UNIVERSITÄT SIEGEN

Fakultät III
Wirtschaftswissenschaften,
Wirtschaftsinformatik und
Wirtschaftsrecht

Volkswirtschaftliche Diskussionsbeiträge

Discussion Papers in Economics

No. 196-23

June 2023

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http://www.wiwi.uni-siegen.de/vwl/

ISSN 1869-0211

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On the Public Provision of Positional Goods

Désirée I. Christofzik* Sebastian G. Kessing§

June 28, 2023

Abstract

We investigate whether public provision of positional goods can be a sensible instrument to address inefficiencies arising from relative-standing externalities associated with the excessive consumption of such goods. In situations where consumers face a discrete choice between a private and a public alternative, providing the latter for free or at a subsidized rate generates incentives to opt for the public alternative. This allows to reduce excessive consumption. We show that such policies can increase welfare and characterize situations where they can even implement efficiency. Efficiency can typically be achieved if the non-positional utility component is sufficiently important. Moreover, we investigate how public provision of positional goods may be a useful policy instrument in second-best situations, where either the government is constrained to rely on distortionary taxes, or where it redistributes facing information constraints.

JEL classification: H42, D62, H52

Keywords: Positional goods, relative standing externality, publicly provided goods, in-kind provision.

1 Introduction

The classic policy recommendations to address externalities arising from the consumption of positional goods suggest some form of corrective taxation, either by directly taxing positional goods or through progressive expenditure or income taxation, cf. Frank (2008), Hopkins and Kornienko (2004), Ireland (1994, 1998, 2001), among others. However, under some circumstances, setting an optimal corrective

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tax may be challenging. Hinging on the externality's nature, and the set of available tax instruments, the first-best allocation may not be achievable (Eckerstorfer and Wendner, 2013). We study public provision as an alternative policy instrument to address relative standing externalities.

Examples of goods for which status aspects at least partly matter, that in practice are often publicly provided, are housing, transport and education. Consider the example of college education. It involves a discrete choice as individuals can only attend one particular college at a given time. Students and their parents not only care about the absolute quality of the education received, but also about the relative quality (Veblen, 1899; Hirsch, 1978; Ng, 1978; Lommerud, 1989). The quality and the prestige of colleges differ, causing substantial relative standing externalities.[1] In many European countries such as Denmark, France, Germany, Italy, Spain, Sweden and others, higher education is tax-financed and publicly provided free of charge or at highly subsidized rates. In these countries, public provision has almost completely crowded out private alternatives. Such public provision policy confronts individuals with a choice between a free, or subsidized, public alternative and a costly private alternative. If individuals opt for the public alternative relative standing externalities may be reduced which can enhance welfare.[2]

We analyse these aspects in a model that is closely related to Besley and Coate (1991) or Currie and Gahvari (2008). These contributions employ discrete choice frameworks to show how in-kind provision can contribute to redistributive objectives. While all individuals tax-finance provision, only low income individuals self-select into consuming the public alternative. High income individuals opt out and redistribution is achieved. We argue that a similar mechanism can be used to address the efficiency problem of relative standing externalities. In our baseline framework, all individuals tax-finance the public provision of a positional good and face a choice between a public and a private alternative. Because it is free or subsidized, the public alternative will be preferred, even if it is provided below the laissez-faire level. This reduces average consumption, mitigates the externality and increases welfare.

[1] In China, competition for places at prestigious universities has led to such a surge in tutoring that authorities started to ban private after-school programs in 2021, see Stevenson and Li (2021). Seoul imposed a 10 pm curfew on extra-curricular classes in the evenings (Kim et al., 2021). In a structural model, Kim et al. (2021) study the connection between the so called *education fever* in South Korea and low fertility.

[2] While education has been regarded as its poster child by the positional goods literature, other market failures, such as positive externalities or liquidity constraints typically suggest inefficiently low levels of education, and are relevant for an encompassing policy recommendation in this case.

We show that public provision of positional goods can crowd out the private alternative and achieve the first best, provided that the non-positional utility component is sufficiently strong. Moreover, such a policy can generate efficiency gains even when the government has already implemented a second-best tax structure that includes corrective taxation à la Sandmo (1975). With heterogeneity in incomes, we show that public provision of positional goods can help an information-constrained government to redistribute as it can relax incentive-compatibility constraints. Typically, this will call for increasing positional consumption of all individuals. In summary, public provision of positional goods can improve outcomes in various settings where the government faces constraints on its available tax instruments or on its information.[3]

The problem of relative standing externalities has a long legacy in economics starting with the classic studies by Veblen (1899), Duesenberry (1949) and Leibenstein (1950). More recent contributions include, among others, Boskin and Sheshinski (1978), Hirsch (1978), Frank (1985), Ng (1987), Akerlof (1997), Corneo and Jeanne (2001), and Aronsson and Johansson-Stenman (2018, 2021). The empirical relevance of relative standing effects has been corroborated by Clark and Oswald (1996), Alpizar et al. (2005), Luttmer (2005), and Hicks and Hicks (2014). Despite the extensive literature, Friedrichsen et al. (2021) is the only other contribution we are aware of that studies relative standing aspects in the public provision of private goods. These authors focus on the role of status effects for voting outcomes. Status effects arise from *not* consuming the public alternative, such that public provision is a *precondition* for the existence of status effects. This generates the interesting result that status-concerned non-users may be willing to subsidize public provision. In our approach, we take the existence of positional consumption as given, and ask how the public provision of such goods can address the inefficiency arising from *existing* relative standing externalities.

In Section 2, we set out our framework. Section 3 focuses on the discrete choice case with exogenous income and the availability of lump-sum taxation. Within this setting, we also address preference heterogeneity. We examine public provision with distortionary taxation in Section 4, and its potential in a second-best world with redistribution in Section 5. Section 6 concludes.

[3]While our focus is on discrete consumption choices, our analysis may also be extended to cases where topping-up is possible. Public provision of goods or services may also be a sensible policy if they are considered close or perfect substitutes to positional goods, such as high-quality public transport as a substitute to using a car. It may also reduce positional externalities arising from informal activities, such as social norms surrounding childcare and long-term care for parents, which are constructed based on average societal choices.

2 A simple framework

Consider an economy which is populated by a continuum of identical individuals with measure one. There are two goods, z and q. The former is a private good, whereas the latter is a positional good, i.e., individuals care about their relative consumption with respect to others. This good also generates benefits which are independent of positional considerations. The positional good q is discrete, i.e., the individual has to choose between mutually exclusive alternatives. The good is available at different quantities q, $q \in [0, q^{\max}]$, which may be interpreted as quality. The economy is perfectly competitive, exogenous producer prices are normalized to one for all goods, and they are the same for the government and the private agents. Individuals have an exogenous income y, implying a budget constraint $y = z + q$.

There are several ways to model relative position in a utility framework. The first are ratio comparison utility functions which are used, for instance, by Boskin and Sheshinski (1978), Ng (1987) or Wendner and Goulder (2008). The second are additive comparison utility functions; see e.g. Konrad and Lommerud (1993), Ljungqvist and Uhlig (2000), Aronsson and Johansson-Stenman (2008). Clark and Oswald (1998) discuss the theoretical implications of both formulations, but there is little empirical evidence which alternative performs better (Alpizar et al., 2005). We use a general formulation, where the reference level $\overline{q}$ enters utility negatively. Preferences are represented by the strictly quasi-concave utility function

$$u = u(Q, z, S) = u(\psi q, z, \phi s\left(q, \overline{q}\right)), \tag{1}$$

which is increasing in Q, z, and S, sufficiently differentiable, and normal in Q and z. The parameter ψ, $\psi \geq 0$, scales the importance of the non-positional utility component of the positional good. The positional effect $S = \phi s(q, \overline{q})$, $s \geq 0$, depends on the parameter ϕ, $\phi \geq 0$, which scales the importance of the positional effect, on the own consumption q, and on the reference level $\overline{q}$. Thus, increased levels of q affect utility directly as well as indirectly via S. Denoting partial derivatives with respect to the specified argument by subscripts, we let $s_q > 0$ and $s_{\bar{q}} < 0$. Individuals take the reference level as given and do not factor in the consequences of their consumption on that reference level. In the aggregate, we postulate $s_q = -s_{\bar{q}}\bar{q}_q$ if $q = \bar{q}$ in line with common formulations of positional preferences. For $q = \bar{q}$ we either have $s = 0$, as in the typical additive formulation of positionality, or we have $s = 1$ as in the typical proportional formulation. We define the marginal degree of positionality in the spirit of Alpizar et al. (2005) as $\alpha = \frac{\phi u_S s_q}{\psi u_Q + \phi u_S s_q}$. As $\alpha \to 0$ we approach the case where utility is independent of relative consumption, whereas for $\alpha \to 1$, we approach the case of a pure positional good. Note that, in general,

α is endogenous and depends on q and z. For given q and z, the indifference curves are steeper (in absolute value) in q-z-space for higher α. Moreover, for given q and z, there is a strictly monotone relationship between α and ψ, $\frac{\partial \alpha}{\partial \psi} < 0$, and between α and ϕ, $\frac{\partial \alpha}{\partial \phi} > 0$. Thus, variations in ψ or ϕ directly correspond to changes in the degree of positionality. Finally, we assume that the reference level is given by the average consumption of q.

An individual with rational expectations about $\bar{q}$, which are fulfilled in equilibrium, chooses the privately optimal quality level q^* defined by

$$\frac{\psi u_Q + \phi u_S s_q}{u_z} = 1 \tag{2}$$

in the laissez-faire. We abstract from corner solutions and assume that the equilibrium is unique.[4]

A social planner would choose a level of q which reflects the external costs of individual consumption.[5] The socially optimal quality level q^{**} is characterized by

$$\frac{\psi u_Q + \phi u_S \left(s_q + s_{\bar{q}} \bar{q}_q\right)}{u_z} = \frac{\psi u_Q}{u_z} = 1, \tag{3}$$

which implies inefficiently high private consumption $q^* \geq q^{**} \geq 0$. The laissez-faire coincides with the social optimum, $q^* = q^{**}$, for $\phi = 0$. Without the non-positional utility component, $\psi = 0$, the socially optimal quantity is zero, $q^{**} = 0$. More generally, an efficient outcome requires the individual trade-off $\frac{\psi u_Q + \phi u_S s_q}{u_z} = \frac{1}{1-\alpha}$. The more important the relative standing component ($\alpha \to 1$), the larger is the discrepancy between the privately chosen and the socially optimal level. The traditional policy instrument to address the positional inefficiency is a corrective tax to internalize the relative standing externality. Taxing the positional good with a specific tax $t = -\frac{\phi u_S s_{\bar{q}} \bar{q}_q}{u_z}$ and returning the proceeds lump sum restores efficiency.

3 Public provision

Consider now the alternative policy of public provision. We first assume that the government levies a head tax T on all individuals to finance public provision q^g.[6] If all other individuals consume the publicly provided quantity, an individual

[4] The latter requires that the solution to $\bar{q} = q^*(y, p, \bar{q})$, where $q^*(y, p, \bar{q})$ is the demand function for the positional good and p the price vector, is unique.

[5] The assumption that such individual preferences, which can be considered a form of envy, should be respected by the social planner, may be questioned. However, differences in policy recommendations may actually not be too pronounced, see Eckerstorfer and Wendner (2013) and Aronsson and Johansson-Stenman (2018).

[6] We assume that it is provided free of charge to illustrate the key mechanism. It could also be offered at a subsidized rate. In Sections 4 and 5, the government can charge for its alternative.

faces $\overline{q} = q^g$ and the government's budget requires $T = q^g$.[7] We first set $\psi = 1$, such that $Q = q$. The individual chooses either the private alternative $\check{q} = \arg\max_q \left[u(q, y - q^g - q, \phi s\left(q, q^g\right))\right]$ or the publicly provided alternative q^g. In the first case, utility can be expressed by the indirect utility function $v(p, y - q^g, q^g)$, which is a function of the price vector p, the disposable income $y - q^g$ and the reference consumption level $\bar{q} = q^g$. If the individual decides to consume the public alternative, her utility will be $u(q^g, y - q^g, \phi s\left(q^g, q^g\right))$.

It is useful to define a monetary measure of the utility differential between the two alternatives. We define $m\left(q^g\right)$ as the transfer to make an individual choosing the private alternative as well off as under the public alternative,

$$v(p, y - q^g + m\left(q^g\right), q^g) = u(q^g, y - q^g, \phi s\left(q^g, q^g\right)). \tag{4}$$

This monetary measure is the equivalent variation of the public alternative, given that taxes are paid by all individuals and provided that all other individuals opt for the public alternative. Denoting by $e\left[\cdot\right]$ the expenditure function, we can invert (4) and solve explicitly for the equivalent variation

$$m\left(q^g\right) = e\left[p, u(q^g, y - q^g, \phi s\left(q^g, q^g\right)), q^g\right] - \left(y - q^g\right). \tag{5}$$

This equivalent variation has important properties that are useful for understanding the nature of the public provision equilibrium in the economy and its potential to increase welfare. First, a public provision equilibrium will only be sustainable, if individuals prefer the public alternative, i.e., if $m\left(q^g\right) \geq 0$. Second, $m\left(0\right) < 0$. If the government provides a level of zero, this will not be sustainable, since individuals have an incentive to privately choose a higher level. Third, $m\left(q^*\right) = q^* > 0$. If the government provides the laissez-faire level, an individual will choose the public alternative. Since the individual has to pay taxes, given that everyone chooses the public alternative, her disposable income is lower than in the laissez-faire. Accordingly, the optimal choice is a lower level of q by normality. However, it can never be optimal to choose a lower level privately, since a higher level is offered for free by the government. Moreover, at $q^g = q^*$ we have $m(q^*) = q^*$, since, with

[7] Focusing on symmetric equilibria, there are two potential equilibria in this setting. In the public provision equilibrium, individuals expect that everyone else opts for the public alternative, and it is optimal for the individuals to choose this alternative. Alternatively, in the private equilibrium, individuals expect that no one chooses the public alternative, and it is privately optimal not to choose it. We focus on the public provision equilibrium. Since the private equilibrium outcome corresponds to the laissez-faire, whenever the public provision outcome improves the outcome relative to the laissez-faire, the public provision equilibrium payoff-dominates the private equilibrium, which supports our focus on the public provision equilibrium.

a transfer of that amount, the private choice would be $\check{q} = q^*$, such that the utility is the same as under the public alternative. Fourth, we can consider how m varies as q^g changes,

$$m_{q^g} = \frac{\Omega}{\mu} + e_{q^g} + 1, \tag{6}$$

where μ is the marginal utility of income, $e_{q^g} > 0$ the necessary marginal expenditure increase to compensate for the change in the reference level, and $\Omega \equiv u_Q - u_z + u_S \phi \left(s_q + s_{\bar{q}} \bar{q}_{q^g}\right) = u_Q - u_z$. For $q^g \leq q^{**}$, $\Omega \geq 0$, so that over this interval $m_{q^g} > 0$. For $q^g > q^{**}$, $\Omega < 0$, so that $m_{q^g} < 0$ for all $q^g > \hat{q}^g$, where $\hat{q}^g$ is implicitly defined by $m_{q^g}(\hat{q}^g) = 0$. Thus, given that $m(0) < 0$, $m(q^*) > 0$ and $m(q^g)$ continuous and hump-shaped, there exists a unique public provision level $\tilde{q}^g$ on the interval $[0, q^*]$, such that $m(\tilde{q}^g) = 0$. This level $\tilde{q}^g$ is the lowest incentive-compatible level, and all provision levels q^g with $\tilde{q}^g \leq q^g \leq q^*$ are sustainable as a public provision equilibrium. This critical provision level is weakly decreasing in ϕ

$$\frac{d\tilde{q}^g}{d\phi} = -\frac{m_\phi}{m_{\tilde{q}^g}} \leq 0, \tag{7}$$

given that $m_{\tilde{q}_g} > 0$ and $m_\phi \geq 0$. Whether the latter inequality is strict, depends on the nature of the function $s(q, \bar{q})$. Typically, the more important is the degree of positionality, the lower is the critical provision level that guarantees incentive-compatibility.

We can now use these properties to analyse the desirability of the public provision of positional goods.

Proposition 1 *If $\phi > 0$, public provision can increase welfare relative to the laissez-faire.*

Proof. Since $m(q^*) > 0$, the government can choose a marginally lower quality level $q^g = q^* - \varepsilon$. By continuity, $\lim_{\varepsilon \to 0} m(q^* - \varepsilon) > 0$, such that this marginally lower quality level can be implemented as a public provision equilibrium. Since welfare is strictly decreasing in q over the interval $[q^{**}, q^*]$, this increases welfare. ■

Forcing a discrete choice between a free and a costly alternative allows the government to offer a lower provision level, which will still be chosen. This reduces the average consumption of the positional good and the corresponding relative standing externalities which makes everybody better-off.

Proposition 2 *Let preferences be separable in S if $s(q^g, q^g) = 1$, and $\psi = 1$. Then, public provision can achieve efficiency.*

Proof. First, for $\phi = 0$, which represents the case of a non-positional good, the efficient quantity can always be achieved through public provision. Moreover, the efficient quantity remains independent of ϕ, since either $s(q^g, q^g) = 0$ or $u_{QS} = u_{zS} = 0$ for $s(q^g, q^g) = 1$ are sufficient for $\frac{dq^{**}}{d\phi} = 0$. However, the laissez-faire quantity, and thus the discrepancy between the private outcome and the efficient outcome, increases in ϕ. From (7), the lowest level $\tilde{q}^g$ achievable through public provision is weakly decreasing in ϕ. Thus, the constant efficient level always exceeds this lower bound, thereby enabling its implementation via public provision. ■

Public provision implies that opting out reduces disposable income relative to the laissez-faire. Moreover, it lowers the reference level, which typically decreases the marginal utility from spending on q. Both effects make opting out sufficiently unattractive, such that the efficient quantity of the positional good can always be implemented.

The efficiency result depends on the presence of the non-positional utility component of the positional good. To see this, consider the case of $\phi = 1$, i.e., we keep the importance of the positional aspect constant but allow the non-positional utility component to vary via changes in the parameter ψ. Moreover, we assume that the efficient quantity q^{**} is increasing in ψ.[8] Note that Proposition 1 holds in this case. However, whether efficiency can be implemented via public provision depends on the importance of the non-positional utility component.

Proposition 3 *Let $\phi = 1$. Then, public provision can achieve efficiency provided that the non-positional utility component is sufficiently strong, i.e. if $\psi \geq \tilde{\psi} > 0$, where $\tilde{\psi}$ is the critical importance of the non-positional utility component of the positional good such that $\tilde{q}^g(\tilde{\psi}) = q^{**}$.*

Proof. First, if $\psi = 0$, the good is purely positional and the efficient quantity will be zero. If the government provides this level, it will never be chosen. Thus, with pure positional goods public provision can never implement efficiency. Moreover, the efficient quantity q^{**} is increasing in the importance parameter of the non-positional utility ψ, and $q^{**}\left(\check{\psi}\right) \geq q^{*}(0)$, for some sufficiently large $\check{\psi}$. Next, for the minimum implementable quantity we have $\tilde{q}^g(0) < q^{*}(0)$ and this quantity is strictly decreasing in the importance of the non-positional utility component, $d\tilde{q}^g/d\psi < 0$. Thus, there exists a unique critical $\tilde{\psi}$ at which $\tilde{q}^g(\tilde{\psi}) = q^{**}$, such that for all $\psi \geq \tilde{\psi}$ efficiency can be implemented via public provision. ■

With a given positional utility component, efficiency can typically only be attained if the non-positional utility component is sufficiently strong relative to the positional aspect. Intuitively, the less important the private aspect of the good, the

[8]This appears intuitive, but, with our preference formulation, it requires that $u_q + q\psi u_{QQ} - qu_{zQ} > 0$.

lower the efficient quantity will be. At such low levels, a public alternative loses its appeal, causing individuals to be more inclined to opt out. This indicates that public provision is more likely to be a sensible policy option for positional goods that also generate important direct private benefits.

Our framework can easily be extended to incorporate heterogeneity. We first focus on preference heterogeneity and consider income heterogeneity and redistribution in Section 5. Let individuals care differently about positionality as reflected by the parameter ϕ, with ϕ distributed uniformly on the interval $[0, \bar{\phi}]$, and let $\psi = 1$. We maintain the assumption that the reference level is determined by the average consumption of q.[9] For all individuals i, the laissez-faire positional consumption q^{i^*} is increasing in ϕ^i, and is higher than the socially optimal level, except for $\phi^i = 0$. The efficient quantity $q^{i^{**}}$ is the same for all individuals.

Proposition 4 *If ϕ differs between individuals, public provision can implement efficiency.*

Proof. It follows from Proposition 2 that the efficient quantity can be implemented for all individuals. Given that the efficient quantity is the same for all individuals, efficiency can be implemented. ■

This shows that public provision can implement efficiency even under heterogeneous preferences, at least if efficiency requires a uniform quantity for all individuals. Whenever efficiency necessitates differentiated quantities among individuals, however, public provision can typically not achieve the first-best outcome. Although public provision can lower the reference level, individuals are then constrained to consume the same amount. Thus, there will be a trade-off between level reduction and consumption dispersion. However, if the population self-selects into consumers of the public and the private alternative, public provision may also be a useful instrument as we discuss in Section 5.

[9]Different reference levels can be plausible with heterogeneous individuals, and the choice of an appropriate reference point relies on the context (Aronsson and Johansson-Stenman, 2018; Eckerstorfer and Wendner, 2013). The latter authors highlight various characteristics that reference levels can possess, including the unequal contributions of individuals to a reference level (non-atmospheric externality) and the varying importance of an individual's consumption to different peers (asymmetric externality). These characteristics influence the effectiveness of policy instruments. While a corrective tax on q can efficiently address the externality in cases of atmospheric positional externalities, achieving an optimal allocation requires personalized commodity taxes for non-atmospheric externalities (Eckerstorfer and Wendner, 2013).

4 Public provision with distortionary taxation

So far, in our analysis the positional good was available free of charge and lump-sum taxes were mechanically used to balance the budget. We now investigate whether public provision of positional goods can improve the situation if the government has to rely on distortionary taxation and has already implemented an optimal linear tax system that finances expenditures and addresses the positional externality. We study this question using a framework similar to Munro (1992), but additionally allow for positional externalities. Consider individual preferences $u = u(q, z, f, s(q, \bar{q}))$, where we set $\psi = 1$ and $\phi = 1$, and f is leisure, which does not include a positional aspect.[10] Let the individual have a total income (time endowment) of Y, so that $\hat{y} \equiv Y - f$ is realized gross market income, i.e., the wage rate is normalized to one. The tax scheme is linear with the tax on labor normalized to zero.[11] The individual budget constraint with the private alternative is $z(1 + t^z) + q(1 + t^q) = Y - f$. An individual who does not opt for the public alternative, chooses q, z, and f. An individual choosing the public alternative decides on z and f to maximize $u = u(q^g, z, f, s(q^g, q^g))$ subject to $(Y - f) = z(1 + t^z) + c$, where $c \geq 0$ is a fixed charge for consuming the publicly provided level q^g, i.e., we allow for the possibility that the positional good may not be provided by the government for free, in line with several real world examples. Moreover, given the distortionary tax system, free provision is unlikely to generate efficiency gains, see Munro (1992). Expecting that all other individuals choose the public alternative, the optimal consumption of an individual choosing the public alternative is characterized by the first order condition $u_z = u_f(1 + t^z)$, which, together with the budget constraint, determines z^* and f^*. Tax revenues finance exogenous expenditures R and publicly provided goods. The government's budget constraint in a private equilibrium is $R = zt^z + qt^q$, in a public provision equilibrium it is $R + q^g = zt^z + c$.

First note that if the government can adjust t^q upwards, it can always make the private alternative sufficiently unattractive so that the public alternative will be preferred, even at a positive charge c. In the case without exogenous expenditures ($R = 0$), setting t^q sufficiently high and $c = q^g$, we are back in the case with lump-

[10]We acknowledge that the idea of *conspicuous leisure* goes back to Veblen (1899) and has more recently been analysed, e.g., by Aronsson and Johansson-Stenman (2013) theoretically and by Huang and Shi (2015) empirically. We abstract from this, since we are interested in how the analysis is affected by endogenous labor supply.

[11]Non-linear income tax policies in the context of positional goods have been studied, e.g., by Ireland (2001) and Aronsson and Johansson-Stenman (2008, 2018).

sum taxation, since the government does not have to rely on distortionary taxes to finance the public alternative.

We consider the situation where the government has set the linear taxes t^z and t^q optimally to finance exogenous expenditure requirement $R > 0$, such that the decision to provide q publicly will have fiscal repercussions. The existing tax structure corresponds to the one first derived by Sandmo (1975), where the externality is positional. This defines a level of positional consumption, and we study a quantity change at this benchmark. Again, the choice of the public alternative may always be induced by increasing the tax on the private alternative, but note that, in the notation below, t^q corresponds to the optimal tax rate without public provision.

In line with the rationing literature, e.g., Neary and Roberts (1980), we define the shadow price of the positional good π implicitly as the price of q, for which the publicly provided quantity would be chosen,

$$q^g = q\left(\pi, 1 + t^z, y, \bar{q}\right),$$

where now $y \equiv Y - c + \pi q^g$ denotes virtual income.

The demand function for z is $z = z\left(\pi\left(q^g, y\left(q^g\right)\right), 1 + t^z, y\left(q^g\right), \bar{q}\left(q^g\right)\right)$. The government's budget constraint with public provision can be written as $R = zt^z + q^g t^q + c - \left(1 + t^q\right) q^g$. This implies $dc/dq^g = -\frac{\partial R}{\partial q^g} / \frac{\partial R}{\partial c}$. Denote by σ_{ij} the Slutsky substitution term for good i with respect to price j. Following Munro (1992), we can evaluate

$$\frac{dc}{dq^g} = \frac{1 + t^q - t^z \frac{z_\pi}{\sigma_{qq}} - t^q - \pi t^z \check{z}_y}{1 - t^z \check{z}_y}, \tag{8}$$

where $\check{z}_y \equiv z_y + z_\pi \pi_y = z_y - \frac{\sigma_{z\pi}}{\sigma_{qq}} q_y$, since $y_{q^g} = \pi$, $\pi_{q^g} = \frac{1}{\sigma_{qq}}$, and $\pi_y = -\frac{q_y}{\sigma_{qq}}$. Around the optimal q we have $\pi \approx 1 + t^q$, so that

$$\frac{dc}{dq^g} = 1 + t^q - \frac{t^z \frac{z_\pi}{\sigma_{qq}} + t^q}{1 - t^z \check{z}_y}. \tag{9}$$

We can now assess the effect of increasing q^g on indirect utility $v = v\left(1 + t^z, \pi, y, \bar{q}\right)$,

$$\frac{dv}{dq^g} = \frac{\partial v}{\partial \bar{q}} \frac{\partial \bar{q}}{\partial q^g} + \frac{\partial v}{\partial c} \frac{dc}{dq^g} = \frac{\partial v}{\partial \bar{q}} + \mu \frac{t^z \frac{z_\pi}{\sigma_{qq}} + t^q}{1 - t^z \check{z}_y}. \tag{10}$$

The second term in (10) is the standard fiscal externality term resulting from the quantity change as derived by Munro (1992). As argued by this author, the denominator of this term will typically be positive. With positional externalities, t^q will contain an element of corrective taxation according to the well-known additivity property derived by Sandmo (1975), so that it is also likely that the numerator is positive. Thus, the second term typically pushes for higher provision levels.

This reflects the result that quantity expansions of taxed goods can generate positive fiscal externalities in a second-best setting, see Guesnerie and Roberts (1984). However, in the case of positional goods, there is a countervailing force. The first term in (10) represents the marginal effect on utility from increasing the positional reference level in the economy, which is negative. Since either term may dominate the other, it may be optimal to increase or decrease the quantity of the positional good via public provision. Only if the two terms in (10) exactly balance there will be no room for improvement via public provision. This illustrates that public provision can increase welfare, even if we start from an second-best optimal system of linear taxes à la Sandmo (1975).

We can now make use of these optimal tax rates characterized by

$$\frac{t^q + \frac{v_{\bar{q}}}{\lambda}}{1+t^q} = \frac{\omega t^z}{1+t^z}, \tag{11}$$

where λ is the multiplier corresponding to the government budget in the optimal tax problem, and $\omega \equiv (\omega_{zz} - \omega_{qz})/(\omega_{qq} - \omega_{zq})$, where $\omega_{ij}, i, j = q, z$ denote the compensated demand elasticities. Solving for $v_{\bar{q}}$ and substituting into (10), we have

$$\frac{dv}{dq^g} = \mu \left[\frac{\lambda}{\mu} H + \frac{t^z \frac{z_\pi}{\sigma_{qq}} + t^q}{1 - t^z \tilde{z}_y} \right], \tag{12}$$

where $H \equiv \frac{(1+t^q)t^z\omega}{1+t^z} - t^q$, with $H = (v_{\bar{q}}/\lambda) < 0$. Considering the case without cross-price effects ($\omega = \omega_{zz}/\omega_{qq}$) this simplifies to

$$\frac{dv}{dq^g} = \mu \left[\frac{\lambda}{\mu} H + \frac{t^q}{1 - t^z z_y} \right]. \tag{13}$$

Since $H < 0$, $\frac{dv}{dq^g}$ is decreasing in $\frac{\lambda}{\mu}$, which represents the marginal cost of public funds. Typically, this will exceed one. More generally, the larger $\frac{\lambda}{\mu}$, the more likely it is that $\frac{dv}{dq^g} < 0$. The optimal public provision policy should then reduce positional consumption below the level under optimal corrective second-best taxation. Defining $\kappa \equiv \omega - 1$, and spelling out H, we can rewrite (13) as

$$\frac{dv}{dq^g} = \mu \left[\frac{\lambda}{\mu} \frac{t^z - t^q + \kappa t^z + \kappa t^z t^q}{1 + t^z} + \frac{t^q}{1 - t^z z_y} \right]. \tag{14}$$

If $\omega \geq 1$, so that $\kappa \geq 0$, and assuming $1 - t^z z_y > 0$ in line with Munro (1992), then, for $\frac{\lambda}{\mu}$ sufficiently small, $\frac{dv}{dq^g} > 0$. The optimally publicly provided quantity of the positional good should then exceed the level under second-best taxation. Thus, welfare improvements through public provision may necessitate an increase or a decrease in positional consumption, and the marginal cost of public funds plays a key role for the optimal policy direction. A higher marginal value of public funds amplifies the marginal benefit of reducing the positional externality. The optimal public provision policy trades off this marginal benefit with the marginal fiscal externality of a quantity change. The higher the marginal value of public funds, the more likely it is that the marginal benefit of lowering positional consumption dominates.

5 Public provision and redistribution

We now analyse jointly efficient redistribution and the internalization of positional externalities. Let the population consist of two income classes or types $i = l, h$, $y^h > y^l$, with equal population shares. The reference level is given by the average consumption of q, so that $\overline{q} = \frac{\overline{q}^l}{2} + \frac{\overline{q}^h}{2}$. Individuals form expectations about the consumption level of the positional good for both types and the corresponding average level in the economy, which are fulfilled in equilibrium. We set $\psi = 1$ and $\phi = 1$. Laissez-faire positional consumption q^{i^*} is determined by $\frac{u_{q^i} + u_s s_{q^i}}{u_{z^i}} = 1$. This implies inefficiently high levels of positional consumption by both groups.

To illustrate the potential of public provision of positional goods we focus on a second-best world, where the government wants to redistribute from high to low income individuals but cannot observe the income status. The basic idea is that of a separating equilibrium, in which only the low income individuals consume the publicly provided quantity and the high income individuals opt out. Together with either uniform or differentiated taxes, this results in reduced and differentiated positional good consumption and achieves redistribution.

We cast our analysis in the framework of Currie and Gahvari (2008) which closely corresponds to our setting. The government's objective is

$$W = \gamma^l u\left(q^l, z^l, s\left(q^l, \bar{q}\right)\right) + \gamma^h u\left(q^h, z^h, s\left(q^h, \bar{q}\right)\right), \tag{15}$$

where $\gamma^l > \gamma^h > 0$ are the welfare weights, which we normalize $\gamma^l + \gamma^h = 1$. While incomes are exogenous, they cannot be observed by the government. We focus on a direct revelation mechanism where the government offers bundles $\left(T^h, q^h\right)$ and $\left(T^l, q^l\right)$, where T^i are cash transfers or subsidies. In the separating equilibrium we focus on, individuals expect that everyone chooses the bundle designed for them, and calculate the reference level accordingly. Implementation will be feasible via public provision of the low-income quantity, leaving the high income types to buy in the market, and taxing participants and non-participants differently, see Currie and Gahvari (2008, p.344-45). Incentive-compatibility requires $u^h \geq u^{hl}$ and $u^l \geq u^{lh}$, where u^{hl} and u^{lh} denote the respective utility from mimicking the other type. Because of the redistribution objective, the second of these constraints will not be binding. We denote the multiplier corresponding to the first constraint by ρ^h. The government's budget constraint is $T^h - q^h + T^l - q^l \geq 0$.

We first restate the results without positional externalities as analysed by Currie and Gahvari (2008). With utility given as $u(q^i, z^i)$ and both q and z being private goods, the optimal policy is characterized by

$$\frac{u_q^h}{u_z^h} = 1 \text{ and} \tag{16}$$

$$\frac{u_q^l}{u_z^l} = 1 + \Delta, \tag{17}$$

where $\Delta = \left(1/\left(\rho^h u_z^{hl} + \lambda\right)\right) \rho^h u_z^{hl} \left(\frac{u_q^{hl}}{u_z^{hl}} - 1\right)$, and λ being the multiplier corresponding to the government budget. The high income types should not be distorted. Moreover, if redistribution is small, so that incentive-compatibility will not be binding and $\rho^h = 0$, the low income types will also not be distorted.

Consider now the case where the publicly provided good is of a positional nature. For the high income individuals, the first order conditions of maximizing (15) subject to the incentive-compatibility constraint and the government budget constraint lead to

$$\frac{u_q^h + u_s^h s_q^h}{u_z^h} = 1 - \Phi + \Psi, \tag{18}$$

where $\Phi = \frac{1}{\lambda}\left[\gamma^l u_s^l s_{\bar{q}}^l + \gamma^h u_s^h s_{\bar{q}}^h\right] \bar{q}_{q^h}$, $\Phi < 0$ and $\Psi = \frac{\rho^h}{\lambda}\left(u_s^{hl} s_{\bar{q}}^{hl} - u_s^h s_{\bar{q}}^h\right) \bar{q}_{q^h}$, and where we have written the left hand side of (18) to reflect that $u_{q^h}^h + u_s^h s_{q^h}$ is now the total private marginal utility of q. Relative to the situation without the positional externality, two additional terms come into play. Firstly, the term Φ reflects the marginal positional externality, weighted by the respective marginal utility and welfare weights. Naturally, this reduces the optimal q^h. Secondly, the term Ψ is the marginal effect of the positional externality on the utility differences between mimicking and truthful behaviour. The latter effect will only affect the optimal policy if incentive-compatibility is binding. For the low income individuals we find

$$\frac{u_q^l + u_s^l s_q^l}{u_z^l} = 1 + \tilde{\Delta} - \tilde{\Phi} + \tilde{\Psi}, \tag{19}$$

where $\tilde{\Delta} \equiv \left(1/\left(\rho^h u_z^{hl} + \lambda\right)\right) \rho^h u_z^{hl} \left(\frac{u_q^{hl} + u_s^{hl} s_q^{hl}}{u_z^{hl}} - 1\right)$ directly corresponds to Δ in (17), but $u_{q^l}^{hl}$ is replaced by $u_q^{hl} + u_s^{hl} s_q^{hl}$ to take into account the full private marginal benefit of q for a mimicker, $\tilde{\Phi} \equiv \left(1/\left(\rho^h u_z^{hl} + \lambda\right)\right)\left(\gamma^h u_s^h s_{\bar{q}}^h + \gamma^l u_s^l s_{\bar{q}}^l\right) \bar{q}_{q^l}$, $\tilde{\Phi} < 0$, and $\tilde{\Psi} \equiv \left(\rho^h/\left(\rho^h u_z^{hl} + \lambda\right)\right)\left(u_s^{hl} s_{\bar{q}}^{hl} - u_s^h s_{\bar{q}}^h\right) \bar{q}_{q^l}$. Here as well, the benchmark is adjusted by two terms. The term $\tilde{\Phi}$ reflects the weighted marginal positional externality, which reduces the optimal q^l, and the term $\tilde{\Psi}$, which corresponds to the marginal effect of the positional externality on the utility difference between mimicking and truthful behavior. Just as for the high income individuals, the marginal positional externality affects the optimal policy regardless of whether the incentive-compatibility binds for the high income individuals. However, the terms $\tilde{\Delta}$ and $\tilde{\Psi}$ will vanish if it is not binding.

We can directly compare the optimal second-best policy with the first best, which is characterized by

$$\frac{u^i_{q^l} + u^i_s s_{q^i}}{u^i_z} = 1 - \frac{\left(\gamma^i u^i_s s^i_{\bar{q}} + \gamma^j u^j_s s^j_{\bar{q}}\right) \bar{q}_{q^i}}{\lambda}, i = l, h, \text{ and } i \neq j, \tag{20}$$

and corresponds to (18) and (19), respectively, for $\rho^h = 0$. This will be the case if redistribution is limited, so that public provision of positional goods will be an adequate policy to reach the first best in a second-best world. If incentive-compatibility for the high income individuals is binding, the optimal provision policy additionally reflects their effects on incentive-compatibility. In particular, in the likely case that the marginal effect of average status consumption on utility is larger in absolute value for a mimicker, i.e., if $\left(u^{hl}_s s^{hl}_{\bar{q}} - u^h_s s^h_{\bar{q}}\right) < 0$, we have $\Psi < 0$ and $\tilde{\Psi} < 0$, which pushes optimal positional consumption upwards for high and low income individuals. Higher consumption levels of either group increase the average, which reduces status utility for high income individuals. If this effect is stronger at the margin for the mimickers, incentive-compatibility can be relaxed by higher levels of positional consumption of both groups. We summarize our findings in the following proposition.

Proposition 5 *If incentive-compatibility is binding, neither the high income nor the low income individuals will achieve the first best. Higher levels of positional consumption of high and low income individuals will then relax incentive-compatibility if increasing average status consumption has a stronger absolute effect on the marginal utility of mimickers than on non-mimickers. If transfers from low income to high income individuals are small, so that the incentive-compatibility constraint is non-binding, public provision of positional goods can achieve the first-best outcome.*

Thus, the result of reaching the first-best outcome for limited transfers extends to the case of positional externalities. This implies that public provision of positional goods can jointly obtain efficient redistribution and internalization of the positional externalities. Moreover, as in the case without positional considerations, this is typically not possible using a tax and transfer policy, see Currie and

Gahvari (2008). For a more sizeable redistribution, both high and low income individuals are distorted, where this policy optimally trades off the marginal effects on incentive-compatibility with the internalization of the positional externalities. The former will typically call for higher levels of positional consumption for all individuals.

6 Discussion and conclusion

Our analysis has highlighted several instances where public provision can improve efficiency. The baseline analysis in Section 3 has considered the case of atmospheric externalities. In such situations, efficiency can be established by an appropriate corrective tax. Thus, relying on public provision in such situations may not be the preferred policy choice, and may only be optimal if the use of an optimal tax policy is precluded for exogenous reasons. However, as we have argued in Section 4 and 5, public provision may also be a useful policy instrument in second-best settings, and the combination of taxes and public provision can extend the set of implementable quantities. Our results thus suggest that whether public provision of positional goods is a sensible policy will, in general, depend on the importance of positional versus purely private consumption aspects, the extent of redistributive policy objectives, as well as on the constraints of policy makers in terms of the available tax instruments and information. In line with our findings, public provision of positional goods is in practice typically constrained to goods that also have an important non-positional utility component. Future research may explore in more detail how corrective tax policies and public provision can be used jointly to improve the outcome in complex situations with heterogeneity along other dimensions, such as reference levels, which may interact with heterogeneity in income or preferences.

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