Taxation of Status Goods

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Abstract

In this paper we first derive and characterise the optimal tax system in the presence of status goods. As status goods are associated with negative externalities they will in general be taxed at higher rates than non-status goods. However, under second-best assumptions to what extent the rate of tax on a status good exceeds that on a non-status good depends on its complementarities with the supply of labour to the market. We combine this insight with the theory by Tabellini (2008) of how individual behaviour is influenced by material incentives and social norms to suggest that the taxation of status goods is closer to the optimal level in homogenous than in heterogeneous societies.

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1. Introduction

Under the neoclassical paradigm society is considered as consisting of individuals each maximizing his own material welfare. It has with few exceptions been the basis for the development of economic theories during the second half of the 20th century. However, confronted with the insight from evolutionary biology and experimental evidence provided by neuro-biologists, psychologists and behavioural economists, leading economists have started to explore alternative assumptions as the basis for explaining economic behaviour (see for example Dixit (2004,2008, Bernabou and Tirol 2006, Tabilini 2008).

The concept of "homo economicus" can be traced back to Malthus, but was both in economics and politics reinforced by the Darwin theory of natural selection. However, already Darwin without knowing the genetic mechanism of evolution realised that human behaviour cannot be explained solely as a result of "survival of the fittest". He realised that the fact that man until to the advent of agriculture has evolved in groups of at most a few hundred individuals engaged in close collaboration, but with much less and not necessarily collaborative contact with members of other groups, might explain the amble examples of altruistic (and spiteful) behaviour in man.

Based on evolutionary biology we now know that the human gene pool is the result of

- selection for survival of individuals in competition with other individuals,
- sexual competition, and
- selection for survival of the group as a whole in competition with other groups.

This insight has important implications for economics which are starting to emerge. First, it suggests that preferences with respect to the consumption of goods and the supply of labour are closely interrelated, in particular among people who consider themselves as belonging to the same group. Second, it raises the question whether the methodological individualism is always the best research strategy in explaining economic phenomena.

The *selection at the individual level* explains that man behaves selfishly when it comes to the satisfaction of his basic needs. *Sexual competition* explains that an individual will use resources to increase his reproductive success even if it reduces his chance of survival. In contrast, *group selection* explains why human groups develop institutions to limit the impact of selfish behaviour and of sexual competition to the extent this is detrimental to the survival of the group as whole.

In the course of evolution the survival of the human group has depended on the total group production, as well its distribution within the group. On the one hand, for the survival of the group it has been favourable that individual members in order to acquire status would exert effort with the outcome of this effort being shared with other members of the group. On the other hand, it has also been favourable for group

survival to limit individuals' use of resources just to obtain a higher status as this from the point of view of the group constitutes a waste. We may thus assume that humans have a genetic disposition for group behaviour which increases the cost of acquiring status goods and which provides competing goods collectively.

Before progressing, let us briefly consider the methodological implications of recognising that the evolution of man has been influenced by group selection. First of all it suggests that humans are *not* born equal. Individuals will have different dispositions for selfish and altruistic behaviour; but more significantly to allow for the benefit of specialisation within the group, group selection has favoured the differentiation of the genes between individuals in a non-random fashion and mechanisms of coordination and control. Group behaviour is therefore likely to represent a complex interaction between individuals with different dispositions due to differences in genes, not only for individual, but also for collective behaviour. The evolution of the human gene pool may be seen in analogy with the rapid development (in evolutionary terms) during the Cambrian revolution of complex organisms with specialisation of different cells within the organism and of hierarchical systems of control. How group selection has resulted in the emergence of multi-cell organisms is not well understood among biologists and has been a controversial subject (see for example Buss 1987), however when biologists as a methodological approach take the organism rather than the cell as the unit of discourse in general they accept the ontological hypothesis that organisms consist only of interacting cells. By analogy methodological individualism may not always represent the optimal strategy in the study of human societies. Since the introduction of agriculture, very recently in terms of the evolution of the human gene pool, cultural evolution has created societies far more complex and far more hierarchical than the societies of loosely connected small groups of hunters and gatherers to which man is genetically adapted (see Dixit 2008). The increased complexity as a result of cultural evolution provides an additional argument why the study by economists of modern societies may benefit from research strategies where society as a whole is taken as the unit of discourse for the same reasons that biologists in studying organisms do not solely consider the behaviour of the organism as the result of interaction of cells. For the study of human societies both traditional reductionist and non-reductionist research strategies may complement each other.

The purpose of this paper is to contribute to the understanding of how taxation of status goods and the collective provision of goods competing with status goods differs over time and space, drawing on the one hand on the insight from evolutionary psychology and on the other hand using standard tools of economics, more concretely, general equilibrium and optimal tax theory. We draw on the theory of how individual behaviour is influenced by material incentives and socials norms by Tabellini and a model adapted from Sandmo (1975, 2000) of optimal taxation with externalities and abatement. We use the optimal tax model to represent that the consumption of status goods is associated with negative externalities and that the government by taxation and

collective use of resources is able to reduce the negative effect for society of the consumption of status goods. We represent the behaviour of society by the maximisation of a community utility function, thus diverting from the principle of methodological individualism. The paper is organised as follow, in Section 2 we consider some relevant literature. Section 3 we set out the model. In Section 4 we identify for reference what determines the optimal tax system without externalities. In Section 5 we characterise the optimal tax system in an economy with one status good, one non-status good and one public good. In Section 6 we consider how the degree of heterogeneity is likely to affect the taxation of status goods and the collective provision of competing goods.

2. Some relevant literature

The role of group selection in explaining animal and in particular human behaviour has been controversial (see for example Bergstrom 2002), but after the spectacular advances in neuro-science have provided solid empirical evidence for altruistic behaviour in man, in particular in the form of punishment of antisocial behaviour (see Spitzer, Fischbacher, Herrnberger, Grön and Fehr 2007) the importance of group selection for understanding human behaviour has recently gained acceptance in a number of scientific disciplines. The literature on the issue has recently been reviewed and developed by Dugatkin (1999, 2001, 2009).

Evolutionary biology explains the use of resources by individuals to signal non-observable abilities. The socalled *handicap principle* has been developed by Amotz Zahavi (Zahavi and Zahavi 1997). Sexual selection explains that animals of greater biological fitness signal this through behaviour which implies squandering of resources. The biological theory of the handicap principle has been linked to the Veblen (1899) theory of *conspicuous consumption* (see e.g. Miller 2009). This theory has motivated a number of contributions to the explanation of consumer behaviour, however with few making an impact on mainstream economics.

Among economists Stiglitz (1975) more than 30 years ago drew attention to the negative external effects of signalling in the context of education. Ng (1997), Ireland (1998) and Deng and Ng (2004) has recognised the potential for burden-free taxation of status goods in analogy with the taxation of environmental externalities. The optimal system of taxation in the presence of externalities where the government does not possess the information to levy lump-sum taxes was first analysed by Sandmo (1975, 2000). The analysis of status goods has been reviewed and analysed within a game theoretic framework by Truyts (2008) drawing attention to the link to Sandmo's analytical framework. Ireland (1998) and Rege (2008) have recognised that the introduction of status goods might induce an increase in the supply of labour and thus might be welfare improving.

Pierre Bourdieu, a sociologist, has developed and provided empirical support for the idea that societies invest in socialization of its members to adhere to fundamental set

of beliefs and values. These serve both to provide a shared understanding of reality and a source of norms of behavior which provide cohesion within society.

Bernabou and Tirol (2006) have also provided theoretical explanations and empirical evidence for the importance of socialization in the belief in a just world for social cohesion. They have used this to provide a political economic theory of taxation.

There has over the last 20 years emerged ample experimental evidence that human behaviour does not correspond to that predicted by models based on *homo economicus* (see for example Fehr, Fishbacher and Gatchter 2002, Fehr and Fischbacher 2003).

Based on this insight and the pioneering work by Dixit (2004), Tabellini (2008) has established a theory which links the (perceived) degree of heterogeneity in society to social norms of collaboration and enforcement. He considers a society of individuals organised in social groups. Interaction between individuals has the characteristics of a prisoners' dilemma game. Individual welfare is a function not only of material benefit derived from these games, but also of the satisfaction in itself of adopting a collaborative strategy. The satisfaction from collaboration is higher when collaborating with individuals from one's own group (*limited morality*) than with individuals from other groups (*generalised morality*)[1]. Non-collaboration within a group is sanctioned informally, but in the case of interaction between individuals from different social groups by institutionalised legal provisions. In homogeneous societies with little (perceived) distance between individuals belonging to different groups there will be a relatively strong legal enforcement. Social norms develop over time in response to changes in exogenous factors. They are transmitted from one generation to the next by a process of socialization and therefore subject to deep lags.

3. The model setting

We consider a society consisting of a household sector, a production sector and a government, with one primary factor, two produced commodities and a public good. The primary factor we label 0 and interpret as "labour". The household consumes commodity 1 a "status good" , which is associated with negative external effects, and commodity 2 a "non-status good" , which is not. We denote the set of commodities *FC* and the set of produced commodities *C*. The endowment of the primary factor is partly consumed within the household sector and not observable by the government. $\mathbf{X} \equiv \left(X_0, X_1, X_2\right)$ is the net demand vector of the household sector. By the negativity convention, the supply of the primary factor to the market is measured negatively, i.e. $X_0 < 0$. We represent the behaviour of the household sector as the result of maximising a strictly quasi-concave utility function $u = u\left(\mathbf{X}, e\right)$ where e indicates the amount of the public good. The public good is assumed to be a substitute for the status good, i.e. the larger the provision of the public good, the smaller is the perceived

[1] In fact Tabellini assumes that the satisfaction from collaboration is a continues function of the distance between the players.

benefit of consuming the status good. Both the status good and the public good are complementary with the supply of labour to the market. Production possibilities are represented by constant returns to scale production functions with Y_i being the production of commodity i and y_0^i the use of the primary factor in its production. The government's resource requirements, $\mathbf{X}^G \equiv \left(X_0^G, X_1^G, X_2^G\right)$, are financed solely by taxes on market transactions. Government expenditures are divided between expenditures to provide the public good, A, and other costs, G. The public good is an function decreasing in X_1 and increasing in A

$$e = e\left(X_1, A\right) \tag{1}$$

Consumer prices are $\mathbf{q} \equiv \left(q_0, q_1, q_2\right)$ and producer prices $\mathbf{p} \equiv \left(p_0, p_1, p_2\right)$. For a tax system $\mathbf{t} \equiv \mathbf{q} - \mathbf{p}$ to be feasible, the three basic conditions for a market equilibrium: *Profit maximisation*, *Utility maximisation* and *Material balance* have to be satisfied, as well as the condition for the government's budget to be balanced. Profit maximization implies that

$$y_0^i = -a_0^i Y_i \qquad i \in C \tag{2}$$

$$p_i = a_0^i p_0 \qquad i \in C \tag{3}$$

Using the *Expenditure function approach*, we represent the utility maximisation condition as[2]

$$\mathbf{X} = \mathbf{E_q}(\mathbf{q}, u; e) \tag{4}$$

$$E\left(\mathbf{q}, u; e\right) \leq I \tag{5}$$

where $I = 0$ since firms generate no profit (see Dixit 1975 and Dixit and Munk 1977). The first of these two equations (4) says that $\mathbf{X}$ must be the solution to the household's problem of minimising the expenditures required to achieve the utility level u at the prices $\mathbf{q}$ for given level of the public good e; the second equation (5) says that the household's unearned income I must be larger or equal to these expenditures as represented by the value of the expenditure function $E\left(\mathbf{q}, u; e\right)$.

Material balance requires

$$Y_i = X_i + X_i^G \qquad i \in C \tag{6}$$

$$\sum_{i \in C} y_0^i = X_0 + X_0^G \tag{7}$$

By successive substitution equations (1) to (7) may be reduced to

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[2] Using the subscript notation, we write

$$\mathbf{E_q}(\mathbf{q}, u; e) \equiv \left\{X_i\ (\mathbf{q}, u; e), i \in FC\right\},\ \mathbf{E_{qq}}(\mathbf{q}, u; e) \equiv \left\{\frac{\partial X_k}{\partial q_i}(\mathbf{q}, u; e),, i, j \in FC\right\}$$

$$\sum_{i\in C} a_0^i \left(E_i\ (q,u;e) + X_i^G\right) \ + E_0\left(q,\ u;e\right) + X_0^G = 0 \tag{8}$$

$$E\left(\mathbf{q},u;e\right) = 0 \tag{9}$$

$$\left(\mathbf{q}-\mathbf{p}\right)'\mathbf{E}_{\mathbf{q}}(\mathbf{q},u;e) = A+G \tag{10}$$

$$e = e\left(E_1\ (\mathbf{q},u;e), A\right) \tag{11}$$

By Walras' law we can delete either (8) or (10). Deleting the government's budget constraint (10), by the homogeneity of $E(\mathbf{q},u;e)$ and $\mathbf{E}_{\mathbf{q}}(\mathbf{q},u;e)$ in $\mathbf{q}$ of degree one and degree zero, respectively, it is easy from (8) and (9) to establish that we can fix the value of one consumer price and one producer price as a matter of normalisation. We can therefore without loss of generality assume that supply of the primary factor to the market is untaxed, i.e. $p_0 = q_0$; however, equally valid rule of normalisation is to assume the tax on labour or on any other commodity as fixed at a given rate (see Munk 1978 for details).

4. Optimal tax rules in an economy with only private goods[3]

In this section, as a preliminary step, we consider what determines the optimal tax system when both goods are non-status goods, i.e. $e = e\left(A\right)$. Deleting with reference to Walras' law the material balance condition (8), the government's maximisation problem in terms of choosing an optimal tax system $\mathbf{t}$ may be formulated as

$$\underset{\mathbf{t},u}{Max}\ u \text{ s.t.}$$

$$E\left(\mathbf{p}+\mathbf{t},u;e\left(A\right)\right) = 0$$

$$\mathbf{t}'\mathbf{E}_{\mathbf{q}}(\mathbf{p}+\mathbf{t},u;\left(\mathbf{p}+\mathbf{t},u;e\left(A\right)\right)) = A+G \tag{12}$$

The corresponding Lagrangian expression is

$$£ = u + \mu\left(-E\left(\bar{\mathbf{p}}+\mathbf{t},u;e\left(A\right)\right)\right) + \lambda\left(\sum_{\mathrm{i}\in\mathrm{FC}} t_{\mathrm{i}}\, E_{\mathrm{i}}\ \left(\bar{\mathbf{p}}+\mathbf{t},u;e\left(A\right)\right) - A - G\right) \tag{13}$$

The first order conditions for optimality with respect to u and $\mathbf{q} \equiv \left(q_0, q_1, .., q_{\mathrm{N}}\right)$ are, respectively,

$$\frac{\partial £}{\partial u} = 1 - \mu E_u + \lambda \sum_{i=0}^{N} t_i E_{iu} = 0 \tag{14}$$

$$\frac{\partial £}{\partial q_k} = -\mu X_k + \lambda\left(\sum_{i\in FC} t_i E_{ik} + X_k\right) = 0 \qquad \mathrm{k} \in \mathrm{FC} \tag{15}$$

where, $E_{\mathrm{ij}} \equiv \dfrac{\partial^2 E}{\partial q_i \partial q_j} = \dfrac{\partial X_i}{\partial q_j}$, $E_{\mathrm{u}} \equiv \dfrac{\partial E}{\partial u} = 1/\dfrac{\partial V}{\partial I}$, and $E_{\mathrm{iu}} \equiv \dfrac{\partial^2 E}{\partial q_i \partial u} = \dfrac{\partial X}{\partial I} \Big/ \dfrac{\partial V}{\partial I}$.

[3] This section draws on Munk (2009) which may be consulted for details

From (14) we have that the *net social value of income* (see Diamond 1975) is

$$\mu = \alpha + \lambda \sum_{i=0}^{N} t_i \frac{\partial x_i(\mathbf{q}, I)}{\partial I} \tag{16}$$

where $\alpha \equiv \frac{\partial V(\mathbf{q}, I)}{\partial I} = 1/E_u$.

Reordering (15) we obtain,[4]

$$\sum_{i \in FC} E_{ki} t_i = -\frac{\lambda - \mu}{\lambda} X_i \tag{17}$$

where $\lambda > \mu$ because the Slutsky matrix $\mathbf{E_{qq}} \equiv \{E_{ik}(\mathbf{q}, u),\ i, j \in FC\}$ is negative definite. In the Mirrlees tradition of the analysis of optimal commodity taxation (see Mirrlees 1976), (17) is interpreted in terms of the so-called *Ramsey rule*, that at the optimum the reduction in compensated demand for all commodities $\Delta x_i = E_i(\mathbf{q}, u^*) - E_i(\mathbf{p}, u^*),\ i \in FC$ relative to the first-best solution $\mathbf{X}^*$ is approximately proportional.

Applying this rule to commodity 0 we have

$$\frac{\Delta X_0}{X_0^*} \simeq \frac{\sum_{i \in FC} E_{0i}(\mathbf{q}, u^*) t_i}{X_0^*} = -\theta \tag{18}$$

where $\theta = \frac{\lambda - \mu}{\lambda} > 0$. The Ramsey rule may therefore be formulated as saying that the basic distortion caused by the government being obliged to raise revenue by taxes based on market transactions rather than by lump-sum taxes is that the supply of labour to the market is discouraged, and that the production and consumption of produced commodities is reduced at approximately the same rate.

Choosing the primary factor, commodity 0, as untaxed numeraire the first order conditions for an optimal tax system (17) can be written as

$$\begin{aligned} E_{11} t_1 + E_{12} t_2 &= -\theta X_1 \\ E_{21} t_1 + E_{22} t_2 &= -\theta X_2 \end{aligned} \tag{19}$$

Solving for the optimal tax rates, it is possible to derive the following well-known optimal tax formula which support the Corlett and Hague (1953) insight that those commodities relatively strongly complementary with the consumption of leisure should be taxed at the highest rate (see for example Atkinson and Stiglitz 1980, pp375-376)

$$\begin{aligned} t_1 &= \theta\left(-\varepsilon_{11} - \varepsilon_{22} - \varepsilon_{10}\right) \frac{q_1 q_2}{D} \\ t_2 &= \theta\left(-\varepsilon_{11} - \varepsilon_{22} - \varepsilon_{20}\right) \frac{q_1 q_2}{D} \end{aligned} \tag{20}$$

where D= $E_{11}\ E_{22}$ - $E_{21}\ E_{12}$ >0.

[4] This result can as is well-known also be achieved using the *Indirect utility functions approach*, however with less ease of derivation and interpretation (see for example Atkinson and Stiglitz 1980).

The Allen (or Allen-Uzawa) elasticity of substitution, σ_{ij}, may be defined as

$$\sigma_{ij} \equiv \frac{M(\mathbf{q},u)M_{ij}(\mathbf{q},u)}{M_i(\mathbf{q},u)M_j(\mathbf{q},u)},\ i,j \in FC$$

where $M(\mathbf{q},u)$ is the full income expenditure function. Since $\varepsilon_{j0} = \alpha_0 \sigma_{j0}$ and $\alpha_i = \frac{q_i c_i}{q_0 \omega_0}$, we may rewrite (20) as

$$\frac{t_1/q_1}{t_2/q_2} = \frac{(-\varepsilon_{11} - \varepsilon_{22}) - \alpha_0 \sigma_{10}}{(-\varepsilon_{11} - \varepsilon_{22}) - \alpha_0 \sigma_{20}} \tag{21}$$

As compensated own price elasticities, ε_{ii}, are always negative, $\sigma_{10} < \sigma_{20}$ imply $t_1/q_1 > t_2/q_2$. As $\varepsilon_{20} - \varepsilon_{10} = \alpha_0(\sigma_{20} - \sigma_{10})$ is clearly related to the effect of a tax reform on the labour supply, the optimal tax system may be interpreted as a compromise between two objectives (see Munk 2009):

Objective 1: to encourage the supply of labour to the market, X_0,

and

Objective 2: to limit the distortion the marginal rate of substitution in consumption between produced commodities, $\frac{dX_1}{dX_2}$.

We now compare this derivation based on the expenditure function approach with that based on the indirect utility function approach. Solving (9) for u we obtain

$$u = V(\mathbf{q},0) \tag{22}$$

where $V(\mathbf{q},I)$ is the indirect utility function and where $I = 0$. Substitution for u in (10) by (22), all the equilibrium conditions for a tax system $\mathbf{t} \equiv (t_0, t_1, .., t_N)$ to be feasible may be represented by

$$\mathbf{t}'\mathbf{X}(\mathbf{q},I) = G \tag{23}$$

Using the *Indirect utility function approach* we may therefore alternatively formulate the government's maximisation problem as

$$\underset{\mathbf{t}}{Max}\ V(\mathbf{t}+\mathbf{p},0;e(A)) \text{ s. t.}$$

$$\mathbf{t}'\mathbf{X}(\mathbf{p}+\mathbf{t},0;e(A)) = A + G \tag{24}$$

The Lagrangian expression corresponding to (12) is

$$£ = V(\overline{\mathbf{p}}+\mathbf{t},0;e(A)) + \lambda\left(\sum_{i\in FC} t_i X_i(\overline{\mathbf{p}}+\mathbf{t},0;e(A)) - A - G\right) \tag{25}$$

The first order conditions with respect to $\mathbf{q} \equiv (q_0, q_1, .., q_N)$, for an optimal solution are

$$\frac{\partial £}{\partial q_k} = -\alpha X_k + \lambda\left(\sum_{i\in FC} t_i \frac{\partial X_i}{\partial q_k} + X_k\right) = 0 \qquad k\in FC \ (26)$$

Reordering we have

$$\sum_{i\in FC} \frac{\partial X_i}{\partial q_k}(\mathbf{q},0)t_i = -\frac{\lambda-\alpha}{\lambda} X_i \qquad k\in FC \ (27)$$

which may be compared with (17).

It is possible to derive optimal tax formulae from (27) in terms of uncompensated price elasticities, but there are two major difficulties in interpreting such formulae. Both $\frac{\lambda-\alpha}{\alpha}$ and $\frac{\partial x_i}{\partial q_k}(\mathbf{q},I)$ depend on income effects which change with the rules of normalisation adopted. The sign of $\frac{\lambda-\alpha}{\alpha}$ (in contrast to the sign of $\frac{\lambda-\mu}{\lambda}$) and the values of uncompensated price elasticities thus depend on arbitrary rules of normalisation. In the general equilibrium optimal tax literature (27) is therefore transformed into (17) using the Slutsky equation. By definition

$$E_i(\mathbf{q},u) \equiv X_i(\mathbf{q},E(\mathbf{q},u)) \qquad (28)$$

Differentiating by prices and reordering we obtain the *Slutsky equation*

$$\frac{\partial X_i}{\partial q_k}(\mathbf{q},0) = E_{ik} - X_k \frac{\partial X_i}{\partial I}(\mathbf{q},0) \qquad k\in FC \ (29)$$

Substituting by (29), we can transform (27) into (17) by eliminating income effects and then derive (20) (see for example Atkinson and Stiglitz, op. cit).

However, when as in the model considered the public good is negatively affected by the external effect of the consumption of commodity 1, eliminating income effects becomes much more complicated as we now, rather than (28), have

$$E_i\left(\mathbf{q},u;e\left(E_1(\mathbf{q},u;e),A\right)\right) \equiv X_i\left(\mathbf{q},E(\mathbf{q},u;e);e\left(E_1(\mathbf{q},u;e),A\right)\right) \qquad (30)$$

In the seminal contribution to the analysis of optimal taxation with externalities by Sandmo (1975) and the subsequent literature the indirect utility function approach has been adopted to derive optimal tax formulae, however without income effects being eliminated[5]. In the following section we derive optimal tax formulae in terms of compensated demand effects bypassing the problem of solving (30) to obtain a modified Slutsky equation to eliminate the income effects from the first-order conditions.

5. Optimal tax rules with status goods

We now move on to the characterisation of the optimal tax system when the consumption of the status good is associated with negative external effects. In the this case, again deleting with reference to Walras' law the material balance condition (8), the government's maximisation problem may be formulated as

[5] For the reason given above eliminating income effects by (29) clearly would not be appropriate.

$$\underset{\mathbf{q},A,e,u}{Max}\ u \text{ s.t.}$$

$$E(\mathbf{q},u;e)=0$$

$$\sum_{k=0}^{2} t_k E_{\mathrm{k}}(\mathbf{q},u;e)-A-G=0$$

$$e=e\left(E_1(\mathbf{q},u;e),A\right) \tag{31}$$

The corresponding Lagrangian expression is

$$£=u+\mu\left(-E(\mathbf{q},u;e)\right)+\lambda\left(\sum_{i=0}^{2} t_i E_i(\mathbf{q},u;e)-A-G\right)+\rho\left(e\left(E_I(\mathbf{q},u;e),A\right)-e\right) \tag{32}$$

First-order conditions with respect to u, $\mathbf{q}\equiv(q_0,q_1,q_2)$, e and A, respectively, are

$$\frac{\partial £}{\partial u}=1-\mu E_u+\lambda\sum_{i=0}^{N} t_i E_{iu}+\rho e' E_{1\mathrm{u}}=0 \tag{33}$$

$$\frac{\partial £}{\partial q_k}=-\mu X_k+\lambda\left(\sum_{i\in FC} t_i E_{ik}+X_k\right)+\rho e' E_{1k}=0 \qquad \mathrm{k}\in \mathrm{FC} \tag{34}$$

$$\frac{\partial £}{\partial e}=-\mu E_e+\lambda\sum_{i=0}^{2} t_i E_{ie}+\rho e' E_{1e}-\rho=0 \tag{35}$$

$$\frac{\partial £}{\partial A}=-\lambda+\rho\frac{\partial e}{\partial A}=0 \tag{36}$$

where $e'\equiv\dfrac{\partial e}{\partial X_1}<0$.

Differentiating $e=e\left(E_1(\mathbf{q},u;e),A\right)$ by q_j we obtain

$$\frac{de}{dq_j}=e'E_{1j}+e'E_{1e}\frac{de}{dq_{\mathrm{j}}} \tag{37}$$

$$\frac{de}{dq_{\mathrm{j}}}=e'E_{1j}\frac{1}{1-e'E_{1e}} \tag{38}$$

The last factor in (38) we call the *feed back factor,* $\dfrac{1}{1-e'E_{1\mathrm{e}}}$. It indicates the factor by which the partial effect of an increase of q_j on the public good $e'E_{1j}$ of a price change has to be multiplied to obtain the total effect. As we have assumed $E_{1\mathrm{e}}<0$, this factor is less than 1.

Before characterising the optimal tax formula we interpret the Lagrangian multipliers. From (33), using that $E_{\mathrm{u}}=1/\dfrac{\partial \mathrm{V}}{\partial I}(\mathbf{q},e,I)$, $E_{\mathrm{iu}}=\dfrac{\partial X_i}{\partial I^{\mathrm{h}}}(\mathbf{q},e,I)/\dfrac{\partial V}{\partial I}(\mathbf{q},e,I)$, we have that *the net marginal social value of household income is*

$$\mu=\alpha+\lambda\sum_{i=0}^{2} t_i\frac{\partial X_i}{\partial I}+\rho e'\frac{\partial X_1}{\partial I} \tag{39}$$

where $\alpha \equiv \frac{\partial V}{\partial I}$ is the *gross social marginal value of income*. We thus interpret μ, in analogy with net marginal social value of income without external effects, as the increase in social welfare if the income of the household were increased by one unit from outside the economy.

Defining the value in monetary terms of a marginal increase in the public good as $MV_e = -E_e$ from (35) we have that *the social value of a marginal increase in the public good is*

$$\rho = \left(\mu MV_e + \lambda \sum_{i=0}^{2} t_i E_{ie}\right) \frac{1}{1 - e' E_{1e}} \tag{40}$$

where

1) μMV_e is the social value of an increase in the public good

2) $\lambda \sum_{i=0}^{2} t_i E_{ie}$ the social value of the change in tax revenue due to the change in the tax base due to an increase in the public good, and

3) $\frac{1}{1 - e' E_{1e}}$ the feed-back factor defined above.

For the interpretation of the condition for an optimal tax system, it is helpful first to establish what would be the optimal tax system if lump-sum taxation had been feasible. In this case $\lambda = \mu$. Assuming as a matter of normalisation that labour is untaxed, the optimal tax system will be satisfied by a tax system (see (34))

$$t_1 = MV_e e' \tag{41}$$

$$t_2 = 0 \tag{42}$$

The *Piguvian tax* t_1^* is thus equal to the marginal external effect of increasing the consumption of the status good.

Under first-best conditions the optimal provision of the public good requires (see (36))

$$MV_e = MC_e \tag{43}$$

where $MC_e = 1 \Big/ \frac{\partial e}{\partial A}$ are the marginal costs of providing the public good.

Under second-best assumptions, we have from (34) that

$$\sum_{i=0}^{2} t_i E_{ik} = -\left(\frac{\lambda - \mu}{\lambda}\right) x_k - \frac{\rho}{\lambda} e' E_{1k} \qquad k \in (0,1,2) \tag{44}$$

Multiplying on both sides by t_k, summing over k and reordering, we have using that $E_{1k} = E_{k1}$

$$\sum_{k=0}^{2}\sum_{i=0}^{2} t_i t_k E_{ik} + \frac{\rho}{\lambda} e' \sum_{k=0}^{2} t_k E_{k1} = -\frac{\lambda-\mu}{\lambda}\left(A+G\right) \tag{45}$$

The first term is negative because $\left\{E_{ik}, i,k \in (0,1,2)\right\}$ is negative semi-definite, but the second term may be positive. It therefore possible that the marginal costs of government funds, λ, may be smaller than the net social value of income μ. This will be the case if the government's revenue requirement $A+G$ is smaller than the revenue which a Pigouvian tax would generate. In the following we assume that government's requirement will be greater than that with the implication that the Marginal Costs of Government Funds (MCGF), $\frac{\mu}{\lambda}$ is larger than 1.

Setting $t_0 = 0$ as a matter of normalisation, solving (44) for the optimal tax rates we obtain the following optimal tax formula

$$\begin{aligned} t_1 &= \theta\left(-\varepsilon_{11} - \varepsilon_{22} - \varepsilon_{10}\right)\frac{q_1 q_2}{D} - \frac{\rho}{\lambda} e' \\ t_2 &= \theta\left(-\varepsilon_{11} - \varepsilon_{22} - \varepsilon_{20}\right)\frac{q_1 q_2}{D} \end{aligned} \tag{46}$$

where $\theta \equiv \frac{\lambda-\mu}{\lambda}$ and $\frac{\rho}{\lambda} e' = \frac{\mu}{\lambda} MV_e \frac{e'}{1-e'E_{1e}} + \sum_{i=0}^{2} t_i E_{ie} \frac{e'}{1-e'E_{1e}}$

This is similar to the expression for an optimal tax system without external effects (20) except for the second term in tax formula for the status good.

The optimal tax system may thus be interpreted as a compromise between three (rather than two) objectives

Objective 1: To encourage the supply of labour to the market, X_0,

Objective 2: To limit the distortion the marginal rate of substitution in consumption between produced commodities, $\frac{dX_1}{dX_2}$.

Objective 3: To limit the negative external effect of the consumption of the status good

Under second-best conditions the optimal provision of the public good requires (see (36))

$$\left(\frac{\mu}{\lambda} MV_e + \sum_{i=0}^{2} t_i E_{ie}\right)\frac{1}{1-e'E_{1e}} = MC_e \tag{47}$$

Where $MC_e = 1/\frac{\partial e}{\partial A}$

Under first-best assumptions where lump sum taxation is possible the optimal tax on the status good depends only on the external effect of its consumption. Under second-best assumptions the characterisation of the optimal tax system is more complex

depending on the relative strength of the three competing objectives. Objective 3 will always pull the optimal tax on the status good in the direction of a relative high tax rate. However, as we have assumed that the status good is relatively complementary with the supply of labour, Objective 1 will pull in opposite the direction.

We have assumed the public good also to be complementary with the supply of labour. If this effect is relatively large this will result in relatively high expenditures on the public good, thus decreasing the marginal evaluation of the status good.

6. Taxation of status goods and collective provision of goods competing with status goods

In this section we adopt a positive rather than a normative approach making the assumption that a decrease in *generalised morality* (see Tabellini 2008) will involve a move away from optimal taxation of status good and collective provision of competing goods towards a suboptimal solution with less government intervention.

Examples of status goods are luxury cars and private higher education. The theory suggests that the taxation of such goods and the collective provision of competing goods will be relative low in countries with heterogeneous cultures. This may explain why countries like the US have a relatively low tax on status goods and relatively low public provision of collective transport and higher education. One would for this reason expect also a larger supply of labour and lower welfare than in Scandinavian countries. The difference with respect to labour supply will however be less than one might expect on this basis, as the labour supply in Scandinavian countries is enhanced by the positive effect on the labour supply of publicly provided competing services.

Similarly one would expect increased heterogeneity (with some lag) to result in lower taxation of status goods and lower collective provision of competing services.

7. Concluding remarks

The importance of preference interdependence was recognised by in the early stages of the development of economic theory by economists such as Veblen (1999) and Pigou (1932). However, during the second half of the 20th century the neoclassical economic paradigm based on *"homo economicus"* has dominated the evolution of mainstream theory with the economic profession largely ignoring contributions which challenged this paradigm. However, as the empirical work by Tycho Brahe (see Kuhn 1932) provided the ammunition which eventually led to the demise of geocentric perception of the universe, the careful empirical work of behavioral economists and scientists from other disciplines have provided the ammunition which is likely to result in the

demise of the established paradigm, however as is usually the case in a scientific revolution incorporating the valid insight obtained within the previous paradigm.

The neoclassical paradigm clearly has had a large influence on political thinking. The big question is how the emerging new paradigm will influence politics. Policy-makers increasingly realize that it is not possible to create a just society based on the concept that man is basically altruistic (socialism) or motivated only by maximizing his material benefits (liberalism). The new paradigm will challenge the market fundamentalism and even the social liberalism which in many western societies during the last decades has been used to justify privatization of public services and lower taxation of high earners. The emerging insight is that man is hardwired within groups which are not larger than direct person to person contact is possible under the influence of social norms to behavior altruistically with no or little material reward. Policy makers should use this insight to resurrect the principles of public service. The design problem is to organize societies which maximize social welfare using relatively small social groups rather than individuals as building blocks. However, in addressing the challenge in designing societies where social groups collaborate harmoniously, it is important to recognize than we as a species have moved into a territory to which our biological evolutions has not prepared us to operate.

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