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Carlos Maravall Rodríguez [1]

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The structure of each level of government in the United States has changed over the last 200 years. Wallis (2000) has presented empirical evidence that relates the dominance of each level not to the functions government decides to undertake (the expenditures it commits to), but to the costs and benefits of the financial instruments each level has available (the way each level extracts revenues). In this paper we provide theoretical evidence for this hypothesis. We show why two different levels of government (e.g. state and federal) would not want to use a common instrument to finance the same good.

Keywords: Fiscal Federalism; Community Models; Publicly Provided Private Goods.

JEL Classification: D78, E62, H42, H77

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Fiscal Federalism with a Single Instrument to Finance Government

Carlos Maravall Rodríguez[*]

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Abstract

The structure of each level of government in the United States has changed over the last 200 years. Wallis (2000) has presented empirical evidence that relates the dominance of each level not to the functions government decides to undertake (the expenditures it commits to), but to the costs and benefits of the financial instruments each level has available (the way each level extracts revenues). In this paper we provide theoretical evidence for this hypothesis. We show why two different levels of government (e.g. state and federal) would not want to use a common instrument to finance the same good.

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1 Introduction

In the United States the structure of government has changed over the last 200 years. Wallis (2000) has presented empirical evidence that relates (i) the growth of government to the functions it decides to undertake (the expenditures it commits to) but (ii) the dominance of each level (State 1790-1840, Local 1840-1933 and Federal 1933-) to the costs and benefits of the financial instruments each level has available (the way each level can extract revenues). In this paper we provide theoretical evidence for this second hypothesis. In particular, we show why two different levels of government, defined by the extent of their franchise (e.g. a country made up of different communities with a central government and community governments) would not want to use a common instrument to finance the same good.

It is not immediately obvious why two different levels of government would not want to use the same instrument to finance themselves. For example, Wallis (2000) himself has argued that:

> "Governments raise revenues and spend money. Raising revenues is politically costly, but spending money generates political benefits. [...] When there are multiple levels of government, with multiple revenue instruments and multiple purposes on which money can be spent, then marginal costs and benefits should be equated across all governments, revenue sources, and expenditures functions."
>
> (pp. 64).

The reason is that the benefit from using an instrument at one level is at the expense of another: marginal costs and benefits cannot be aligned at different levels of government. The

use of one instrument at one level at the expense of another implies that marginal conditions will remain unequal and there will be corner, not interior solutions.

Related Literature

The capacity that centralized government has to extract resources from its citizens has been a source of concern for political scientists since, at least, the time of the Federalist papers. The recent work of Persson and Tabellini (1996) has analyzed this problem from the perspective of redistribution from rich to poor regions. They show that a system of government which is centralized (a federation, as the U.S.) will provide higher levels of redistribution than a system of government in which the different states bargain over intergovernment transfers (a confederation, as the E.U.). The complaints inhabitants in rich regions in Germany, Italy, and Spain, express against the benefits their poor counterparts get because they belong to the same country provide an example of this problem.

In contrast, the study of Fiscal Federalism (Oates, 1972) or Economic Federalism (Inman and Rubinfeld, 1997) considers the possibility that government can be designed with different levels (local, state and federal in the U.S.) to optimally provide a good or service. The limits that define the activities performed by a higher or a lower level of government, are determined, among others, by intrastate externalities, the geographical differences in tastes, etc. The recent surveys of Inman and Rubinfeld (1997), Oates (1999), and Wallis (2000) give an overview of this literature.

This paper presents one clarification with respect to how much we can expect from the latter principle, given the power that centralization entails. In particular, it does not negate

the possibility of an optimal assignment of expenditures across different levels of government, but it asserts that it better be that the different levels collect their revenues with different instruments.

2 The Model

There is a population of individuals who only differ in their initial endowment of income, y_i. The density function of income across the whole country is f, with median, y^{med}, and mean, $\bar{y}$. Mean and median income satisfy the inequality $y^{med} < \bar{y}$ as is observed in actual distributions. Individuals have preferences over two goods: a numeraire private good (consumption) and a publicly provided private good, c and g, respectively. Preferences are:

$$u\left(c, g\right)$$

with $u_c, u_g > 0$ and $u_{cc}, u_{gg} < 0$, i.e. u is strictly increasing, and strictly quasi-concave. All individuals value a positive level of consumption and public provision, i.e. $\lim_{c \to 0} u_c = \lim_{g \to 0} u_g = \infty$.

The good g is financed with proportional taxes on personal income, y_i, across the country, t^f, and within each community, t^i. Initially, no restrictions are imposed on tax schedules, allowing them to be positive or negative, i.e. progressive or regressive: $t^f, t^i \in \Re$. Only feasibility conditions will constrain these. The country includes all individuals in the economy, whilst communities are mutually exclusive and collectively exhaustive (i.e. individuals cannot belong to two communities at a time and they must belong to at least one). For simplicity, I consider communities that are perfectly homogenous. This allows us to focus on issues of distribution across communities, instead of within.

In community i an individual is constrained, as (s)he cannot consume more income than is available, and the community is constrained as it cannot allocate more funds than there are available:

$$c_i \leqslant \left(1 - t^f - t^i\right) y_i \tag{1}$$

$$g^i \leqslant t^f \bar{y} + t^i y^i. \tag{2}$$

Note that as communities are homogenous, mean income is equal to the community's representative individual's income and, as $u_c, u_g > 0$, in equilibrium both constraints will be satisfied with equality. Moreover, as $\lim_{c \to 0} u_c = \lim_{g \to 0} u_g = \infty$, it will also be true that $c, g > 0$, i.e.

$$t^f + t^i < 1,$$

$$t^f \bar{y} + t^i y^i > 0.$$

Finally, individual feasibility constraints require that an individual cannot be taxed more income than (s)he has available:

$$t^f, t^i, t^f + t^i \leqslant 1.$$

The problem with no feasibility constraints

Unless mean income in the federal level and the community where a voter lives are equal, the difference between them can be used to finance the good at less expense than if there was a single level of government. For the sacrifice of being taxed by any of the two levels is the same (see equation (1)), but the return is higher for one than the other (see equation (2)), as long as their mean incomes differ, and the amount taxed at one level, can be neutralized by the other. Moreover, even if the federal tax is completely neutralized by the state tax, $t^i = -t^f$, when

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$y_i < \bar{y}$ funds are increasing in the federal level t^f, as $g_i = t^f \bar{y} + t^i y_i = t^f \left(\bar{y} - y_i \right)$ is increasing in t^f. This implies a gain with no cost, as if $t^i = -t^f$, $c_i = \left(1 - t^f - t^i \right) y_i = y_i$.

Proposition 2.1 *The preferred tax rates of individuals when there are no feasibility constraints are:*

(i) if $y^i < \bar{y}$: $t^f = \infty, t^i = -\infty$, with $t^f + t^i < 1$ and $t^f \bar{y} + t^i y^i > 0$,

(ii) if $y^i > \bar{y}$: $t^f = -\infty, t^i = \infty$, with $t^f + t^i < 1$ and $t^f \bar{y} + t^i y^i > 0$.

Proof. As long as we do not consider the individual feasible tax constraints $t^f, t^s \leqslant 1$, the problem has no solution. The Kuhn Tucker conditions show that the first order conditions of

$$\max_{t^f, t^i} u \left[\left(1 - t^f - t^i \right) y_i, t^f \bar{y} + t^i y_i \right]$$

$$s.t.$$

$$t^f + t^i \ < \ 1,$$

$$t^f \bar{y} + t^i y^i \ > \ 0.$$

cannot hold in space $t^f \times t^i$ as

$$-u_c \left(c_i, g_i \right) y_i + u_g \left(c_i, g_i \right) y_i \ = \ 0$$

$$-u_c \left(c_i, g_i \right) y_i + u_g \left(c_i, g_i \right) \bar{y} \ = \ 0.$$

and it is immediate to note that both equations cannot hold unless $y_i = \bar{y}$.

As there can be neutralization at *any* level of taxation, and the higher the level of taxation, the higher the level of funds available, a voter who is decisive can finance the good at no cost. The problem is analogous to that of an individual who has two assets available with the same

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variance but different expected value. A pure arbitrage condition allows for an infinite (!) profit by short selling the asset with the lower return (indebting oneself with it) and leveraging on the asset with a higher return (investing in it). The spread is pure profit and without a constraint, it can be made infinite.

Figures 1 and 2 present the solution with feasibility constraints, but it is immediate to note the nature of the problem if one removes them. ∎

Feasibility constraints

The intuition described above shows that in this economy the population is divided into two groups with respect to their preferences over taxes: those who want as high a federal tax as possible and as low a state tax as possible, i.e. those with with $y_i < \bar{y}$, and those with $y_i > \bar{y}$ who want as low a federal tax as possible and as high a state tax as possible. By assumption, the number of individuals in the former group dominates the latter as $y^{med} < \bar{y}$; hence the federal tax will be positive. Is it possible to be more specific about the federal tax? And, can we determine the state schedules? Indeed we can, once we introduce feasibility constraints.

Proposition 2.2 *The preferred tax rates of individuals are:*

(i) if $y^i < \bar{y}$: $t^f = 1$, $t^i < 0$ s.t. $t^i y_i = $ constant, $t^f + t^i < 1$ and $t^f \bar{y} + t^i y^i > 0$,

(ii) if $y^i > \bar{y}$: $t^f < 0$, $t^i = 1$, with $t^f + t^i < 1$ and $t^f \bar{y} + t^i y^i > 0$ satisfied.

In equilibrium, as $y^{med} < \bar{y}$, taxes are set as in (i).

Proof. The problem to solve for each individual is

$$\max_{t^f, t^i} u\left[\left(1 - t^f - t^i\right) y_i, t^f \bar{y} + t^i y_i\right]$$

s.t.

$$t^f \;\leqslant\; 1, \text{ with multiplier } \alpha_1 \geqslant 0,$$

$$t^i \;\leqslant\; 1, \text{ with multiplier } \alpha_2 \geqslant 0,$$

$$t^f + t^i \;<\; 1,$$

$$t^f \bar{y} + t^i y^i \;>\; 0.$$

The set defined by the constraints in $t^f \times t^i$ space is shown in figure 1 when $y_i > \bar{y}$ and figure 2 when $y_i < \bar{y}$. Utility is increasing in the North-West direction, as shown in figure 1, as when $t^i = -t^f$ if $y_i > \bar{y}$ utility is decreasing in t^f. In analogy, figure 2 shows what is true for a voter with $y_i > \bar{y}$. In this case, utility is increasing away from the origin in the South-East direction.

The Kuhn-Tucker conditions provide the same information. Ignore the first two inequality constraints, by considering their interior, as $\lim_{c \to 0} u'(c) = \lim_{g \to 0} v'(g) = \infty$. The first order conditions are

$$-u_c\left(c_i, g_i\right) y_i + u_g\left(c_i, g_i\right) \bar{y} \;=\; \alpha_1,$$

$$-u_c\left(c_i, g_i\right) y_i + u_g\left(c_i, g_i\right) y_i \;=\; \alpha_2.$$

For those individuals with $y_i < \bar{y}$ we find that $t^f = 1$ as $\alpha_1 > \alpha_2 \geqslant 0$ because $\alpha_1 - \alpha_2 = u_g\left(c_i, g_i\right)\left(\bar{y} - y_i\right) > 0$. With respect to t^i, we find, first, that as $t^f = 1$ and $t^f + t^i < 1$, then $t^i < 0$ (and $\alpha_2 = 0$). Second, if $t^f = 1$ all income is equally redistributed through the federal

tax. But, if all income is redistributed, then all individuals have access to the same amount of income, ex-post, to allocate to the publicly provided private good or the numeraire. As we have considered individuals who do not differ in their preferences, only in their income, then if they all have access to the same pool of ex-post income, then they will all want the same allocation of numeraire and publicly provided private good. That is, given $t^f = 1$, the solution to $u\left[-t^i y_i, \bar{y} + t^i y_i\right]$ must be identical across individuals. Thus, we can conclude that $t^i y_i = t^j y_j, \forall i, j$. For this to be true then state taxes must be decreasing, in absolute value, in income. That is,

$$\frac{dt^i}{dy_i} = -\frac{\left[u_{cc}\left(c_i, g_i\right) + u_{gg}\left(c_i, g_i\right)\right] t^i y_i}{\left[u_{cc}\left(c_i, g_i\right) + u_{gg}\left(c_i, g_i\right)\right]\left(y_i\right)^2} > 0,$$

and, given that state taxes are negative, they are increasing in income, and, hence, decreasing in absolute value. Finally,

$$\frac{d\left(t^i y_i\right)}{dy_i} = 0, \text{ and hence}$$
$$c_i = c,$$
$$g_i = g.$$

For individuals with $y_i > \bar{y}$ it is immediate to note that $t^i = 1$ and, as $t^f + t^i < 1$, then $t^f < 0$. However, we cannot go further than this analysis without making further assumptions on their relative preferences between the two goods. But, given that a majority of the individuals satisfy $y^{med} < \bar{y}$ the analysis for these individuals is what is informative as individuals with $y_i > \bar{y}$ will take $t^f = 1$ as a given. ∎

Figure 3 is a graphical description of this solution and figures 1 and 2 present the optimal solution for each set of voters in the population.

3   Conclusion

How is a publicly provided good to be financed? The literature on fiscal federalism suggests that if there are different levels of government, its provision will be Pareto superior to that when it can only be provided at a uniform rate by a central government. Similarly, with a political economic context in mind, Epple and Romano (1996) have shown that public provision of a private good supplemented by private purchases is preferred by a majority to pure public provision. Fernández and Rogerson (2003) reinterpret private provision as a supplement provided by an individual's community using the same instrument of funding as the central government. If the community is homogenous, as they assume, then they share the same result with Epple and Romano (1996). However, the analysis implicitly assumes that each level of government is restricted to use progressive taxes (i.e. $t^f, t^i \geqslant 0$ in our model), a counterfactual assumption (Klor, 2003). Instead, if no restrictions beyond feasibility conditions are imposed on these, it might be of little practical use to have several levels of government to finance a good. A single level, the central government, will provide all the funding, as a majority of individuals who live in poor communities will prefer central funding using the rich communities' income. This is shown in this paper, i.e. interregional redistribution funds the whole "cake" and community taxes are used to transfer funds across different categories of goods within a region. Hence, to avoid this expropriation of the rich communities by the poor regions, the former will have an interest in developing different fiscal instruments for each level.

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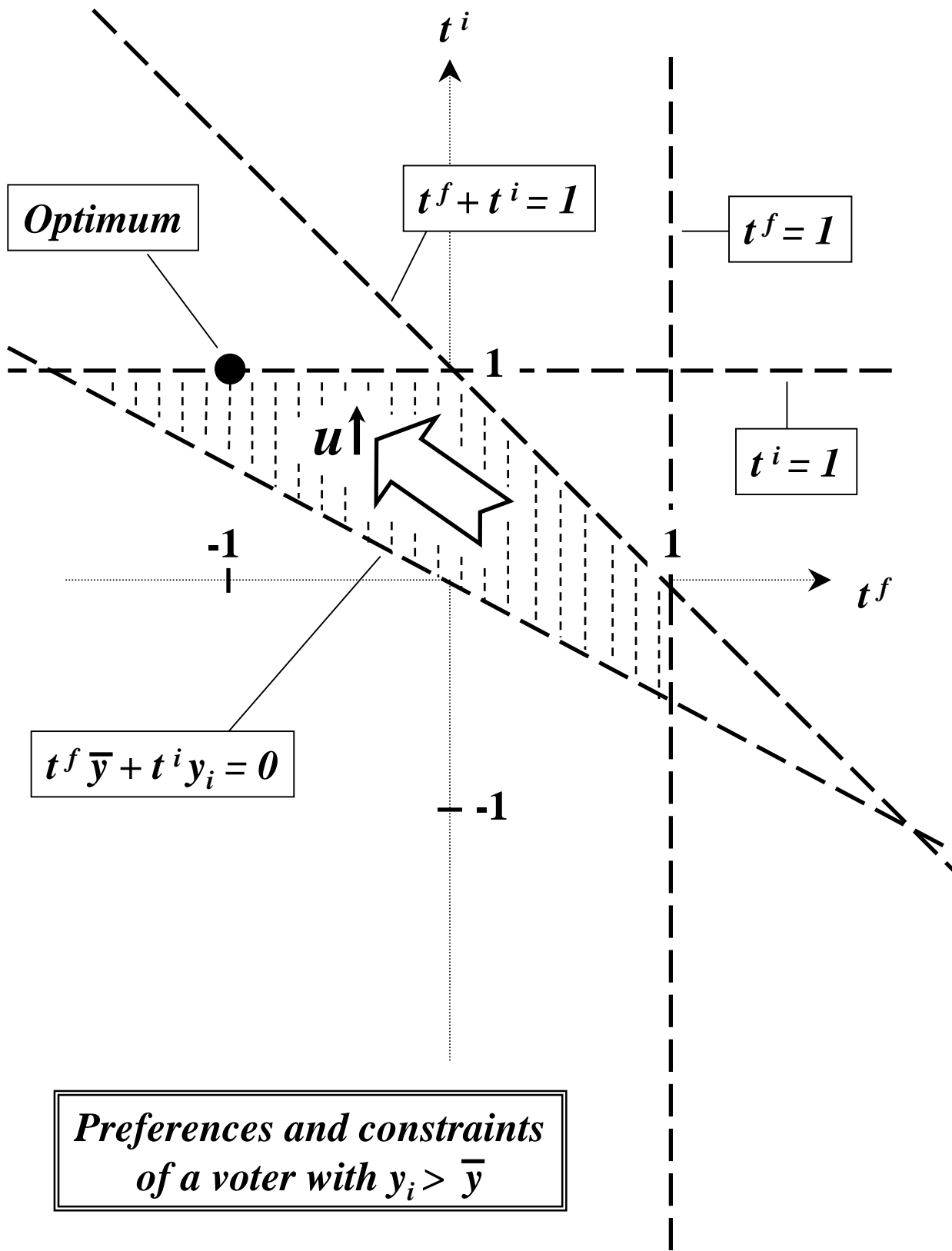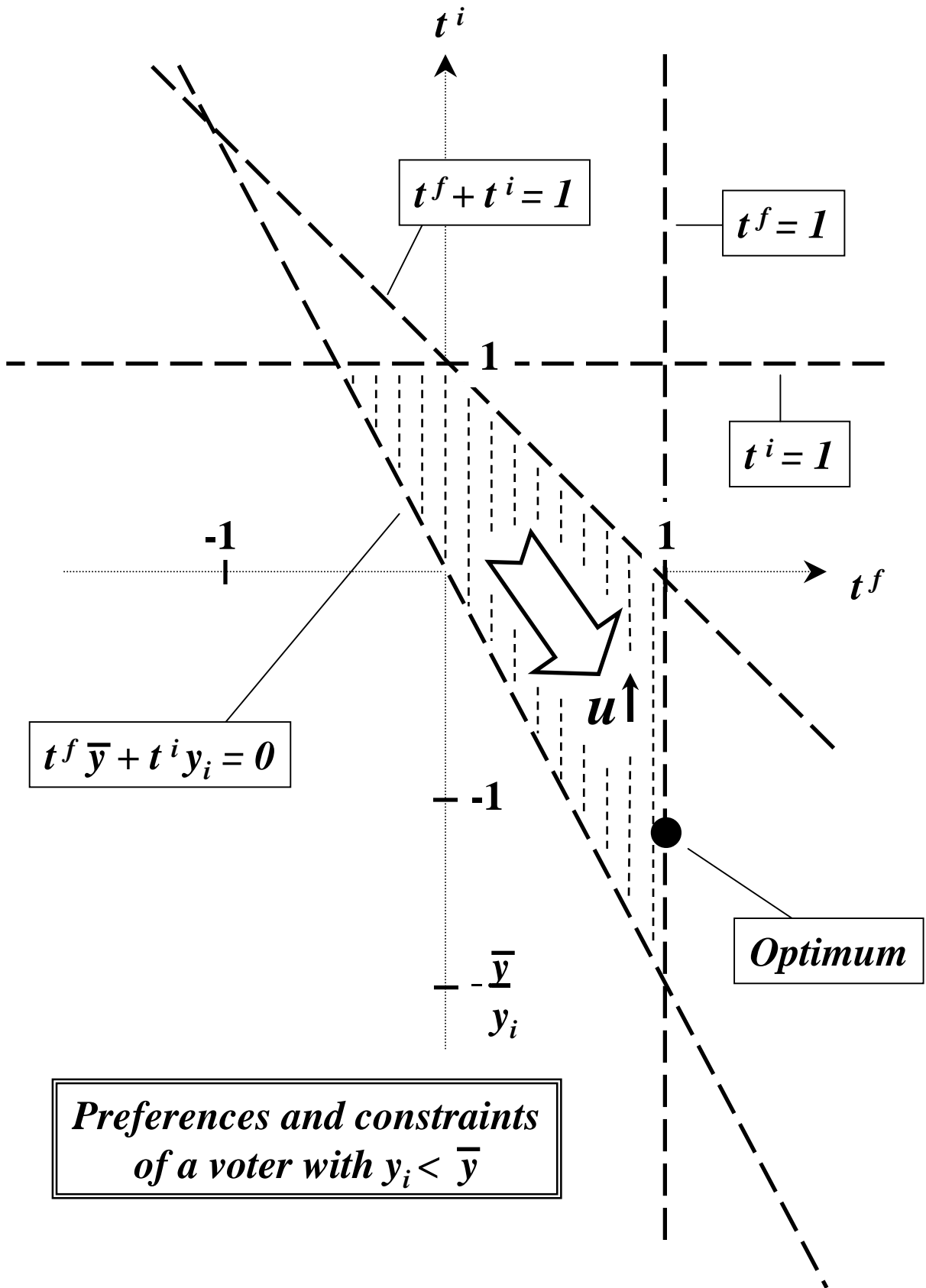
Optimum

$t^f + t^i = 1$

$t^f = 1$

$t^i = 1$

u

$t^f \, \overline{y} + t^i y_i = 0$

Preferences and constraints of a voter with $y_i > \overline{y}$

Figure 1

Figure 2

Figure 3