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Image Concerns and the Political Economy of Publicly Provided Private Goods

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Image Concerns and the Political Economy of Publicly Provided Private Goods

Abstract

Governments often provide their citizens with goods and services that are also supplied in markets: education, housing, nutritional assistance, etc. We analyze the political economy of the public provision of private goods when individuals care about their social image. We show that image concerns motivate richer individuals to vote for the public provision of goods they themselves buy in markets, the reason being that a higher provision level attracts more individuals to the public system, enhancing the social exclusivity of market purchases. In effect, majority voting may lead to a public provision that only a minority of citizens use. Users in the public system may enjoy better provision than users in the private system. We characterize the coalitions that can prevail in a political equilibrium.

JEL-Codes: H420, D720.

Keywords: in-kind provision, status preferences, majority voting.

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1 Introduction

Most countries devote considerable resources to the public provision of private goods such as education, housing, transport, health or food.[1] For many such goods and services, close substitutes are additionally supplied by markets, giving citizens the choice of whether to consume the publicly provided good or its private sector counterpart: parents can send their children to public schools and kindergartens or to private ones; people can live, if eligible, in private apartments or social housing and they can, in many places, commute by public transport or by private car. In democratic systems, public provision is determined through elections and referenda. A substantial body of research has studied the underlying political economy and its interaction with market provision (see, e.g., Stiglitz, 1974; Epple and Romano, 1996; Glomm and Ravikumar, 1998; Fletcher and Kenny, 2008; Luelfesmann and Myers, 2011). In a number of ways, the predictions from existing models do not square with empirical observations of public-private (dual) provision systems. In particular, they cannot explain why richer individuals, who consume the private alternative, often support public provision, why democratic governments provide goods and services to their citizens though a majority of voters do not use them or why publicly provided goods and services are sometimes of better quality than their alternative in the market.

Almost all research on the public provision of private goods assumes that individual choices between public and private alternatives are driven solely by price and quality. This ignores the fact that consumer choice is often also shaped by intangible image and reputational concerns: individuals pay attention to the social perceptions of their consumption choices, which confer on them prestige, esteem or social approval (see, e.g., Veblen, 1899 [1994]; Leibenstein, 1950; Frank, 1985; Bagwell and Bernheim, 1996; Glazer and Konrad, 1996; Corneo and Jeanne, 1997; Hopkins and Kornienko, 2004). Such image concerns also matter in choices between publicly provided goods and their private alternatives: sending one's child to a private rather than to a public school may conspicuously signal high income, great wealth or refined tastes – and thus caters to needs for social distinction and elitism (Ireland, 1994; Fershtman et al., 1996; Postlewaite, 1998; Akerlof and Kranton, 2002; Levy and Razin, 2015). Private cars and apartments reflect economic

[1] In some OECD countries, around a third of the GDP is devoted to such government programs, which are growing both in developed and developing countries (Currie and Gahvari, 2008; OECD, 2015, pp. 72f).

prowess and social success and deliver larger image rents than public transportation or social housing, which are often considered the poor man's choice (Frank, 1985; or Litman, 2009, on "bus stigma" in the US or the UK). *A fortiori*, public alternatives are often tainted with welfare stigma, and people may not take up social benefits out of fear of being stereotyped as unsuccessful, idle or morally weak (Moffitt, 1983; Besley and Coate, 1992; Lindbeck et al., 1999).

In this paper, we analyze the political economy of private goods when individuals have concerns about social image or reputation. We provide a simple model where a tax-financed, publicly provided good is determined by majority voting and a private option for this good is available. The decision as to whether or not to consume the publicly provided good provides an informative signal about income; and the ascription of higher incomes confers higher social standing on individuals. The image values of public and private sector consumption are endogenous and increase with the expected income of individuals who make the same choice. As individuals who buy the good in the market are richer, the image gap between private and public sector consumption is positive.

We show that image concerns generate a social feedback effect of public provision. Different levels of public provision partition society differently into public and private sector users, thus changing both the social perceptions of how rich (or poor) a typical public and private sector user is and the associated image rents. Presuming standard income sorting (richer [poorer] people tend to consume the private [public] alternative), the image rents of both public and private sector consumption increase when public provision increases: a higher provision level attracts more and, on average, richer people into the public system, increasing average incomes both in- and outside the public sector. This reduces the social stigma from taking up the publicly provided good and also enhances the social prestige of private sector consumption, as opting out becomes more socially exclusive.

We demonstrate that these social feedback effects can help to explain several puzzling empirical features of public provision that are hard to reconcile with standard voting models in a unified [theoretical] framework. First, richer individuals often support public services and public welfare although they make no or only little use of such services (Burchardt and Propper, 1999; Busemeyer and Iversen, 2014; Wearing, 2015). For example, in both the US and the UK more than half of the wealthiest quarter of households favor more government spending on health and education, even though they are well aware that this

would imply considerable tax increases for them (ISSP, 1986).[2] If only pecuniary motives mattered, this would be puzzling: richer individuals who choose private alternatives and thus tax-finance public provision without benefiting from it should always favor a retrenchment of public provision. Image concerns, as in our model, can accommodate the puzzle: those opting out of public provision may still be willing to pay for (higher) public supply as that would attract more individuals to the public system, thus increasing the image value of the private alternative (see Proposition 1).

Second, pocketbook voting models predict that the public provision of a good can arise as a voting equilibrium only when a majority of the population actually take up the publicly provided good. Such majority take-ups are, by and large, observed in the education systems in most OECD countries, where only a minority of about 15 percent of students attend private educational institutions (OECD, 2010). However, other important goods and services like housing, nutritional assistance, and sometimes public transport, *are* government-provided although a majority of citizens predominantly purchase them in markets (Currie, 2006).[3] If support for public provision is also driven by the social prestige of being a private consumer, voting may well lead to public provision that is only used by a minority of the population: proponents of public provision may recruit both from in- and outside the public system and can add up to more than half of the population even if less than half of the population actually consume the publicly provided good (see Proposition 2).

Third, if only price-quality considerations mattered in dual provision, the quality level in the public system could never be higher than in the private sector: nobody would be willing to incur the extra expenses (say, tuition fees in private schools) in the private system

[2]For example, in the US and the UK, 58 and 72 percent of respondents in the top income quartile state that governments should spend more or much more on education; similar figures are found for public spending on health. In the 2001 wave of the British Social Attitudes Survey, which explicitly classifies respondents into users and non-users of several kinds of public services, over two-thirds of the respondents whose children or themselves went to a private school stated that they would favor or strongly favor a 1 percent increase in their income tax to be spent on public education (Sefton, 2003). Similarly, a British housing poll by IPSOS Mori (2014) reveals that a majority of owner-occupiers and private renters speak out for more social housing being built in their locality. Such findings are corroborated in lab experiments: Buckley et al. (2015) find that the majority-preferred tax rate is significantly higher than predicted under the opt-out provision, due to higher-income individuals supporting the public system without any pecuniary incentives to do so.

[3]For example, the share of individuals living in social housing is about 17 percent in the UK (Andrews et al., 2011); roughly 15 percent of the US population receive benefits from food stamp programs (USDA, 2015). Likewise, in the typical US city, less than 5 percent of the population utilize the public transport system (Litman, 2009).

unless quality standards are higher than in the public system (on schools, see De Fraja, 2004). Again, this is different in the presence of image concerns: image-concerned citizens are willing to sacrifice a higher quality in the public system in exchange for the image gain in the private scheme (see Proposition 3). In fact, empirical studies on education reveal that private schools are quite heterogeneous, some offering poorer academic quality than in public schools (Matinez-Mora, 2006; Brunello and Rocco, 2008).[4] Conversely, image concerns may explain why eligible households forgo substantial economic benefits by not taking up in-kind programs such as food stamps or Medicare in the US and constrain themselves to the lower qualities of food or medical care which they can afford themselves (Currie and Gahvari, 2008): individuals trade off the avoidance of stigma from program participation against better consumption.

We characterize the political coalitions that can emerge in a voting equilibrium. Assuming – as is empirically plausible for normal goods such as education – that public-sector consumers with higher incomes have a higher willingness to pay for the publicly provided good, models of dual provision have identified the so-called "end-against-the middle" equilibrium as the only possible voting outcome (Epple and Romano, 1996). This equilibrium features a coalition structure where "the rich" (who opt out) and "the poor" (who think that the provision level and tax burden are already too high) would prefer less public provision while the (equally populous) "middle class" inside the public system would prefer higher public provision. As previously discussed, with image concerns, some of those who opt out may support (more) public provision. If the image rent from being an exclusive private-sector consumer has higher value the richer people get, then these supporters will be the "very affluent." They will coalesce with the middle class and vote for more public provision, being balanced in equilibrium by the moderately rich and the poor who oppose public provision. Even "median income earner"-equilibria can emerge, where all individuals who earn more than median income would support higher taxes (see Proposition 4). Hence, in the presence of image concerns the universe of possible voting equilibria becomes more nuanced.

[4]For example, Bertola and Checchi (2004) find that Italian public schools, on average, show better academic performance than (religious and lay) private schools. Looking at standardized tests scores in mathematics, reading, and science reported in the 2000 OECD Pisa Program, Vandenberghe and Robin (2004) find that public schools outperform private schools in France and Austria. Figlio and Stone (1999) assess the effect of religious and non-religious US private schools on educational outcomes and find that only the latter increase individual outputs relative to public schools; for religious private schools, the treatment effects on math and science high school performance are significantly negative.

Some of the empirical phenomena described above might, in parts, be driven by factors other than image concerns. For instance, altruism, preferences for redistribution or paternalistic concerns might make richer voters support public services that they themselves do not use (Gasparini and Pinto, 2006). Indirect incidence may also matter: Fack and Grenet (2010) show that public school performance capitalizes in housing prices, which would then make homeowners support public provision. However, such motives and channels cannot plausibly explain why provision quality could be lower in the private sector. On the other hand, the few exceptions in the literature that allow for a lower quality in the private sector – see Brunello and Rocco (2008) who argue that private schools can sell a lower educational standard at a positive price because they attract students with lower costs of effort – cannot explain why individuals politically support services that they do not use. Our model has the advantage that it captures several empirical features of dual provision systems in a single theoretical framework, clearly without claiming that image concerns are the only relevant aspect.

Our paper complements the literature, cited above, on image and status concerns in consumer demand and on suppliers' reactions to such desires for distinction (Rayo, 2013; Vikander, 2015; Friedrichsen, 2016). These studies cover market provision only; the role of image concerns – to our knowledge – has not yet been considered for dual-provision, political economy scenarios. There is a growing literature on the role of social image concerns for normative policy analysis (see, e.g., Truyts, 2012; Bilancini and Boncinelli, 2012, and the references therein). Still, positive studies on the political economy with image concerns are scarce. Corneo and Grüner (2000) study voting over redistributive income taxation when relative consumption serves as a signal for relative wealth. Higher taxes lessen the consumption gap between rich and poor, thereby reducing the signaling advantage for the rich. Image concerns thus reinforce the reluctance of the rich to redistribute to the poor. This is different in our paper: higher income taxes and better public services may benefit the rich as they keep their social clubs (private schools, private housing) smaller and less socially diluted.

Our paper builds on Levy and Razin (2015) who forcefully argue that social image concerns affect voting incentives. They find that richer individuals may support redistributive income taxation as it reduces the incentives to engage in costly signaling and sorting (e.g., paying tuition fees for otherwise superfluous private schools). They show that

under certain conditions all individuals up to the mean, and some above, politically prefer full income equalization to a laissez-faire society with costly signaling. In our paper, redistribution (via public provision) is a vehicle for social signaling rather than a remedy against it: the larger the benefit-dependent class, the greater the social distinction of the rich. Second, unlike in Levy and Razin (2015), our focus is not on egalitarian outcomes but rather on the more frequently observed type of political equilibria where some social stratification prevails (e.g., the partition into rich and poor groups in the case of dual provision). Moreover, we allow that private alternatives are not purely wasteful signaling devices but have an intrinsic consumption value, enabling us to analyze potential quality differences between the public and private sector and their ramifications in voting in detail, yielding the general results described above.

The rest of this paper is organized as follows: Section 2 presents the model. Section 3 analyzes the properties of endogenous image utilities. Section 4 discusses technical aspects of majority voting equilibria. Their political and economic features are described in section 5. Section 6 concludes. All proofs are relegated to appendices.

2 The model

2.1 Framework

General: The economy is populated by a continuum of individuals with measure one. Individuals differ in their exogenous gross incomes y. Incomes in the population are distributed according to a continuous cumulative distribution function $F(\cdot)$ with support on $\mathcal{Y} = [\underline{y}, \bar{y}] \subset (0, \infty)$. By $y_{med} = F^{-1}(1/2)$ and $Y = \int_{\mathcal{Y}} y \mathrm{d}F(y)$ we denote, respectively, median and average income in the economy. Subsets of the population will be abbreviated by the capital letter H, the attending measure will be indicated by the lower-case h. That is, for $H \subseteq \mathcal{Y}$ we have $h = \int_{y \in H} \mathrm{d}F(y)$.

Goods and their provision: There are two private goods, denoted by x and c. Good c, which serves as the numéraire, is exclusively supplied via markets. For good x, there is dual provision: an equal per-capita level $\bar{x}$ is costlessly provided by the government to all individuals; as an alternative to consuming $\bar{x}$, individuals can also opt out of public provision and buy their desired level of x in a market. Public and private sector consumption

are mutually exclusive: individuals cannot supplement or diminish the publicly provided quantity via additional purchases or sales in the private market.

To finance public provision, the government levies a proportional income tax at rate t. Everybody has to pay the tax, irrespective of whether he consumes $\bar{x}$ or opts out. The production technology of good x is linear and identical in the public and the private sector: one unit of the numéraire can be transformed into one unit of x. We correspondingly normalize the market price of good x to one.

Preferences: All individuals have identical preferences. They derive utility from the consumption of goods x and c, represented by a smooth, strictly increasing, and strictly quasi-concave utility function $u(x, c)$.

In addition to consumption utility, the decision whether to consume the publicly provided level of good x or to buy the good on the market imparts to individuals a certain social reputation or (self-)image. Let P_a denote the image utility of consumption choice a, where the binary variable $a \in \{in, out\}$ takes value "in" for an individual who consumes the publicly provided level $\bar{x}$ and "out" for people who opt out of public provision and buy good x on the market. Preferences are given by

$$U(x, c, a) = u(x, c) + \beta \cdot P_a, \tag{1}$$

where scalar $\beta \geq 0$ measures the weight of image concerns. The additive separability between $u(x, c)$ and P_a in (1) allows for a clear distinction between consumption and image utility.

The values P_{in} and P_{out} represent the differences in the prestige, distinction, stigma or, generally, social image associated with public and private sector consumption of good x. Such differences are assumed to arise as individuals are, or perceive themselves to be, socially equated with those consumers who make the same consumption choice as they do. Image values P_a are endogenous, varying with the partition of individuals into public and private sector users. We assume that both P_{in} and P_{out} increase in the average incomes of the population subgroup they represent. Specifically,

$$P_a = \mathbf{E}(y|a). \tag{2}$$

Here, $\mathbf{E}(\cdot|a)$ is the expectations operator, conditional on the choice $a \in \{in, out\}$. The linearity of U in $\mathbf{E}(y|a)$ is chosen for simplicity, reflecting a constant marginal relevance of image concerns.

Interpretation: Preferences (1) and (2) capture various social perceptions of public provision and market purchases. One interpretation, akin to Corneo and Jeanne (1997) and Bénabou and Tirole (2011), is income or status signaling: choices between publicly provided and private options – such as sending one's child to a private rather than to a public school or living in private instead of social housing – typically involve a sorting according to incomes or wealth. Since these decisions are often observable for social peers, they might thus easily communicate otherwise private information about one's income or wealth (Charles et al., 2009; Heffetz, 2011). This may be beneficial if, e.g., higher incomes are associated with a higher social rank. It may also generate stigma if, e.g., public schemes for transportation, housing or health insurance turn out to be the "poor man's schemes" and are associated with failure, idleness or other stereotypes of low-income earners.

Preferences (1) and (2) could also lend to an interpretation in terms of social norms. A public provision scheme redistributes from the non-users to the users of publicly provided goods (since taxes must be paid by everybody). The terms P_{out} and P_{in} can be interpreted as the image values associated with being a net contributor to or a beneficiary from the public budget. The image utility of public sector consumption will turn out to increase in the take-up rate of public provision in equilibrium (see below), which is consistent with the notion of endogenous welfare stigma (Currie, 2003; Lindbeck et al., 1999):[5] the psychological costs of participating in welfare programs decrease the more common such behavior is. Image concerns P_{in} and P_{out} can also relate to the (dis-)satisfaction from (not) complying with social norms. Consider, e.g., a social norm commanding that one ought to take care of oneself and make a living independently of government. Then, P_{in} and P_{out} being increasing in the take-up rate reflects that negative feelings from failing the norm diminish and feelings of virtue when complying increase the more commonly the norm is broken.

[5]Lindbeck et al. (1999) directly include the number of welfare users in the utility function. Our modeling can be interpreted as a micro-foundation of this approach.

Sequence of events: The model proceeds in three stages. First, a policy $(t, \bar{x})$ with an income tax rate t and an expenditure level $\bar{x}$ is selected by majority voting (political equilibrium). Second, each individual decides whether to consume good x in the public system or to purchase it on the market, taking $(t, \bar{x})$ as given (decision over a). Third, given a and $(t, \bar{x})$, individuals spend their after-tax incomes to maximize utility (individual consumption choices). We solve the model by backward induction.

2.2 Consumption and system choice

Stage 3: Given $(t, \bar{x})$, an individual with gross income y who opts out of public provision ($a = out$) purchases the (unique) bundle $(x, c) > (0, 0)$ that maximizes $u(x, c)$ subject to the budget constraint $c + x = y(1 - t)$. Let $x^* = x^*(y(1 - t))$ and $c^* = c^*(y(1 - t)) = y(1 - t) - x^*(y(1 - t))$ be the Marshallian demand for goods x and c. By the separability of U in (1), choices x^* and c^* do not depend on image concerns. Indirect utility from consumption is given by

$$v(y(1 - t)) := u(x^*, y(1 - t) - x^*).$$

If the individual consumes the publicly provided amount $\bar{x}$ (i.e., if $a = in$), she spends her entire net income $y(1 - t)$ on good c, and the consumption utility then amounts to $u(\bar{x}, y(1 - t))$.

Stage 2: Anticipating the decisions in Stage 3, an individual chooses $a = out$ over $a = in$ whenever the difference in image utilities between the consumption options is large enough to compensate for differences in consumption utility, i.e., if:

$$\beta \cdot (P_{out} - P_{in}) > u(\bar{x}, y(1 - t)) - v(y(1 - t)). \tag{3}$$

For given image values P_{out} and P_{in} and policy $(t, \bar{x})$, condition (3) partitions the population into those who consume in the private system ($a = out$) and of those who choose the publicly provided level ($a = in$). We denote these groups by

$$\begin{aligned} \tilde{H}^{out}(P_{out} - P_{in}, t, \bar{x}) &:= \{y \in \mathcal{Y} |\ \text{Condition (3) holds}\}, \\ \tilde{H}^{in}(P_{out} - P_{in}, t, \bar{x}) &:= \mathcal{Y} \setminus \tilde{H}^{out}(P_{out} - P_{in}, t, \bar{x}). \end{aligned}$$

Consistent expectations. We require that perceptions of image values are consistent with actions. Formally, at any policy $(t, \bar{x})$, image values (P_{out}, P_{in}) must simultaneously satisfy:

$$P_{out} = \int_{y \in \tilde{H}^{out}(P_{out}-P_{in},t,\bar{x})} y \mathrm{d}F(y) \quad \text{and} \quad P_{in} = \int_{y \in \tilde{H}^{in}(P_{out}-P_{in},t,\bar{x})} y \mathrm{d}F(y). \tag{4}$$

Denote the sets of individuals in and outside of the public system under consistent expectations by $\tilde{H}^{in}(t, \bar{x})$ and $\tilde{H}^{out}(t, \bar{x})$. We assume that their measures are continuously differentiable in t and $\bar{x}$.

2.3 Balanced budget

In stage 1, a policy $(t, \bar{x})$ is selected by majority vote. We restrict the analysis to policies that both balance the government budget and involve consistent expectations. We call a policy $(t, \bar{x})$ *feasible* if

$$t \cdot Y = \bar{x} \cdot \int_{y \in \tilde{H}^{in}(t,\bar{x})} \mathrm{d}F(y). \tag{5}$$

By the Implicit Function Theorem, Eq. (5) defines the provision level $\bar{x}$ as a continuously differentiable function of the tax rate t, i.e.,

$$\bar{x} = x(t). \tag{6}$$

Obviously, $x(0) = 0$. Without loss of generality, we assume that every positive tax rate $t > 0$ that we consider goes along with positive public provision levels $x(t) > 0$. Moreover, we confine our analysis to the increasing segments of the Laffer curve. That is, a higher tax rate implies a higher provision level:

$$\frac{\mathrm{d}x(t)}{\mathrm{d}t} > 0$$

for all t. This property is not implied by the primitives of our model in general; it is straightforward to show that it needs to prevail in a majority voting equilibrium, however. By (6), the policy space is one-dimensional, with the tax rate t as the remaining policy

variable. Henceforth, we denote by

$$H^{in}(t) := \tilde{H}^{in}(t, x(t)) \quad \text{and} \quad H^{out}(t) := \tilde{H}^{out}(t, x(t))$$

the sets of individuals in and outside the public system. At feasible policy $(t, x(t))$, the image values of consuming in and outside the public system are given by

$$P^{in}(t) := \mathbf{E}(y|y \in H^{in}(t)) \quad \text{and} \quad P^{out}(t) := \mathbf{E}(y|y \in H^{out}(t)). \tag{7}$$

3 Political preferences and image concerns

3.1 Indirect utility

We now define individual preferences over policies, which will determine voting behavior. Given a tax rate t, denote by

$$\begin{aligned} V^{in}(t, y) &:= u(x(t), y(1-t)) + \beta P^{in}(t), \\ V^{out}(t, y) &:= v(y(1-t)) + \beta P^{out}(t) \quad \text{and} \\ V(t, y) &:= \max\{V^{out}(t, y), V^{in}(t, y)\} \end{aligned} \tag{8}$$

the utility levels of an individual with income y in the public system (V^{in}), outside of the public system (V^{out}), and when choosing the better of the two (V). Observe that V^{in}, V^{out}, and V incorporate the utility-maximizing behavior of all other individuals, the partition of the population into H^{in} and H^{out}, and the government budget constraint. Functions V^{out}, V^{in}, and V are continuous and differentiable in (t, y) with the exception that $V(\cdot, y)$ has a (zero-measure) non-differentiability when $V^{in}(t, y) = V^{out}(t, y)$.

Utilities V^{out} and V^{in} in (8) depend on policies t in two ways. First, taxation affects consumption utilities $u(x(t), y(1-t))$ and $v(y(1-t))$. This effect is present in the absence of image concerns as well. Second, changes in t alter the composition of public and private sector users and, thus, the image utilities P^{in} and P^{out} of individuals in and outside of the public system. These social feedback effects translate into additional motives to favor or oppose public provision.

The political economy of dual, public-private provision can produce a rich variety of equi-

librium outcomes already in a setting without image concerns; adding endogenous image concerns multiplies these potential outcomes. In accordance with everyday observations, we suggest that opting in and out of public consumption arise along income lines, that image concerns do not offset this income sorting, and that higher tax rates *ceteris paribus* make the public system more attractive.[6]

Assumption 1 (Income sorting) *For all $y \in \mathcal{Y}$:*

- $V^{out}(0, y) - V^{in}(0, y) > 0 > V^{out}(1, y) - V^{in}(1, y)$;
- $\frac{\partial}{\partial t}[V^{out}(t, y) - V^{in}(t, y)] < 0$ *for all t;*
- $\frac{\partial}{\partial y}[V^{out}(t, y) - V^{in}(t, y)] > 0$ *for all t.*

The first item in Assumption 1 means that at very low tax rates and public provision levels everybody buys good x in the market, and that for sufficiently high tax rates everybody will consume x in the public system.

The second item states that staying in the public system becomes more attractive the larger the tax rate and, hence, the public provision level. Together, the first two items imply that for every income level $y \in \mathcal{Y}$ there exists a unique tax rate $\hat{t}$ such that $V^{in}(t, y) \geq V^{out}(t, y)$ for all $t \geq \hat{t}(y)$. That is, an individual with income y stays in [opts out of] the public system whenever $t \geq \hat{t}(y)$ [$t < \hat{t}(y)$].

The third item in Assumption 1 ensures that if a person is in [out of] the public system then so are all poorer [richer] persons: for any t, if $V^{in}(t, y') = V^{out}(t, y')$ at some income y', then $V^{in}(t, y) \geq V^{out}(t, y)$ for all lower incomes y and $V^{out}(t, y) \geq V^{in}(t, y)$ for all higher incomes y.

Assumption 1 implies that the tax rate of indifference increases in income:

$$\frac{\mathrm{d}\hat{t}(y)}{\mathrm{d}y} = -\frac{\partial(V^{out} - V^{in})/\partial y}{\partial(V^{out} - V^{in})/\partial t} > 0 \quad \text{for all } (t, y). \tag{9}$$

Intuitively, for richer individuals a higher tax rate (equivalently, a higher public provision level) is needed to keep them consuming in the public system.

[6] Assumptions are phrased in terms of $V^{in}(t, y)$ and $V^{out}(t, y)$, and thus, are combined requirements on direct preferences (u), image concerns (βP_a), the distribution function ($F(y)$), and their interplay through (4) and (6).

From (9), $\hat{t}(y)$ can be inverted; we denote the inverse by $\hat{y}(t)$ with

$$\frac{\mathrm{d}\hat{y}(t)}{\mathrm{d}t} > 0.$$

Given a tax rate t, there exists an income threshold $\hat{y}(t)$ such that individuals with incomes below [above] $\hat{y}$ stay in [out of] the public system; this threshold increases in tax rates.

3.2 Implications for image utilities

Assumption 1 shapes image utilities in the aggregate. In particular, the sets of individuals in and outside of the public system are, at feasible policy t, the income brackets below and above $\hat{y}(t)$:

$$H^{in}(t) = [\underline{y}, \hat{y}(t)] \quad \text{and} \quad H^{out}(t) = (\hat{y}(t), \bar{y}]. \tag{10}$$

From (7), the image values ascribed to consuming good x in and outside the public system then are the average incomes below and above the threshold $\hat{y}$:

$$P^{in}(t) = \mathbf{E}(y|y \leq \hat{y}(t)) \quad \text{and} \quad P^{out}(t) = \mathbf{E}(y|y \geq \hat{y}(t)). \tag{11}$$

Image utilities have the following properties:

Proposition 1 *Under Assumption 1, $P^{out}(t) > P^{in}(t)$ for all $t \in (0,1)$. Moreover,*

$$\frac{dP^{out}(t)}{dt} > 0 \quad \textit{and} \quad \frac{dP^{in}(t)}{dt} > 0. \tag{12}$$

The **proofs** of Proposition 1 and of all results to come are relegated to the Appendix. Individuals who purchase good x in the market enjoy higher image utility than users in the public system: by income sorting, individuals in $H^{out}(t)$ are richer. Moreover, image utilities P^{in} and P^{out} both increase in the tax rate. Higher tax rates attract richer individuals into the public system, raising average incomes both in and out of the public system. Consuming good x in the public system loses some of its stigma, buying it in the market becomes even more select.

The monotonicity of image utilities in (12) has important implications for political preferences V^{out} and V^{in}. For individuals outside of the public system, consumption util-

ity $v(y(1-t))$ strictly decreases in the tax rate. Without image concerns, individuals in the private system would thus always favor cutting back tax and provision levels: $\partial V^{out}/\partial t < 0$ if $\beta = 0$. By contrast, image concerns imply a benefit from higher taxes ($dP^{out}/dt > 0$). If these image effects are strong enough, they can override the reduction in consumption utility and render $\partial V^{out}(t)/\partial t$ positive. This is in line with the empirical evidence, quoted in the introduction, that rich non-users of publicly provided goods often politically support public provision or its expansion.

For those in the public system, a higher tax rate involves a trade-off in consumption utility $u(x(t), y(1-t))$: it means a higher provision level $x(t)$ but comes at the cost of reducing the consumption level of the other good, $c = y(1-t)$. Depending on which effect dominates (which may vary with income and the prevailing tax rate), their materialistic concerns can lead consumers in the public system to favor expanding or cutting back public provision. Image concerns $P^{in}(t)$ add a marginal benefit from higher tax rates, leading *ceteris paribus* to stronger support for (or lower reluctance against) more public provision among users. However, if tax rates become large, the deterioration in consumption utility due to the low level of good c will override the benefits from higher tax rates.

4 Majority voting equilibria

4.1 Definition

A majority voting equilibrium (MVE) is defined as a feasible tax rate that beats every other feasible tax rate in pairwise comparison:

Definition 1 *A feasible tax rate t^* is a* majority voting equilibrium (MVE) *if at least half of the population prefers, with respect to $V(t, y)$, policy t^* to any other feasible tax rate. An MVE is called* interior *if $t^* > 0$ and, consequently, $x(t^*) > 0$. An MVE is said to feature* dual provision *if both $H^{out}(t^*) \neq \emptyset$ and $H^{in}(t^*) \neq \emptyset$.*[7]

Generally, an MVE only exists under further restrictions on the distribution of voters' preferences over the policy space, such as single-peakedness (Black, 1958), single crossing

[7] MVE without dual provision are uninteresting for our purpose: if nobody is in the public system at an MVE, t^* is trivially zero. If everybody is in the public system, the median income earner is decisive, i.e., $t^* = \arg\max_t V(t, y_{med})$. Due to income sorting, dual provision will arise if some people (the richest) opt out of the public system at the median income earner's favorite policy. This condition appears as Assumption (A.6) also in Epple and Romano (1996).

(Gans and Smart, 1996), intermediateness (Rothstein, 1990) or top monotonicity (Barbera and Moreno, 2011). Even without image concerns, political preferences over dual provision do not naturally exhibit any such property (see, e.g., Stiglitz, 1974; Epple and Romano, 1996; Luelfesmann and Myers, 2011). Image concerns complicate things further: while in the absence of image concerns the preferences of individuals outside the public system are trivially single-peaked (everybody always prefers lower tax rates), image-concerned voters may have a positive willingness to pay for public provision even outside the public system, rendering the distribution of preferred policies across the whole income support a relevant issue. By the following assumption we ensure that for all y and *within* a system of provision individuals have uniquely defined most-preferred tax rates and that *within* a consumption system no individual is ever indifferent between two tax rates on the same side of his utility peak:

Assumption 2 (Single-peakedness) *For every $y \in \mathcal{Y}$, $V^{in}(t, y)$ and $V^{out}(t, y)$ are single-peaked in t.*

Even single-peakedness of domain-specific preferences $V^{out}(t, y)$ and $V^{in}(t, y)$ does not imply single-peakedness of their upper envelope, which would be needed to establish Condorcet winners (see Barbera and Moreno, 2011). While our focus is not on technical questions of the existence of an MVE, we illustrate all our propositions by examples with standard direct preferences and income distributions, evidencing that voting equilibria with the alleged properties can in fact exist.

4.2 Coalitions in an MVE

Given a tax rate t, the following four (not necessarily non-empty) subsets of individuals partition the population into individuals with like-minded preferences and consumption

system choices:

$$
\begin{aligned}
H_{-}^{in}(t) &= H^{in}(t) \cap \left\{ y \;\middle|\; \frac{\partial V^{in}(t,y)}{\partial t} < 0 \right\}, \\
H_{+}^{in}(t) &= H^{in}(t) \cap \left\{ y \;\middle|\; \frac{\partial V^{in}(t,y)}{\partial t} \geq 0 \right\}, \\
H_{-}^{out}(t) &= H^{out}(t) \cap \left\{ y \;\middle|\; \frac{\partial V^{out}(t,y)}{\partial t} \leq 0 \right\}, \\
H_{+}^{out}(t) &= H^{out}(t) \cap \left\{ y \;\middle|\; \frac{\partial V^{out}(t,y)}{\partial t} > 0 \right\}.
\end{aligned}
$$

As before, superscripts *in* and *out* collect individuals who consume the publicly provided good or opt out. Subscripts $+$ and $-$ indicate whether individuals would favor a (marginal) reduction of the tax rate or would like to see the tax rate increased. The following technical result will be helpful:

Lemma 1 *Under Assumption 1, in an interior MVE with dual provision the following holds true:*

$$
h_{-}^{in}(t^*) + h_{-}^{out}(t^*) = \frac{1}{2} = h_{+}^{in}(t^*) + h_{+}^{out}(t^*). \tag{13}
$$

Lemma 1 states that there are two opposing coalitions in any interior MVE: those who advocate (slightly) higher tax rates, $H_{+}^{out}(t) \cup H_{+}^{in}(t)$, and those who advocate (slightly) lower tax rates, $H_{-}^{out}(t) \cup H_{-}^{in}(t)$. Coalitions encompass half of the population each; they, thus, exactly offset one another in political power.

4.3 Public provision for a minority

In the absence of image concerns, everybody who opts out of public provision has $\partial V^{out}/\partial t < 0$ and therefore prefers a zero tax rate and provision level to any other policy. Hence, $H^{out}(t^*) = H_{-}^{out}(t^*)$ in a MVE. From Lemma 1, political preferences in an MVE then are such that a 50%-group of consumers in the public system with a preference for more provision is offset by an equally large coalition of individuals, consisting of users and non-users of the publicly provided good, with a preference against higher provision ($H_{-}^{in} \cap H_{-}^{out}$). In terms of (13), an MVE, thus has: $h_{+}^{in}(t^*) = \frac{1}{2} = h_{-}^{in}(t^*) + h_{-}^{out}(t^*)$. This implies that at least half of the population consume the publicly provided good ($h^{in}(t^*) \geq 1/2$). As,

by Assumption 1, public sector users are located at the lower end of income distribution, they must include the median income earner: $y_{med} \in H^{in}(t^*)$. Put differently, positive public provision can only arise as an MVE if a majority of individuals actually use public supply (see Epple and Romano, 1996, Prop. 2).

This is different in the presence of image concerns. Here, h_+^{out} in (13) is not zero in general: some non-consumers of the public option might prefer higher public provision due to the gain in image utility this would generate for them. Hence, h_+^{in} is no longer restricted being equal to one half in an inner MVE. It is even conceivable that $h_+^{in}(t^*) + h_-^{in}(t^*) < 1/2$, and hence, $y_{med} \in H^{out}(t^*)$: majority voting may lead to public provision although the public option is taken up only by a minority of the population. That such seemingly puzzling situations may generically occur under image concerns is shown by means of a numerical example in Appendix A.3, where we choose a simple CES function for consumption utility and a uniform income distribution. We thus state:

Proposition 2 *Suppose that assumptions 1 and 2 hold. With image concerns, the median income earner might opt out of the public system at an interior MVE. That is, it is possible that $t^* > 0$ is a MVE such that $y_{med} \in H^{out}(t^*)$.*

Proposition 2 is relevant for important goods and services such as housing, nutritional assistance or transportation, which *are* typically publicly provided in democratic countries, while the majority of citizens chooses the private alternatives and only low-income individuals consume the publicly provided option (see, e.g., Andrews et al., 2011; USDA, 2015; Litman, 2009). While (most) existing voting models cannot account for such a minority provision, our image model can: even individuals who buy good x on markets might benefit from the existence of a public sector as it enhances their image utility from opting out. If such effects are strong enough, the decisive voter is willing to provide a positive level of $\bar{x}$ even if he himself relies on the private market. Majority voting then leads to the provision of a good that the majority does not consume.

4.4 Private provision levels

In the absence of image concerns, everybody who opts out of public provision in an MVE purchases a higher level (or quality) of good x than the level $\bar{x}$ provided in the public

system.[8] As noted in the introduction, this prediction is not always in line with empirical evidence, where individuals sometimes choose a lower level of good x than $\bar{x}$. Image concerns might explain this: in exchange for the gains in image utility from opting out of the public system individuals might be willing to accept lower consumption levels of *both* goods when buying them on the market (for private car use, see Steg, 2005, or Litman, 2009). Conversely, the stigmatization of public in-kind provision (relative to private purchases) can deter people from program take-up even if that means sacrificing better consumption (Moffitt, 1983; Besley and Coate, 1992; Currie and Gahvari, 2008). Recall that opting-out of public provision happens when

$$\beta \left[P^{out}(t) - P^{in}(t)\right] > u(x(t), y(1-t)) - u(x^*, c^*). \tag{14}$$

For $\beta > 0$, the gain in image utility from opting out is positive (see Proposition 1). Hence, image concerns will induce some individuals to opt out of public provision even if that diminishes their consumption utility, i.e., if $u(x^*, c^*) < u(x(t), y(1-t))$. Regardless of image concerns, opting out of public provision is always followed by a reduced consumption of good c (since $c^* < y(1-t)$). In the presence of image concerns, the consumption of good x may also be lower for those who opt out of public provision:

Proposition 3 *In an interior MVE t^* with image concerns, it is possible that $x^*(y(1-t^*)) < x(t^*)$ for some, and possibly even for all, $y \in H^{out}(t^*)$.*

The example in Appendix A.3 can again serve as proof. There, the consumption level of x for *everybody* who opts out of the public mode is lower in an MVE than the publicly provided level. In maybe more realistic scenarios (not constructed as an example here), consumption of good x will be lower than the publicly provided level only for some of those who opt out of the public system. Due to the normality of good x, the gap between the publicly provided level and individual demand is positive and largest for individuals slightly above the threshold of opting out (i.e., for whom (14) just holds). Therefore, our model describes relative low levels of, say, private education or private health insurance as largely a middle-class phenomenon: it is in particular the poorest among those who opt out who are willing to forgo even high quality services in order to avoid program stigma

[8] For $\beta = 0$, individuals who opt out of the public system are characterized by $u(x^*(y(1-t)), c^*(y(1-t))) > u(\bar{x}, y(1-t))$. As $c^* = y(1-t) - x^* < y(1-t)$, this can only hold if $x^*(y(1-t)) > \bar{x}$.

or to mingle with the rich.[9]

5 Voting under income monotonicity

5.1 Positive income monotonicity

Lemma 1 describes coalitions in a quite abstract way by the policy preferences of their members – without studying *who* precisely these members are. Such statements require additional assumptions on the distribution of policy preferences $\{V(\cdot, y)\}_{y \in \mathcal{Y}}$ over voters' types (i.e., incomes).

Since Epple and Romano (1996), dual provision models have typically assumed that the marginal willingness to pay for the publicly provided good (weakly) monotonically varies with the incomes of its users. In the absence of image concerns, users of a publicly provided good whose (private) income elasticity exceeds, in absolute terms, its price elasticity exhibit a marginal willingness that increases with their income; education or health goods are prime examples. Once image concerns prevail, measures of willingness to pay need to account for them. Importantly, the association between income and willingness to pay now also matters for non-users (without image concerns, all that matters is that their willingness to pay is zero). Economically, this boils down to the question of whether the gains in image utility or social distinction from rendering the private system more elitist matter more or less, depending on one's income.

A frequent assumption in matching models with an instrumental interpretation of image concerns (see, e.g., Levy and Razin, 2015) is that the utility gain from mixing with the rich is complementary to income. Combining this idea with the assumption that the consumption-based, "materialistic" willingness to pay for public provision rises with income, this motivates[10]

[9] Depending on whether the median is in or outside the public system, either the upper or the lower income class enjoys relatively low levels of private consumption of good x, in comparison to the poor and the rich.

[10] In the absence of image concerns, Assumption 3 corresponds to the SRI-case in Epple and Romano (1996). There, the analysis is couched in terms of marginal rates of substitution. As in Luelfesmann and Myers (2011) and Glomm and Ravikumar (1998), we equivalently phrase assumptions in terms of indirect utilities. Another (again equivalent) alternative to phrase Assumption 3 would be via favorite tax rates.

Assumption 3 (Positive income monotonicity) *For all $y > y'$,*

$$\frac{\partial V^{in}(t,y')}{\partial t} \geq 0 \implies \frac{\partial V^{in}(t,y)}{\partial t} > 0;$$
$$\frac{\partial V^{out}(t,y')}{\partial t} \geq 0 \implies \frac{\partial V^{out}(t,y)}{\partial t} > 0.$$

Combined with single-peakedness, Assumption 3 implies that whenever some person with income y' in the "in"- or in the "out"-group likes to see public provision raised (i.e., would prefer a higher tax rate) then so does any richer person in that group. In particular, individuals who consume outside of the public system prefer higher tax rates when their income increases. Economically, the very rich are more eager to make private clubs socially exclusive than the not-so-rich, which appears plausible for the case of (private) education. Assumptions 1 and 3 together imply that the sets H_-^{in} through H_+^{out}, defined for Lemma 1, are intervals that partition $\mathcal{Y}$ into ascending income brackets. In particular, under Assumptions 1, 2 and 3 there exist, for any feasible t, income thresholds $y_s^{in}(t)$ and $y_s^{out}(t)$ with $y_s^{in}(t) \leq \hat{y}(t) \leq y_s^{out}(t)$ (with at least one strict inequality) such that[11]

$$\begin{aligned} H_-^{in}(t) &= [\underline{y}, y_s^{in}(t)), \quad H_+^{in}(t) = [y_s^{in}(t), \hat{y}(t)], \\ H_-^{out}(t) &= (\hat{y}(t), y_s^{out}(t)], \quad H_+^{out}(t) = (y_s^{out}(t), \bar{y}]. \end{aligned} \tag{15}$$

When they belong to the interior of $\mathcal{Y}$, the thresholds $y_s^{in}(t)$ and $y_s^{out}(t)$ separate, within the "in"- and the "out"-group, those who would prefer a lower tax rate from those who prefer to see t increase. For individuals with incomes $y_s^{in}(t)$ and $y_s^{out}(t)$, the current tax rate t is then their favorite tax rate, *conditional* on them consuming, respectively, in and outside of the public system.

5.2 Coalition structures in majority voting

The following result characterizes the possible coalition structures in an MVE that are compatible with Lemma 1 and positive income monotonicity.

Proposition 4 *Suppose that $\beta > 0$ and that Assumptions 1 to 3 hold. Suppose further that $t^* > 0$ is an interior MVE where the median income earner consumes in the public*

[11] We adopt the standard conventions that, for all y and $y' > y$, the intervals $[y, y)$, $(y, y]$, $[y', y)$, (y', y) and $[y', y]$ each represent the empty set.

system (i.e., $y_{med} < \hat{y}(t^*)$). Then the distribution of political preferences at t^* is of either of the following types:

(A) "Ends-against-the-middle": Individuals at the lower and at the upper ends of the income distribution prefer a lower tax rate than t^*, while those in the middle of the income distribution prefer a higher tax rate:

$$H_-^{in} \cup H_-^{out} = [\underline{y}, y_s^{in}(t^*)) \cup [\hat{y}(t^*), \bar{y}], \quad H_+^{in} = [y_s^{in}(t^*), \hat{y}(t^*)], \quad \textit{and} \quad H_+^{out}(t^*) = \emptyset$$

for some $y_s^{in}(t^*) < y_{med}$.

(B) "Ends-against-the-ends": Individuals in the lowest and in the lower upper part of the income distribution prefer a lower tax rate than t^*, while those at the highest end and in the lower middle part of the income distribution prefer a higher tax rate:

$$H_-^{in} \cup H_-^{out} = [\underline{y}, y_s^{in}(t^*)) \cup (\hat{y}(t^*), y_s^{out}(t^*)], \quad H_+^{in} \cup H_+^{out} = [y_s^{in}(t^*), \hat{y}(t^*)] \cup [y_s^{out}(t^*), \bar{y}]$$

for some $y_s^{in}(t^*) < y_{med} < y_s^{out}(t^*)$.

(C) "Median income earner": Individuals at the lower end of the income distribution prefer the tax rate to be lower than t^*, while all other individuals prefer a higher tax rate:

$$H_-^{out} = \emptyset, \quad H_-^{in} = [\underline{y}, y_{med}), \quad \textit{and} \quad H_+^{in} \cup H_+^{out} = [y_{med}, \bar{y}].$$

The "ends-against-the-middle" MVE in item (A) of Proposition 4 is well-known from Epple and Romano (1996); it is the only type of equilibrium that can occur in the absence of image concerns. To see this, assume that β is zero. Then, at any inner equilibrium t^*, the group of individuals who opt out and prefer a marginal increase in the tax rate is empty ($H_+^{out} = \emptyset$). The positive alignment of political preferences with incomes in (15) together with Lemma 1 then directly implies that the union of the highest and the lowest ends of the income distribution and the middle class must each constitute half of the population and balance one another in their preference for and against higher taxes in equilibrium. Clearly, by continuity arguments, this "ends-against-the-middle type is also included in the set of possible MVE under image concerns (think of β as being sufficiently

low).[12]

According to Proposition 4, two other types of equilibria can emerge under image concerns. Item (B) discovers what we call an *ends-against-the-ends* equilibrium. Here, image concerns are strong enough to override materialistic preferences for the most affluent non-users of public provision; for some (less rich) consumers outside the public system image concerns are still outweighed by their materialistic preference, i.e., both H_+^{out} and H_-^{out} have members. Politically, the most affluent in the population then join the richest among the individuals who consume in the public system in their advocacy of more provision. This coalition is offset by individuals in the lower ranks of users and non-users of the publicly provided good who prefer less provision.

As a third possibility, Item (C) in Proposition 4 shows that an MVE with image concerns can be of the *median income earner*-type. Here, *everybody* outside the public system prefers a higher tax rate (H_-^{out} is empty) and, in that, forms a coalition with the higher-income earners from the public system. Only the poor in the public system object to tax increases.

The intuition for items (B) and (C) is as follows. Some richer individuals, though choosing private alternatives, may benefit from higher public provision due to its positive impact on their social image. Politically, these individuals will join the middle class in support of an expansion of the public system. As the desire for social exclusivity is assumed to grow along the income ladder, this coalition of supporters comprises the richest individuals. For the not so-rich (i.e., the non-users closer to the critical income level) monetary concerns override status concerns; these people still coalesce with the poor. In sum, this gives rise to an *ends-against-the-ends* equilibrium. If image concerns are sufficiently strong among all non-users, everybody outside the public system favors more public provision for the sake of additional status. With positive income monotonicity also in the private sector, a monotonic preference ordering over the whole income range results, and a classical median-income MVE is restored.

The aim of Proposition 4 is to identify the political coalitions that can occur in an MVE with image concerns. It does not provide conditions such that a certain type of MVE

[12] In a limiting case, H_-^{in} can also be empty. Then $h_+^{in} = h_-^{out} = 1/2$ and $\hat{y} = y_{med}$. At the expense of some notational clutter, this could still be modeled as a degenerate ends-against-the-middle equilibrium.

does in fact emerge.[13] Such conditions require combined and complex restrictions on consumption utilities, the income distribution, and the strength of image concerns. However, Appendix A.5 demonstrates by means of a worked example with CES consumption utility and a Weibull-type distribution of incomes that all MVE types in Proposition 4 can indeed arise – in that example, by varying the strength of image concerns alone.[14]

Image concerns can make rich individuals willing to support an expansion of the public system, though they primarily rely on its private alternatives. Proposition 4 tells us *with whom* these individuals are forming political alliances. For goods like education, where image rents and income appear to be complementary – an assumption which would be even more plausible if the image gain from keeping the private sector socially exclusive is viewed as a social peer or congestion effect – the rich can be expected to ally with the middle class inside the public system, breaking up their pecuniarily-driven coalition with the poor. In this sense, social image concerns result in a compression of votes. Political coalitions between the extreme ends of the income distribution, which are predicted in Epple and Romano (1996) but are not often observed in political reality, lose inevitability.

5.3 Decisive voters

In models of political economy, an MVE can typically be identified with the most-preferred policy for some decisive voter who takes a median position in the distribution of political preferences. It is informative to also identify these decisive voters in our dual provision model with image concerns. The income thresholds y_s^{in} and y_s^{out} that separate the different voting groups in (15) figure prominently here since, if they are in the interior of H^{in} and H^{out}, they indicate the voter(s) whose favorite policy is implemented. For illustration, consider the same scenario as in Proposition 4. Here we observe the following (for formal arguments, see the proof of Proposition 4):

(A) In the "ends-against-the-middle"-case, the MVE is the most preferred tax rate of

[13] Already without image concerns, sufficient conditions already for the existence of a MVE are hard to relate to the fundamentals of the model (see Luelfesmann and Myers, 2011). As we concentrate on the role of image concerns for coalition structures, we abstain from pursuing general questions on existence here.

[14] In passing, our example in Appendix A.5 illustrates that there is no monotonic relation between the strength, β, of image concerns and the tax rate or provision level in an MVE. The example also includes graphical illustrations of the different types of equilibria.

individuals with income $y_s^{in}(t^*)$, which is below median income (see Epple and Romano, 1996, Proposition 3).

(B) In the "ends-against-the-ends"-case, the MVE is at the same time the most preferred tax rate of individuals with income $y_s^{in}(t^*)$ (below the median) and of individuals with income $y_s^{out}(t^*)$ (above the median).

(C) In the "median income earner"-case, the MVE is the most preferred tax rate of median income earners.

Item (A) confirms Corollary 2 in Epple and Romano (1996): in an ends-against-the-middle MVE, the tax rate and the provision level are lower than the median income earner would ideally have them. Item (C) is quite evident, given that in this case policy preferences are monotonically ordered over the entire income distribution. Item (B) conveys that in an "ends-against-the-ends" MVE there are two decisive voters. Compared to the ends-against-the-middle case, the rich no longer unequivocally side with the poor but some coalesce with the middle class in demanding an expansion of public provision. Hence, among the consumers in the public as well as in the private system there is now support for and opposition against higher taxes. Consequently, there are individuals in each consumption group for whom the current provision level is ideal, given their choice of consumption system. Remarkably, in our model such potential non-uniqueness of the decisive voter in terms of income can arise, even though all individuals have identical direct preferences and differ along a single dimension only (viz., incomes).[15]

To conclude, image concerns render the notion of the decisive voter as more elusive: decisive voters need not be unique and individuals even with above-median income can be pivotal. This implies that in order to empirically identify whose policy preferences (will) prevail one needs to take into account the entire income distribution; restricting the search for pivotal voters in public provision to the poorer half or to public sector users might be insufficient.

[15]Multiplicity of pivotal agents in models with voting on taxes has been observed, e.g., in Epple and Platt (1998) or Brunner and Ross (2010). In these settings agents differ both in incomes and in (direct) preferences, i.e., in two dimensions.

5.4 Further scenarios

Proposition 4 rests on two critical assumptions: the willingness-to-pay for image increases in income (Assumption 3) and the median income earner consumes the publicly provided option. For goods like (primary and secondary) schooling these assumptions are likely to hold jointly. For other publicly provided goods, the median income earner might consume outside the public system (see the discussion of Proposition 2) and image concerns might be less pressing, the richer people get (think, e.g., of housing where motives to set oneself apart from occupants of social housing might be stronger with those closely above the critical income than with the really rich).

Our framework yields predictions for these cases. For example, if all inequalities in Assumption 3 are reversed, the income stratification of political preferences reverses, too: poorer consumers of the publicly provided good are now less reluctant to support an expansion than richer ones, and among those who opt out of public provision, the willingness to accept the tax hikes that lure others into the public system is higher for the moderately rich than for the very rich. Exactly the same assortment of possible MVE configurations as in Proposition 4 can emerge, – including ends-against-the-middle and ends-against-the-ends equilibria. This is again in marked contrast to scenarios without image concerns, where only standard median income earner equilibria can occur if the willingness to pay for public provision decreases with income (see Epple and Romano, 1996, Prop. 1).

Cases where the median income earner opts out of the public system, but the willingness to pay for the publicly provided good increase with income in each sector (which might be plausible for nutrition) can also be readily handled: the potential coalition structures in an MVE can again be shown to come in exactly the same three types identified in Proposition 4. An ends-against-the-ends equilibrium also exhibits the same features as before: the upper end [lower end] in the public and private system are political allies in the quest for a higher [lower] tax rate. The end-against-the-middle equilibrium, however, strongly differs now: the rich and the poor ends still coalesce politically but they now favor an *expansion* of public provision (the middle class, who are now buying in the market, prefers cuts).

Generally, how the valuation for public services varies with income is crucial for the coalitions in a majority voting equilibrium. The technique in our paper can be used to

make predictions on the political coalitions that arise from any given distribution of voter preferences. This will be helpful in empirical studies on voting over publicly provided goods.

6 Conclusion

Governments provide goods to their citizens that are at least partly private in nature: education, housing, transport, health services, etc. In democratic regimes, the provision of these goods is determined in a political process, balancing the votes for and against (a larger volume of) public provision. In this paper, we showed that social motives, here exemplified by social image concerns, may substantially affect the political and economic properties of political equilibria.

Image-concerned non-users of the public system may be willing to subsidize public provision though they do not materially benefit from it. Image concerns thus complement social motives such as altruism (Coate, 1995), concerns for equal opportunities (Gasparini and Pinto, 2006) or paternalistic preferences that help to explain why, for example, certain private goods are publicly provided though the majority do not take them up. Unlike image concerns, these other types of social preferences fail to explain, however, why private consumption levels are lower than public provision levels, as sometimes happens in reality. Our approach is the first to accommodate several puzzling observations of public provision in a single unified framework.

The social feedback effect we identified in this paper, i.e., that redistributive income taxation may increase or maintain the social status of the non-beneficiaries of the public system, should apply for the political economy of the welfare state in general, including cash redistribution. The reason is that all redistributive mechanisms, whether cash or in-kind, partition the population into two groups – beneficiaries and net contributors. Belonging to such a group sends socially informative signals about an underlying status-bearing personal characteristic such as income, a strong work ethic, etc. However, taking up or declining a publicly provided good – such as schooling, housing, foods stamps – is more openly visible than receiving (or not receiving) cash payments. So we think that social image motives are particularly relevant for in-kind redistribution; or to those types of social benefit payments where recipients could be more easily identified and sorting

along income lines is particularly strong.

Generally, allowing for voting both over cash and in-kind transfer redistribution would be a particularly interesting extension of our model. When individuals care about social image, richer people are likely to favor discriminatory in-kind programs while poorer people tend to advocate anonymous cash transfers. A promising question for future study is which welfare system mix will emerge in a political equilibrium.

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Appendix

A.1 Proof of Proposition 1

The fact that $P^{out} > P^{in}$ can directly be seen from (11): individuals in the private system are uniformly richer than in the public sector. Next calculate:

$$\frac{dP^{out}}{dt} = \frac{\mathrm{d}}{\mathrm{d}\hat{y}}\left(\frac{1}{1-F(\hat{y})}\int_{\hat{y}}^{\bar{y}} yf(y)\mathrm{d}y\right)\cdot\frac{d\hat{y}}{dt} = \frac{f(\hat{y})}{1-F(\hat{y})}\cdot(\mathbf{E}(y|y\geq\hat{y})-\hat{y})\cdot\frac{d\hat{y}}{dt} > 0,$$

since $d\hat{y}/dt$ is positive by (9). Likewise, one shows that

$$\frac{dP^{in}}{dt} = \frac{f(\hat{y})}{F(\hat{y})}\cdot(\hat{y}-\mathbf{E}(y|y\leq\hat{y}))\cdot\frac{d\hat{y}}{dt} > 0.$$

This proves (12). ■

A.2 Proof of Lemma 1

The sets $H_-^{in}(t)$ through $H_+^{out}(t)$ partition $\mathcal{Y}$ by construction. Hence, $h_-^{in} + h_-^{out} + h_+^{in} + h_+^{out} = 1$ for all t, where all measures vary continuously in t by the continuity of F and V. By the dual provision property and the first two items in Assumption 1, we have $t > \hat{t}(\underline{y})$. Any $t > \hat{t}(\underline{y})$ with $h_-^{out}(t) + h_-^{in}(t) > 1/2 > h_+^{out}(t) + h_+^{in}(t)$ can be defeated in a majority vote against a suitably chosen, slightly lower tax rate; any $t > \hat{t}(\underline{y})$ with $h_-^{out}(t) + h_-^{in}(t) < 1/2 < h_+^{out}(t) + h_+^{in}(t)$ would lose against a slightly higher tax rate. Hence, only tax rates such that $h_-^{out}(t) + h_-^{in}(t) = h_+^{out}(t) + h_+^{in}(t) = 1/2$ can be MVE. ■

A.3 Example for Propositions 2 and 3

The simulations underlying this and all following other examples were done with the help of Mathematica. Source codes are available on request.

Assume that consumption preferences are represented by CES utility function

$$u(x,c) = \frac{1}{1-\gamma}\left(\alpha x^{1-\gamma} + (1-\alpha)\,c^{1-\gamma}\right). \tag{16}$$

We set parameters to $\alpha = 0.125$ and $\gamma = 1.01$. Image utilities are defined as in (2), where image utility has strength $\beta = 0.01$. Incomes are uniformly distributed on $[\underline{y}, \bar{y}] = [0, 100]$

such that $y_{med} = Y = 50$. The structure of the interior MVE is visualized in panel (i) of Figure 1. The income level $\hat{y}$ separates users outside and inside the public system. The vertical axis depicts the sign of $\partial V(t^*, y)/\partial t$ for $y \in \mathcal{Y}$ and, thus, indicates whether the individual would prefer a higher (represented by value $+1$) or a lower tax rate (-1) than t^*. At the jumps, political preferences change. The minus-group (which corresponds to H_-^{out}) and the union of the plus-groups, corresponding to $H_+^{in} \cup H_+^{out}$ form the political coalitions; H_-^{in} is empty here.[16] The plus- and the minus-groups each have measure 1/2 with respect to F. Table 1 reports the resulting distribution of political preferences.

	range	measure (h)
H_-^{in}	$\emptyset$	0
H_+^{in}	$[0, 4.59]$	0.046
H_-^{out}	$(4.59, 54.59]$	0.5
H_+^{out}	$(54.59, 100]$	0.454

TABLE 1: Political preferences

Panel (ii) in Figure 1 depicts the consumption levels of x for all income types. This level equals $\bar{x} = x(t^*)$ for those inside the public system and $x(y(1 - t^*))$ else. As Figure 1 demonstrates, the MVE has two interesting features:

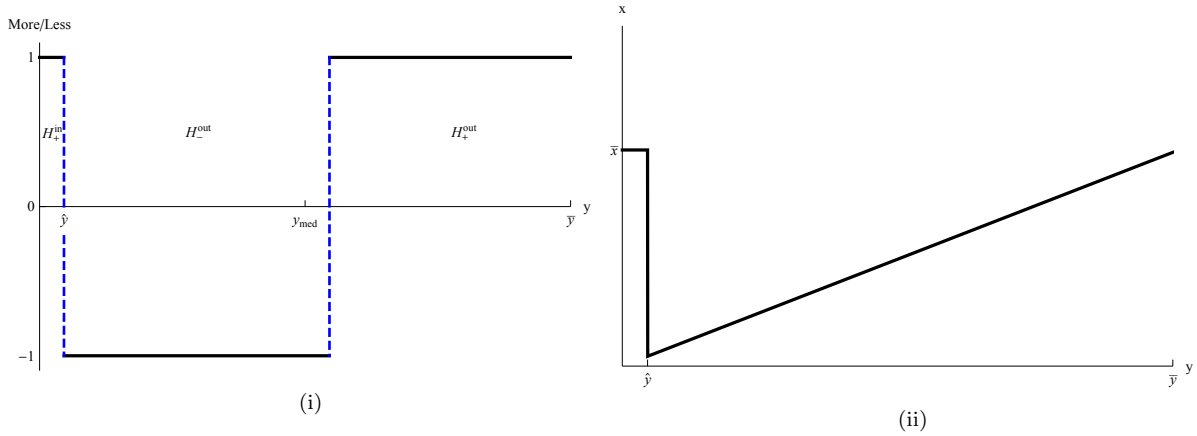
- The median income earner and, with him, a majority of individuals opt out of public supply at t^* (cf. Proposition 2).
- Everybody outside the public system (including the median income earner) purchases less of good x than $\bar{x} = x(t^*)$ (cf. Proposition 3).

A.4 Proof of Proposition 4

This proof derives the possible MVE configurations described in Proposition 4 and, at the same time, provides formal arguments for the discussion of decisive voters in Section 5.3. Suppose that the assumptions of Proposition 4 hold and that t^* is an interior MVE. Dual provision means that $h_-^{out}(t^*) + h_+^{out}(t^*) > 0$ and $h_-^{in}(t^*) + h_+^{in}(t^*) > 0$. As, by assumption, the median income earner consumes in the public system, so do all poorer individuals (this follows from Assumption 1). Hence, $h_-^{in}(t^*) + h_+^{in}(t^*) \geq 1/2$. As the sum of $h_+^{out}(t^*)$

[16] In terms of the nomenclature in Proposition 4, the MVE is of the ends-against-the-middle type (A).

FIGURE 1: Majority opts out and private consumption is always lower than $\bar{x}$



and $h_-^{out}(t^*)$ is positive, at most one of them can be equal to zero. This gives rise to three possible cases:

(A) Only $h_+^{out}(t^*)$ is zero. From Lemma 1, $h_+^{in}(t^*) = 1/2$ and $h_-^{in}(t^*) \geq 0$.

- Suppose, first, that $h_-^{in}(t^*) > 0$. From (15), sets $H_-^{in}(t^*)$, $H_+^{in}(t^*)$, and $H_-^{out}(t^*)$ are ascending income brackets which, via Lemma 1, give rise a political coalition between the rich and the poor (both in favor of lower t) against the middle class (in favor of higher t).

  Observe that $H_-^{in}(t^*)$ and $H_+^{in}(t^*)$ are separated by y_s^{in} with $\underline{y} < y_s^{in}$. At this income level, $\frac{\partial}{\partial t}V^{in}(t^*, y_s^{in}) = 0$, such that t^* is this individual's favorite policy. Since $h_-^{out} > 0$ and $h_-^{out} + h_-^{in} = 1/2$, we must have $h_-^{in} < 1/2$. Hence, $y_s^{in} < y_{med}$, implying that $\frac{\partial}{\partial t}V^{in}(t^*, y_{med}) > 0$: the decisive voter has less than the median income, and the median income earner would prefer a higher tax rate than the one that prevails in the MVE.

- As a borderline case, reported in footnote 12, suppose that $h_-^{in}(t^*) = 0$. Then $h_+^{in}(t^*) = h_-^{out}(t^*) = 1/2$ and $y_{med} = \hat{y}(t^*)$: precisely half of the population consume in the public and in the private system, and everybody in the public [private] system prefers more [less] public provision. This case, which is captured by $y_s^{in} < \underline{y}$, is of limited interest, however.

(B) Both $h_-^{out}(t^*)$ and $h_+^{out}(t^*)$ are non-zero. Then both $h_-^{in}(t^*)$ and $h_+^{in}(t^*)$ must be strictly positive, too. For example, if $h_+^{in}(t^*)$ were zero, then $h_+^{out}(t^*) + h_-^{out}(t^*) >$

1/2 from Lemma 1. Hence, $h^{in}(t^*) < 1/2$, contradicting via Assumption 1 that $y_{med} \in H^{in}(t^*)$. A similar argument rules out that $h^{in}_{-}(t^*) = 0$.

With income sorting (Assumption 3), the non-emptiness of all four groups $H^{in}_{-}(t^*)$ to $H^{out}_{+}(t^*)$ leads to political coalitions between the very rich and the middle class (both in favor of higher t) and between the poor and the moderately rich (both for lower t). In terms of (15), this is tantamount to $\underline{y} < y^{in}_s(t^*) < \hat{y}(t^*) < y^{out}_s(t^*) < \bar{y}$.

By assumption, $\hat{y}(t^*) > y_{med}$. Moreover, as $h^{in}_{-} < 1/2$, we get $y^{in}_s < y_{med}$ by Assumption 3. Together, this implies that $y^{in}_s(t^*) < y_{med} < y^{out}_s(t^*)$, giving rise to two decisive voters, one inside and one outside the public system.

(C) Only $h^{out}_{-}(t^*)$ is zero. By Lemma 1, $h^{in}_{-}(t^*) = 1/2$ or, equivalently, $H^{in}_{-} = [\underline{y}, y_{med})$. Combining Assumptions 1 and 3, this implies that everybody with income larger than y_{med} prefers a higher tax rate than t^*: $H^{in}_{+}(t^*) \cup H^{out}_{+}(t^*) = [y_{med}, \bar{y}]$. Hence, a median-income earner MVE results.

If $H^{in}_{+} \neq \emptyset$, then t^* is the most-preferred policy of the median-income earner.[17] ■

A.5 Example for Proposition 4

Assume that consumption preferences are represented by CES utility function (16) with $\alpha = 0.01$ and $\gamma = 1.5$. Image utilities are defined as in (2). Incomes are distributed according to

$$F(y) = \begin{cases} 0 & y \leq \underline{y} \\ 1 - e^{-(y/\sigma)^{\mu}} & \underline{y} < y \leq y_a \\ 1 + e^{-(y_a/\sigma)^{\mu}} \frac{(y-\bar{y})}{(\bar{y}-y_a)} & y_a < y \leq \bar{y} \\ 1 & \text{otherwise.} \end{cases}$$

This piecewise distribution is Weibull on $[\underline{y}, y_a)$ and uniform on $[y_a, \bar{y}]$ (the piecewise specification ensures that the support of F is bounded). Setting $\underline{y} = 0$, $y_a = 15$, $\mu = 0.35$

[17] In a limiting case, H^{in}_{+} might be empty. Then, $h^{in}_{-}(t^*) = h^{out}_{+}(t^*) = 1/2$ and $\hat{y}(t^*) = y_{med}$: individuals with below-median incomes are in the public system but would prefer a lower tax rate; individuals with above-median incomes are out and would prefer a higher tax rate. The MVE t^* is the median income earner's most preferred policy (in the sense that $\frac{\partial_-}{\partial t} V^{in}(t^*, y_{med}) = 0 = \frac{\partial_+}{\partial t} V^{out}(t^*, y_{med})$), at which he is just indifferent between being inside or outside of public provision ($V^{in}(t^*, y_{med}) = V^{out}(t^*, y_{med})$).

and $\sigma = 0.37$, this distribution is positively skewed with median $y_{med} = 0.13$ and mean $Y = 5.96$. It can be verified that Assumptions 1 to 3 are satisfied.

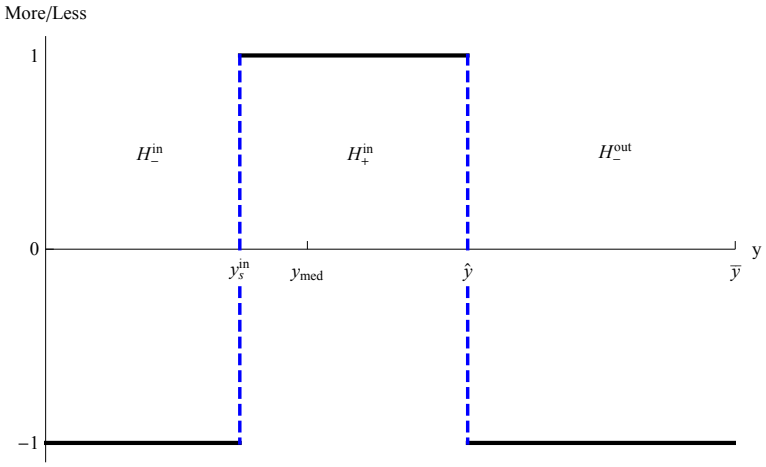
Table 2 reports the features of the MVE if we sequentially increase the strength of image concerns, represented by β. In particular, the MVE type changes from ends-against-the-middle to ends-against-the-ends to median income earner. The equilibrium structures are

β	t^*	$x(t^*)$	$\hat{y}$	MVE type	y_s^{in}	y_s^{out}
0.000018	0.008	0.05	2.56	ends-against-the-middle	0.04	-
0.0002	0.010	0.07	2.68	ends-against-the-ends	0.07	6.35
0.001	0.012	0.08	1.90	median income earner	0.13	-

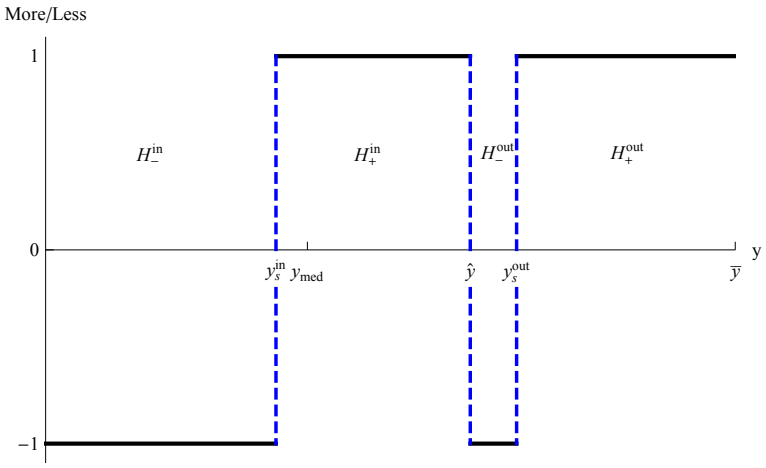
TABLE 2: MVE for varying β

visualized in Figure 2. As in Figure 1, the vertical axis in each panel indicates whether the individual would prefer a higher (represented by value $+1$) or a lower tax rate (-1) than t^*. The union of the plus-groups and the union of the minus-groups form the political coalitions, $H_+^{in} \cup H_+^{out}$ and $H_-^{in} \cup H_-^{out}$. Income level $\hat{y}$ separates users outside and inside the public system. At the jumps, political preferences change. E.g., in Panel (A), individuals with incomes smaller than $y_s^{in} = 0.04$ or above $\hat{y} = 2.56$ prefer a lower tax rate while individuals with incomes between y_s^{in} and $\hat{y}$ (including y_{med}) favor tax rates larger than t^*. This constitutes an ends-against-the-middle configuration. Panels (B) and (C) depict ends-against-the-ends and median income earner configurations. In all panels, the plus- and the minus-groups each have measure 1/2 with respect to F. In the supplementary appendix we verify that the t^* reported in Table 2 indeed constitute MVE: they win all binary majority comparisons against alternative feasible tax rates (including $t = 0$).

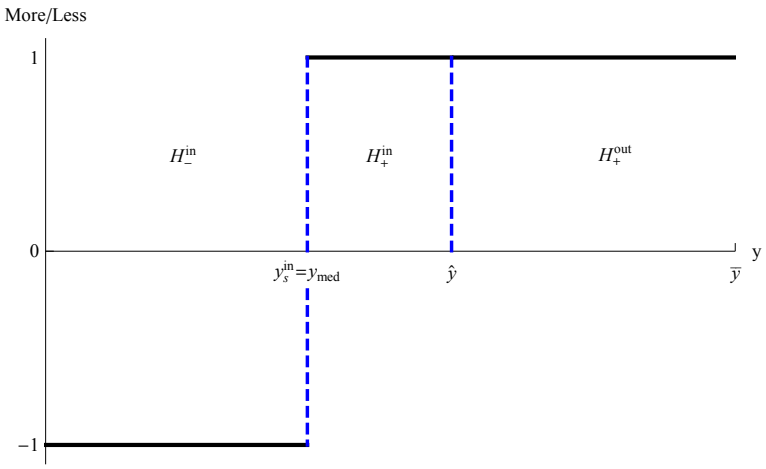
FIGURE 2: Equilibrium configurations



(A): Ends against the middle ($\beta = 0.000018$)



(B): Ends against the ends ($\beta = 0.0002$)



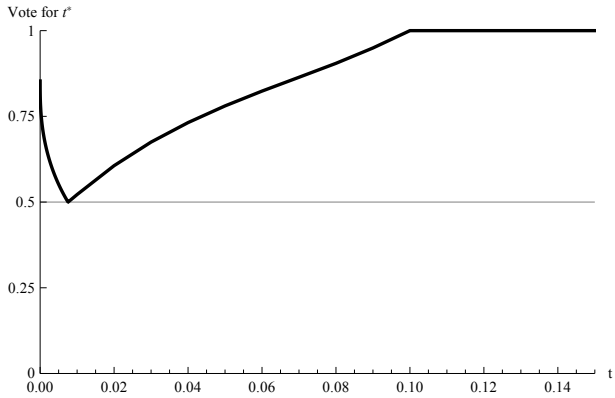
(C): Median income earner ($\beta = 0.001$)

Supplementary Appendix

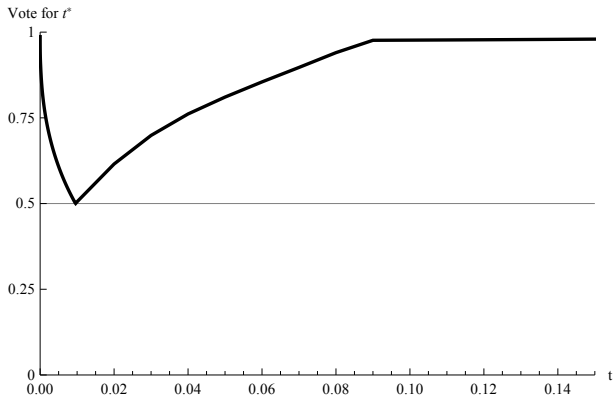
B.1 Verification of MVE for Example A.5

To confirm that the tax rates t^* reported in the example of Appendix A.5 are indeed MVE, we let each of them run in pairwise majority comparison against all alternative feasible tax rates (including $t = 0$). Panels (A) to (C) in Figure 3 plot the shares of individuals preferring t^* in pairwise comparison; for graphical reasons we only plot tax rates in a range from 0 to 0.15. As can be seen, the t^* always garner more than 50 percent of the popular vote and are, thus, indeed MVE. In the example, equilibria gradually change from type (A) via (B) to (C) when the intensity of image concerns increases. This monotonicity is not general, though. For instance, for $\beta \geq 0.015$, the equilibrium again has the ends-against-the-ends structure (B). Likewise, the equilibrium values of tax rate t^* and public provision level $\bar{x}(t^*)$ vary non-monotonically with β.

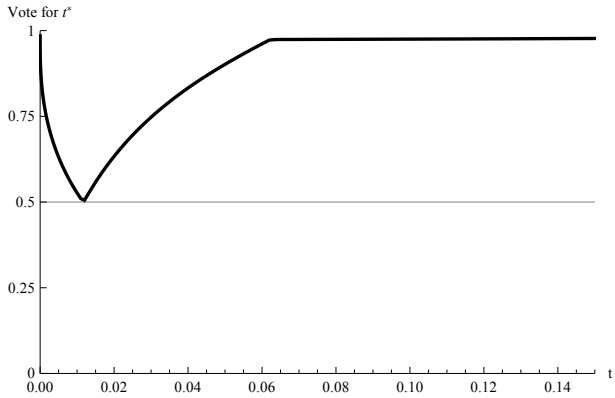
FIGURE 3: Vote shares for t^*



(A): $\beta = 0.000018$



(B): $\beta = 0.0002$



(C): $\beta = 0.001$