are therefore randomizing over tax rates and associated redistribution plans.

We study symmetric mixed strategies in which candidates choose a tax rate according to distribution function $\Upsilon(t)$, and then redistribute the money collected, net of distortions. The offer made to voter e, $X(e)$ is the realization of a draw from a common distribution function with cdf $F_t : R^+ \rightarrow [0, 1]$, that depends on the chosen tax rate. F_t represents the empirical distribution of net transfers by candidate i to voters[11]. The tax rate is thus the same for all voters, and voters are getting on average the same amount of money. This does not mean however that all the voters get the same amount of money ex-post: individual promises depend on the realization of an individual random draw from the distribution F_t.

2.3 Equilibrium

We now show that candidates randomize between tax rates according to the continuous distribution function $\Upsilon(t) = t^{\frac{2\lambda-1}{\lambda}}$. The redistribution function F_t turns out to be very simple: its support contains only two points. For a given tax rate and a corresponding budget, a candidate promises no additional transfer to 50% of the voters (they are thus promised $1-t$) and promises to the other 50% twice the money

[10] Whereas candidates randomize in equilibrium, voters observe their *realized* promise by each candidate. Voter e thus votes for candidate i if and only if

$$X_i(e) > X_{-i}(e).$$

[11] Since redistribution schemes need to balance the budget given a tax-rate, there is a link between the choice of tax rate and the choice of promises and this is an easy way to describe admissible strategies.

collected per capita (these voters are promised $1 - t + 2\lambda t$).

Proposition 1 *Assume that candidates can choose any tax rate $t \in [0,1]$, and then redistribute the revenue from taxation λt among the voters. Then the following strategies constitute an equilibrium of the electoral game:*

Candidates randomize across tax rates using the distribution function $\Upsilon(t) = t^{\frac{2\lambda-1}{\lambda}}$.

For a tax rate t, the candidate promises $(1-t)$ to 50% of the voters and $(1-t)+2\lambda t$ to the remaining 50% of the voters.

$$F_t(x) = \begin{cases} 0 \textit{ for } x < 1-t \\ 1/2 \textit{ for } 1-t \leq x < 1-t+2\lambda t \\ 1 \textit{ for } x \geq 1-t+2\lambda t. \end{cases}$$

Proof

We first check that if the other candidate uses the equilibrium strategy, the vote share associated with any tax rate and its equilibrium redistribution plan is 1/2. This shows that a candidate is indifferent between all the tax rates.

The redistribution plan associated with tax rate t promises a utility of $(1-t)$ to 50% of the voters. They vote for this candidate when the other candidate proposes a higher tax rate and they get no additional promise - this happens with probability $\frac{1}{2}(1-\Upsilon(t))$. The plan also promises $(1-t)+2\lambda t$ to the other 50% of the voters. They vote for this candidate if the other candidate makes no additional promises – this happens with probability $\frac{1}{2}$ because, given that $1-t+2\lambda t > 1$, $1-t+2\lambda t > 1-\widetilde{t}$ for any $\widetilde{t} \in [0,1]$ – or if the other candidate makes additional promises but has a lower tax rate – this happens with probability $\frac{1}{2}\Upsilon(t)$. The total vote share of a candidate using a tax rate t and the associated redistribution plan is thus

$$\frac{1}{2}\left(\frac{1}{2}(1-\Upsilon(t))\right) + \frac{1}{2}\frac{1}{2}(1+\Upsilon(t)) = \frac{1}{2},$$

as claimed.

To complete the proof, we now prove that a candidate can not improve on the redistribution plan prescribed by the equilibrium strategy.

Let $W^*(x)$ denote the equilibrium probability of winning a vote when the income promised to a voter is x. This function summarizes all the information about tax rates used and promises made by the other candidate. For a given tax rate, say t, a candidate leaves to everybody $(1-t)$ units of money and has a budget, net of distortions, of λt to distribute.

This candidate makes transfers to voters to maximize his vote share subject to the budget constraint:

$$\underset{F_t}{Max} \int_{1-t}^{+\infty} W^*(x)\, dF_t(x) \;\; s.t. \;\; \int_{1-t}^{+\infty} (x-(1-t))\, dF_t(x) = \lambda t$$

The Lagrangian associated to this problem is:

$$\mathcal{L} = \int_{1-t}^{+\infty} \left\{ W^*(x) + \gamma \left[\lambda t + (1-t) - x \right] \right\} dF_t(x) \,.$$

To prove that the equilibrium redistribution is optimal, we use this Lagrangian in two different ways. We first argue that the support of F_t must be such that all the promises in this support maximize $\mathcal{L}$. This defines a linear relation between the promises used in equilibrium and the probability of winning a vote associated with this promise. We then explicitly calculate $W^*(x)$ from the strategy used by the other player. Putting together these two pieces of information, we conclude that a tangency condition between $W^*(x)$ and the linear function defined above characterizes the optimal promises. We then check that this condition leads to the proposed equilibrium redistribution.

Let γ^* be the equilibrium Lagrange multiplier. $W^*(x) - \gamma^* x$ is maximal and constant on the support of F_t. This immediately implies that there must be a linear relation between x and $W^*(x)$ on the support of F_t. The intuition is simple and follows Lizzeri and Persico (2005): $W^*(x)$ represents the expected benefits of making a promise of x dollars (for a given tax rate t). At an optimum, this benefit must be equal to the shadow cost of the budget constraint, which corresponds to the opportunity cost of a dollar. This opportunity cost is linear in x; therefore W^* also needs to be linear in x on the support and must lie below this line outside of the support.

Consider now a candidate who chooses a tax rate t. He has has a budget of λt to make transfers to voters. Let us now derive the winning function $W^*(x)$ associated with the equilibrium strategy used by the other player.

$$W^*(x) = \frac{1}{2}\left(1-(1-x)^{\frac{2\lambda-1}{\lambda}}\right) \text{ when } x \leq 1 \tag{1}$$

$$W^*(x) = \frac{1}{2}\left(1+\left(\frac{x-1}{2\lambda-1}\right)^{\frac{2\lambda-1}{\lambda}}\right) \text{ when } 1 \leq x \leq 2\lambda. \tag{2}$$

This probability of winning function is convex for $x \leq 1$ and concave for $x \geq 1$. See figure 1 for an example of such a function.

Given the observation that when a politician optimizes his promises, the probability to win a vote with a given promise must be linear in the transfer. This may seem inconsistent with the fact that Eq. 1 and 2 require the function to be first convex then concave. In fact, it implies that the optimal promises must at the same time belong to the W^* curve and be on this line. This defines a tangency condition that characterizes the optimal promises. (Figure 1 also provides an illustration of this tangency condition)

In equilibrium, a candidate who chooses a tax rate of t, chooses to make no additional transfer to some of the voters. To see this, it is enough to note that, if the candidate would choose to make promises of at least $1-t+\varepsilon$ to all voters, it would be better to choose a lower tax rate that leaves $1-t+\varepsilon$ to everybody and since a lower tax rate leads to less distortions, this would be more efficient.

The best way to redistribute money is thus found by drawing a line starting at $(1-t, W^*(1-t))$ and ending at a point on the W^* curve and choosing the line with the largest slope – because this maximizes the efficiency of redistribution. Intuitively, the slope represents "the bang for the buck" of a given promise. By construction, there is no way to use money more efficiently than by randomizing between promises on this line.

This means that the optimal way to use the funds is to choose the promise that maximizes the probability of winning per dollar promised. To find this, it is enough to find the line that starts at $((1-t), W^*(1-t))$ and that is tangent to the function $W^*(x)$ for $x \geq 1$. Since by construction any other promise $(x, W^*(x))$ would be below that tangent, it would not be optimal to use it. To conclude the proof, we need to show that the promise $(1-t) + 2\lambda t$ satisfies this tangency condition.

The slope of the function W^* at x is $\frac{1}{2\lambda}\left(\frac{x-1}{2\lambda-1}\right)^{\frac{\lambda-1}{\lambda}}$. Hence

$$W^{*\prime}\left((1-t)+2\lambda t\right)=\frac{1}{2\lambda}t^{\frac{\lambda-1}{\lambda}}.$$

The slope of the line going from $((1-t), W(1-t))$ to $((1-t)+2\lambda t, W((1-t)+2\lambda t))$, is

$$\frac{(W((1-t)+2\lambda t)-W(1-t))}{(1-t)+2\lambda t-(1-t)}=\frac{t^{\frac{2\lambda-1}{\lambda}}}{2\lambda t}=\frac{1}{2\lambda}t^{\frac{\lambda-1}{\lambda}}.$$

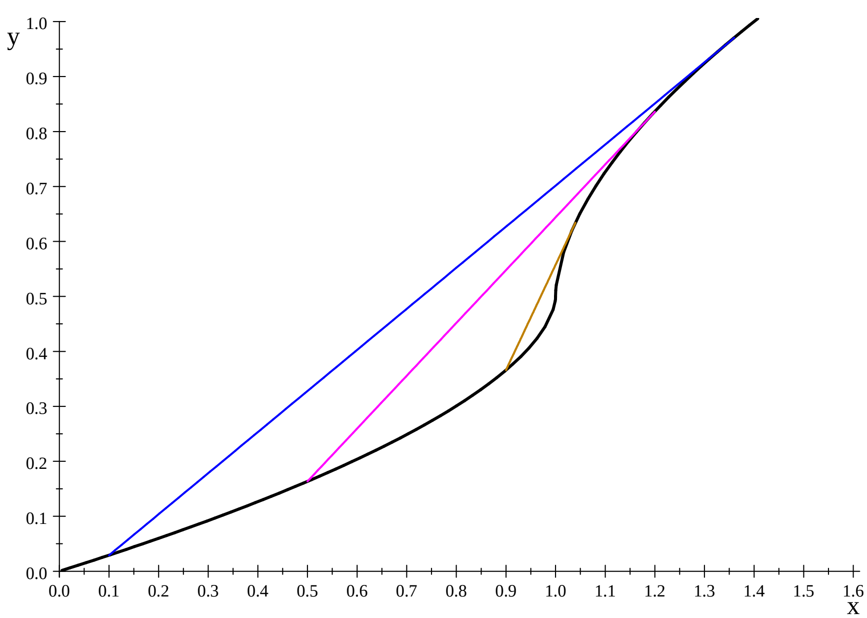
This completes the proof. ■

Note that when λ is close to $1/2$, the distribution function $\Upsilon(t)$ assigns most of the probability mass to tax rates which are very close to 0. As λ increases, the concavity of Υ decreases until it becomes a straight line, for $\lambda = 1$. Thus, when there are no collection costs, the two candidates randomize between tax rates according to a Uniform distribution on $[0, 1]$.

To illustrate the equilibrium, let us look at a concrete example.

Assume the distortions are $\lambda = 0.7$ (only 70% of the tax money collected can be used for redistribution, 30% is wasted in the collection process)

Figure 1 depicts the winning function W^*, and shows the tangency condition for $t = 10\%$, $t = 50\%$ and $t = 90\%$.



Equilibrium with $\lambda = 0.7$

Note that when λ tends to 1, distortions disappear and the equilibrium should converge towards the equilibrium in the Myerson model. This is indeed the case with some caveat. In fact, in the limit equilibrium of our game, politicians would chose uniformly the tax rate and then redistribute the money collected to half the voters. This leads to the same ex-ante distribution of promises as in Myerson's model, in which politicians set a tax rate of 1 (they have no other choice) and the make promises that come from a uniform distribution on $[0, 2]$. The two strategies are equivalent in the sense that they give rise to the same function $W^*(x)$.

2.4 Efficiency, welfare and the size of government

It is interesting to examine the relation between the efficiency of taxation, the politicians' strategic use of taxes and the voters' ex-ante welfare.

The positive literature on taxation is interested in the size of government and the amount of loss in the economy due to the distortions of the tax system. Ex-ante, the expected size of tax revenues is:

$$T(\lambda) = \int_0^1 t d\Upsilon t = \int_0^1 t \left(\frac{2\lambda - 1}{\lambda} \right) t^{\frac{\lambda-1}{\lambda}} dt = \frac{2\lambda - 1}{3\lambda - 1}$$

whereas the expected size of redistribution is

$$R(\lambda) = \lambda T(\lambda) = \lambda \cdot \frac{2\lambda - 1}{3\lambda - 1}$$

We thus have:

Proposition 2 *For $1/2 < \lambda \leq 1$, the expected size of redistribution and the expected amount of taxes collected increase with efficiency of taxes. They are equal to 0 when $\lambda = 1/2$ and increase to $1/2$ when $\lambda = 1$.*

We can also derive the expected welfare in this economy. The welfare measure that we use is the amount of money that is owned by voters after the political process, $V(\lambda)$:

$$V(\lambda) = 1 - T(\lambda) + R(\lambda) = \frac{2\lambda^2}{3\lambda - 1}$$

Turning to the expected deadweight loss due to the political process, this is given by:

$$D(\lambda) = 1 - V(\lambda) = 1 - \frac{2\lambda^2}{3\lambda - 1}$$

We thus have:

Proposition 3 *For $1/2 < \lambda \leq 1$, welfare is U-shaped. It is maximum for $\lambda = 1/2$ or $\lambda = 1$. For small λ, an increase in the efficiency of taxation decreases the welfare, for larger values of λ , an increase in the efficiency of taxation increases the welfare. The minimum welfare is reached for $\lambda = 2/3$.*
Deadweight costs behave the opposite way as welfare. They are hump-shaped and reach their maximum at $\lambda = 2/3$.

The comparative statics on the size of redistribution are not very surprising and are in line with the previous literature of positive theories of taxation. The result about the welfare is more interesting. We show that an increase in the efficiency of tax collection can have the perverse effect of making redistribution a more attractive tool. This can lead candidates to use it more aggressively (in the sense that the probability that they select a higher tax rate is higher) even though it is inefficient.

This effect is reminiscent of the idea developed by Becker and Mulligan (2003) in a very different framework. The case for collecting taxes in the most efficient way seems intuitive and rather obvious. In particular, for a given total government spending, the welfare in the population is maximized when the deadweight loss coming from tax collection is minimized. However, when government spending is endogenously determined (as in our model) as a consequence of electoral competition, the effect of a more efficient tax system is ambiguous. Our model makes this point in a very simple way.

3 Targetable taxes

3.1 Game and candidates' strategies

We now tun to the case of perfectly targetable taxes. A politician can now tax citizens individually. With the money collected, he can then target other voters and make them transfer promises .The difference with the case of non-targetable taxation is that a candidate now chooses how much to tax every citizen and then how much to transfer to give him. As before, we assume tax collection entails some inefficiency. Only a share γ of the taxes collected can be redistributed through transfers. Given that taxes are distortionary, it is inefficient and thus dominated to tax a voter and then give him positive transfers. As a consequence, a pure strategy for a candidate specifies a promise of an income after taxes and transfers, to each voter. If the promise is smaller than 1, this voter is taxed and receives no transfers; if the promise is higher than 1, this voter is not taxed and receives a positive transfer.

The timing of the game is as follows:

1. Candidates, simultaneously and independently, choose binding and credible post-election promises of consumption to voters;
2. After observing the two candidates' offers, voters cast their ballot for the candidate that has offered them the highest utility;
3. Vote shares determine the electoral outcome and payoffs are realized.

Formally a pure strategy is a function $X : E \rightarrow [0, +\infty)$, where $X(e)$ represents the consumption promised to voter e. The function X must satisfy the balanced budget condition.

As before, there is no equilibrium in pure strategy and we will focus on an equilibrium in which each politician draws his promises from a distribution F of income promises. $\int_0^1 (1-x)\, dF(x)$ represents the total taxes that are collected and $\int_1^\infty (x-1)\, dF(x)$ represents the total net transfers promised. The budget constraint can be written as:

$$\gamma \int_0^1 (1-x)\, dF(x) \geq \int_1^\infty (x-1)\, dF(x) .$$

3.2 Equilibrium

Proposition 4 *When taxes and redistribution are fully targetable, politicians are using the distribution function F^* to draw promises made to voters:*

$$F^*(x) = \begin{cases} \frac{x}{2} \text{ for } 0 \leq x \leq 1 \\ \frac{1}{2} + \frac{x-1}{2\gamma} \text{ for } 1 \leq x \leq 1+\gamma \end{cases}$$

Proof:

$F^*(x)$ represents the proportion of voters that is promised an income less or equal to x after the election. $F^*(1)$ is the number of voters that is promised a net tax. $1 - F^*(1)$ is the number of voters that are promised a net transfer.

The vote share of candidate 1 who uses an arbitrary distribution function F_1, when candidate 2 is using the equilibrium F^* is :

$$\begin{aligned} VS &\leq \int_0^1 (x/2)\, dF_1(x) + \int_1^{1+\gamma} \frac{x+\gamma-1}{2\gamma} dF_1(x) \\ &= \frac{1}{2}\left(\int_0^1 x dF_1(x) + \int_1^{1+\gamma} \frac{x}{\gamma} dF_1(x) + \frac{\gamma-1}{\gamma}(1 - F_1(1)) \right) \end{aligned}$$

Recall that the budget constraint of an electoral platform is:

$$\int_0^1 (1-x)\, dF(x) = \frac{1}{\gamma} \int_1^{\infty} (x-1)\, dF(x)$$

We can rewrite it as:

$$\int_0^1 x dF_1(x) + \int_1^{\infty} \frac{x}{\gamma} dF_1(x) = \int_0^1 dF_1(x) + \int_1^{\infty} \frac{1}{\gamma} dF_1(x) = F(1) + \frac{1-F(1)}{\gamma}$$

Substituting it in the vote share inequality, we get:

$$\begin{aligned} VS &\leq \frac{1}{2}\left(F(1) + \frac{1-F(1)}{\gamma} + \frac{\gamma-1}{\gamma}(1 - F_1(1)) \right) \\ &= \frac{1}{2}. \end{aligned}$$

Thus F_1^* achieves $1/2$, the maximal payoff among feasible redistribution plans F_1. Therefore, F_1^* is a best response to F_2^*.■

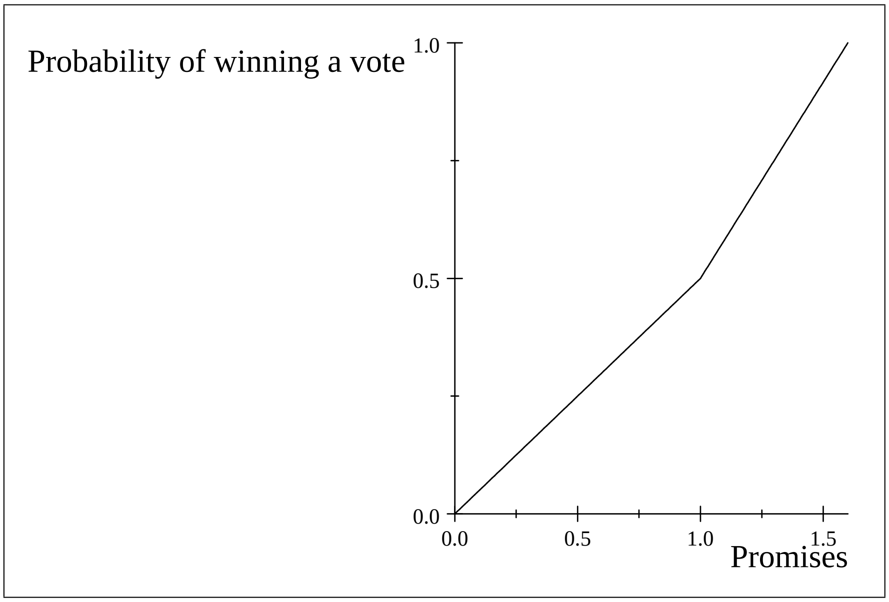


Figure 2: Equilibrium with $\gamma = 0.7$

Figure 2 describes the equilibrium distribution of promises. The linearity of the probability of winning function is again central to the analysis. The probability of winning function is piece-wise linear with a kink at $x = 1$. The linearity for $x \geq 1$ is easily explained. Since the opportunity cost of using an extra dollar on a voter is linear in money, it has to be that the benefit of spending an extra dollar is also linear in money. The explanation of the linearity for $x \leq 1$ follows the same logic. The cost of taxing a voter less is linear in money, implying that the benefits of taxing less a voter must also be linear in money. The difference in slopes is due to the distortion γ: the benefits of transfers (the slope of the winning function when $x \geq 1$) must be higher than the loss due to taxes by a factor γ.

3.3 Efficiency, welfare and the size of government

When taxes are targetable, the effects of the distortions are very different. The amount of taxes does not depend on the efficiency of taxation. For any value of γ, the same amount of taxes (that corresponds to 1/4 of the total income in the economy) is collected. The level of money redistributed is thus decreasing with γ, since it is equal to $\gamma/4$. The effect of the efficiency of taxation on the deadweight loss and the voters' welfare is thus monotonic. Higher efficiency leads to less loss and higher welfare.

4 Efficiency and targetability of tax instruments

The previous analysis shows that targetability and efficiency are important characteristics of tax instruments. We have derived the equilibrium taxes under two scenarios - a perfectly targetable tax, and a completely non-targetable tax. We now turn to the analysis of the trade-off between these two characteristics. We allow for the use of two tax instruments that vary along these two dimensions: targetability and efficiency. Intuitively, both dimensions are desirable, but they are likely to be inversely related. To be able to target taxes, the government would need higher administrative costs and thus such an instrument is likely to be less efficient.

This analysis is a first step towards a positive analysis of taxation instruments. We show that when the difference of efficiency is not high enough in favor of the non-targetable instrument, only the targetable instrument is used in equilibrium. Targetability can thus be interpreted as a substitute for efficiency. In particular, when one cannot target taxes, it is necessary to tax everybody to be able to increase promised transfers. The cost of taxes comes from the fact that one needs to tax everybody, even the voters that one plans to make transfers to. With a targetable instrument, it is only necessary to tax a few individuals, which is less costly even if the cost per dollar collected is higher. However, targetability is an imperfect substitute to efficiency. Indeed, the targetable instrument is always used in equilibrium, unless the non-targetable instrument is fully efficient ($\lambda = 1$). The following two propositions prove the above statements.

Proposition 5 *If $\gamma \geq 2\lambda - 1$, only the targetable tax instrument is used and the equilibrium is the same as when only targetable taxation is possible.*

Proof:

Assume that candidate 1 uses the targetable tax only, following the equilibrium strategy described in proposition 4. Candidate 2 can choose to use only targetable taxation, only non-targetable taxation or a mix of both instruments. We now show that the best response is to use targetable taxation only.

Suppose candidate 2 uses non-targetable taxation only. He chooses a tax rate t and then redistributes λt as efficiently as possible. Figure 2 gives us the probability of winning a vote corresponding to a promise of x. Reasoning as in the proof of proposition 1, given the tax rate t, the most efficient way to redistribute money is to promise $1+\gamma$ to as many voters as possible. This comes from the fact that the slope of the line starting at $(1-t,(1-t)/2)$ to any point on the probability of winning a vote curve is maximal when it goes to $(1+\gamma,1)$. The vote share corresponding to such a plan is:

$$\frac{\lambda t}{\gamma+t}+\left(1-\frac{\lambda t}{\gamma+t}\right)\left(\frac{1-t}{2}\right)=\frac{\lambda t}{\gamma+t}\left(\frac{1+t}{2}\right)+\frac{1-t}{2}$$

The vote share is equal to $1/2$ when $t=0$ and to $\lambda/(1+\gamma)$ when $t=1$ which is smaller than$1/2$ when $\gamma \geq 2\lambda-1$. To prove that any other choice of tax t is not better, it is enough to show that the vote shares is decreasing in t which is true since $\frac{(2\lambda t+\lambda)-\lambda t(1+t)}{(\gamma+t)^2}-1\leq 0$ for these values of γ and λ.

To show, that using both targetable and non-targetable taxes can not improve the vote share, we consider a candidate who uses non-targetable taxation and then shows that it it then not profitable to use targetable taxes in association. It is once again useful to think about the linearity of the winning function. Given a non-targetable tax rate t, the cost of collecting resources through targetable taxation is still linear with an opportunity cost of $1/2$, that is that to collect an amount of money the loss in terms of votes is proportional to $1/2$ the amount collected. Then a share γ of the amount collected can be used to win additional votes. The benefit of doing this has to be larger. However, the benefit would be smaller than $1/2\gamma$ since the slope between $(1-t,(1-t)/2)$ and $(1+\gamma,1)$ is maximal at $t=0$ and equal to $1/2\gamma$.■

Non-targetable taxation has a built-in inefficiency. A candidate cannot increase transfers without at the same time taxing the group he wants to redistribute to. Since in equilibrium, 50% of the voters are receiving positive transfers, a distortion of λ is effectively twice as costly when compared to the distortion coming from a targetable instrument. Proposition 4 thus shows that the non-targetable tax instrument needs to be sufficiently more efficient than a targetable instrument to be used by politicians. We could think that efficiency and targetability are thus substitutes and that when the targetable instrument is sufficiently inefficient, it is not used. Proposition 5 shows that this is not the case.

Proposition 6 *If $\gamma < 2\lambda-1$ and $\lambda < 1$, both tax instruments are used in equilibrium.*

Proof:

We know from proposition 4 that we can not have an equilibrium with only targetable taxes, since a non-targetable tax of $t = 1$ would enable a candidate to make promises of $1+\gamma$ to more than 50% of voters, since the budget collected would be of 2λ. Let's show that using only the more efficient non-targetable instrument is not an equilibrium. For that, we assume that candidate 1 is using the equilibrium strategy of proposition 1 and prove that candidate 2 can do better by using targetable taxation.

To see this consider the probability of winning function $W(x)$ as defined in the proof of proposition 1 (figure 1 in an example of it). Let's consider the following strategy of a non-targetable tax rate of 0. This would lead to 100% of voters getting a promise of 1 leading to a vote share of 1/2. But suppose now that in addition, the candidate targets ε voters that he fully taxes. He then uses the money collected $\gamma\varepsilon$ to redistribute to the $1-\varepsilon$ other voters. In terms of change of the vote share, this leads to a loss of ε voters that were voting for him with probability 50%. The loss is thus of $\varepsilon/2$. The additional money collected γe is divided among $1-\varepsilon$ voters. This brings $\left(W\left(1+\frac{\gamma\varepsilon}{1-\varepsilon}\right)-1/2\right)(1-\varepsilon)$. Since the slope of W is infinite at $x=1$, it will always be optimal to make such a change for ε small enough.■

To understand this result, recall that in the equilibrium in which only non-targetable taxation is used,the density of voters promised income close to 1 is high. It is thus very attractive for a politician to move from a promise of 1 to a slightly higher promise. The non targetable instrument does not allow them to take advantage of that since to get some resources to make these higher promises, a politician needs to increase the tax rate for everybody . What is gained by promising voters a bit more than 1 is lost because the politician has to tax everyone and give them less than one by doing that. Targetable taxes are much more flexible since there is no need to tax every voter in order to gain some additional resources for transfers.

Proposition 5 shows that, unless non-targetable taxation leads to no distortion, the targetable instrument is used with positive probability in equilibrium whatever its efficiency.

5 Conclusion

This paper presented a model of electoral competition between two politicians who compete in terms of both (distortionary) tax and redistribution promises. Specifically, we studied the equilibrium of a game in which politicians decide how much to tax ex-ante identical voters and how to redistribute the funds thus collected.

Whereas redistribution is always assumed to be individually targetable, we solved for the case of both targetable and non-targetable taxation. From a theoretical perspective, our model thus extends both Myerson (1993) and Lizzeri and Persico (2001).

Comparing the equilibrium with targetable taxes to that with non-targetable taxation, we highlighted that there exists an efficiency versus targetability trade off. This first step towards a positive theory of tax instruments allowed us to show that targetable taxes are an imperfect substitute for non-targetable taxes: as soon as the efficiency gap in favor of non-targetable taxes decreases below a certain positive threshold, politicians will use targetable taxes only. Yet, our results also show that targetable taxation is an imperfect substitute for non-efficient non-targetable taxes, in the sense that politicians will always use targetable taxes in equilibrium, regardless of their efficiency, because of the political benefit of being able to use targetable taxation.

Whereas a full positive analysis of tax instruments is beyond the scope of this paper, a few avenues for further research are worth mentioning. First, it would be interesting to see how the equilibrium is modified when redistribution is non-targetable. Does the new equilibrium bear any relationship to the one we found when taxation is not targetable?

Another very interesting extension would be to consider a population of voters with different inital incomes. That would lead to new questions on the nature of targetability of taxes. Targetability can mean the possibility to single out individuals and decide how much to tax them as in the present paper. With heterogeneous income distribution, another way to undertake targeting is to adopt non-linear tax schemes that single-out a category of voters with an income level. Under this assumption, it is however not possible to tax differently two voters with the same initial income.

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