E C O N O M I C S B U L L E T I N

Merit goods provision and optimal tax evasion

ROSELLA LEVAGGI
DIPARTIMENTO DI SCIENZE ECONOMICHE -UNIVERSITA' DI BRESCIA

FRANCESCO MENONCIN
DIPARTIMENTO DI SCIENZE ECONOMICHE - UNIVERSITA' DI BRESCIA

Abstract

In a recent article Davidson, Lawrence and Wilson propose a model showing that, in the presence of distortionary taxation and goods of different quality, tax evasion can be an optimal device. Here, we show that this result, although quite interesting, cannot be generalised to a framework where Government activity consists of supplying merit goods and levying taxes to finance their provision.

Citation: LEVAGGI, ROSELLA and FRANCESCO MENONCIN, (2008) "Merit goods provision and optimal tax evasion." *Economics Bulletin,* Vol. 8, No. 7 pp. 1-3
Submitted: July 18, 2008. **Accepted:** September 26, 2008.
URL: http://economicsbulletin.vanderbilt.edu/2008/volume8/EB-08H20003A.pdf

1 Introduction

In a recent article Davidson, Martin and Wilson (2005), hereafter DMW, present a model showing that, in the presence of distortionary taxation, tax evasion can be an optimal strategy which, in some special cases, allows replication of a first best tax system. The model stands on four basic assumptions: a) there are two types of goods in the economy: a numeraire and another good that is produced in several qualities; b) goods are produced using Leontief technologies; c) consumers' utilities are additive, and they differ in their evaluation of quality (the marginal utility of quality is however decreasing); d) Central Government levies taxes on the good with several varieties to finance the production of a preset level of public goods.

Although utility is linear, the assumption of decreasing marginal utility, combined with a non-linear aggregation of linear preferences, allows the authors to show that uniform tax is distortionary and that in some cases evasion can improve welfare. Given a probability of being caught, Central Government will then set a fine to a level that allows an optimal tax evasion; in this way the tax rate and the fine levied are not uniform and the authors show that welfare improves.[1] In this note we use the framework proposed by DMW to study the scope for tax evasion in an environment where the taxed good is a merit good. We assume that the Government produces the low quality good and subsidizes its consumption whereas the private sector produces the high quality good (which is not subsidized). We believe that this environment is quite suitable to represent Government activity which is more oriented towards the production of merit rather than public goods.[2]

2 Merit goods, public provision and optimal tax

As in DMW, we assume a simple economy where two classes of goods are produced: a quality homogenous numeraire, and a private good whose quality can be either low (θ_L) or high ($\theta_H > \theta_L$). Each agent is endowed with a given amount of the numeraire and he decides whether to buy a single unit of the other good and of which quality. Departing from DMW, we assume that the two-quality product is a merit good[3]. Accordingly, the Government produces and promotes the consumption of the merit good by subsidizing the low quality variety (θ_L) at rate $(1-\rho)$ so that the price paid by the final user is a fraction ρ of the low quality good price P_L. Only the low quality is subsidized in order

[1] In DMW's framework in fact tax evasion when possible is complete and the Government revenue is given by the fines on tax evasion.

[2] In OECD countries about one fourth of public expenditure is represented by public goods and their share is decreasing through time.

[3] A merit good is a commodity which is judged that an individual or society should have on the basis of a norm other than respecting consumer preferences. One rationale for this is paternalism, that the government or other donor provides such a good on the basis of "merit," because it can better provide for individual welfare than allowing consumer sovereignty (Musgrave, 1987). Alternatively, there may be more acceptance for income redistribution in the form of goods, rather than, say, purchasing power (Musgrave and Musgrave, 1973, p. 81).

to reduce as far as possible the burden of Government activity. We believe that health care and education could be two relevant examples. In fact, they are produced both in the public and the private sector, but with different standards as regards quality[4] and prices. The utility function of agent i who buys the good whose quality is $j \in \{L, H\}$ can be written as

$$U_i = E_i - \rho_j P_j(\theta_j) + \alpha_i v(\theta_j),$$

where v is an increasing and concave function of the quality (θ_j) and is the same for any agent, E_i is the numeraire endowment of agent i (which can be transformed into either labour or capital), $P_j(\theta_j)$ is the price of the good j as a strictly increasing function of the quality θ_j, and $\alpha_i \in [0,1]$ is a preference, agent-specific parameter that is distributed according to the continuous density function $h(\alpha)$ and the cumulate distribution $H(\alpha)$. Although the distribution $h(\alpha)$ is obseved by the Government, each single value of α is private information to the consumer. This is the reason why subsidies and taxation can be applied to goods, but they cannot depend on personal characteristics of the consumers. This means that, as in DWM, an optimal tax system cannot be defined. The subsidy ρ_j is either zero for the high quality good or constant for the low quality good (i.e. $\rho_L = \rho$ and $\rho_H = 1$). The reason for subsidizing only the low quality good is twofold: (i) since the public expenditure is always distortionary, it should be kept to the minimum, and (ii) if the low quality merit good satisfies consumer needs, there is no reason to subsidize another good that only differs in its quality content. Given the absence of depreciation and assuming zero interest rate, zero profits and a Leontief production function, both inputs are paid the same cost W and in equilibrium prices for the goods must satisfy:

$$P_j = W_j(1 + t_j),$$

where t_j is the tax on good j.[5] Any agent i may behave in three different ways as regards the choice of the merit good:

1. he does not buy it; this happens if and only if he has a preference α_i such that
$$E_i - \rho P_L(\theta_L) + \alpha_i v(\theta_L) < E_i \Leftrightarrow \alpha_i < \frac{\rho P_L(\theta_L)}{v(\theta_L)} \equiv \alpha_L,$$

[4] The difference in quality levels might be related: (i) to the number of hotel services provided in private hospitals as regards health care, and (ii) to the average number of pupils in each classroom as regards education.

[5] DMW choose to model the tax rate in a slightly different way. Let us call τ_j their tax rate, then in their model the link between price P_j and cost W_j is given by $P_j = \frac{W_j}{1-\tau_j}$. We made our choice in order to simplify the ongoing computations and, nevertheless, our result can be traced back to that of DMW through the following equalities:

$$\frac{\tau_j}{1-\tau_j} = t_j \Leftrightarrow \tau_j = \frac{t_j}{1+t_j}.$$

2. he buys the high quality product; this happens if and only if he has a preference α_i such that

$$\begin{aligned} E_i - P_H(\theta_H) + \alpha_i v(\theta_H) &> E_i - \rho P_L(\theta_L) + \alpha_i v(\theta_L) \\ &\Leftrightarrow \alpha_i > \frac{P_H(\theta_H) - \rho P_L(\theta_L)}{v(\theta_H) - v(\theta_L)} \equiv \alpha_H, \end{aligned}$$

3. he buys a low quality product, this happens if and only if he has a preference α_i such that $\alpha_L < \alpha_i < \alpha_H$.

Other things being equal, the level of ρ discriminates between the market for the subsidized and the other variety since it lowers α_L and increases α_H. However, in the context of a full general equilibrium, this conclusion might be too simplistic since the effect of the tax system should also be studied. To do so, let's start by studying a framework without tax evasion and where the two goods can be taxed at different rates. In particular, given the Central Government subsidizes the low quality good, the latter is not taxed, i.e. $t_H = 0$. This assumption can be justified on several grounds: the tax on good L would simply be a clearing entry since Central Government has to subsidize the price gross of the indirect tax[6]. The merit good nature of the commodity considered is modelled through $\varpi(\alpha)$. This is a distibution of weight that Central Goverment attaches to the utility derived from the consumption of the merit good. We assume that $\frac{\partial \omega(\alpha)}{\partial \alpha} < 0$ i.e. more weight is attached to the utility of those at the low end of the distribution of α, which also represent the individuals that are more likely not to buy such commodity when there is no subsidy. We also assume that the distribution of $\omega(\alpha)$ satisfies the following condition $\int_0^1 \varpi(\alpha) h(\alpha)\, d\alpha = \int_0^1 g(\alpha)\, d\alpha = 1$

The Government solves the following problem[7]

$$\max_{t_H,\rho} \int_{\alpha_L}^{\alpha_H} (\alpha v_L - \rho P_L)\, \omega(\alpha)\, h(\alpha)\, d\alpha + \int_{\alpha_H}^{1} (\alpha v_H - P_H)\, \omega(\alpha)\, h(\alpha)\, d\alpha \tag{1}$$

subject to the budget constraint

$$(1-\rho) \int_{\alpha_L}^{\alpha_H} P_L h(\alpha)\, d\alpha = \int_{\alpha_H}^{1} t_H W_H h(\alpha)\, d\alpha \tag{2}$$

and the following condition:

$$0 \leq \rho \leq 1$$

The solution is presented in appendix 1 and can be written as:

[6] In any case for a given subsidy ρ^*, it is always possible to find a combination (ρ^{**}, t_L^*) that replicates the proposed solution and respects the budget constraint.

[7] We set $v(\theta_j) \equiv v_j$ and $P_j(\theta_j) \equiv P_j$.

$$
\rho^{*}\max\left(1-\frac{v_L\left(v_H-v_L\right)}{W_L}\left(1-H_H\right)\frac{\left(1-H_H\right)\left(G_H-G_L\right)-\left(1-G_H\right)\left(H_H-H_L\right)}{h_L\left(v_H-v_L\right)\left(1-G_H\right)\left(1-H_H\right)+h_Hv_L\left(1-G_L\right)\left(1-H_L\right)};0\right)
$$

$$
t_H^{*} = \min\left(v_L\left(v_H-v_L\right)\frac{\left(1-H_H\right)\left(G_H-G_L\right)-\left(1-G_H\right)\left(H_H-H_L\right)}{h_L\left(v_H-v_L\right)\left(1-H_H\right)^2+h_Hv_L\left(1-G_L\right)\left(1-H_L\right)}\frac{H_H-H_L}{W_H};W_L\frac{H_H}{W_H\left(1-H_H\right)}\right)
$$

The weight Central Government attaches to the consumption of the merit good determines the solution of the problem as expected. When the distribution of the weights is uniform, there is no scope for the subsidy as shown in appendix one. If relative more weight is given to individuals with a low α, $\rho < 1$ and the exact value depends on the two distributions of individuals and weights. Finally, for a ω sufficiently shewed towards the individuals at the low end of the preference distribution, $\rho = 0$, and $\alpha_L^* = 0$ which means that the optimal tax and subsidy are set so that everybody buys one of the goods. This result is in line with the economic theory on the provision of merit goods; what it is interesting to note is that in this context tax evasion in its classical meaning is simply not possible. The burden of providing the merit good to consumers that ask for the low quality good cannot be shifted. The only effect tax evasion might have is to reduce the number of users of the lower quality service by making it more convenient for the marginal consumer to shift to the higher quality consumption. In this case, public expediture and the tax burden would shrink and we might have an improvement to welfare through tax evasion as in DMW. To check whether this effect exists and if it is welfare improving, let's first examine the decision of the firm to evade.

As in DMW, we assume that the final consumer benefits from tax evasion through a reduction in the price of the good he buys. Tax evasion is possible, but there is a probability π of being caught. In this case, the firm should pay a fine f proportional to the cost of production. Firms are assumed to be risk neutral; this means that they evade if

$$
\pi f W_H < t_H W_H,
$$

which can be written as

$$
f < \frac{t_H}{\pi}.
$$

Accordingly, in order to avoid tax evasion, Central Government should set f such that $f \geqq \frac{t_H}{\pi}$. In DMW the implicit assumption is that Central Government chooses to set f to a level that allows tax evasion. In this way the effective tax rate paid in the two sectors is different and welfare improves. Does this result hold in the presence of a merit good? Our answer is no. To show this, let's assume, as in DMW, that Central Government foresees that the firms in the private sector may evade if the fine and the probability of being caught are suitably chosen. If such an instrument were welfare improving, we should expect the Government to allow tax evasion. We introduce this assumption in our model and determine Central Government optimal policy. When evasion is taken into account, the price of the high quality good could be either W_H when the firm evades, or $W_H(1+f)$ when the firm evades and is caught. Accordingly, the expected price for good with quality θ_H will be

$$P_H = (1-\pi)W_H + \pi f W_H = W_H(1+\pi f),$$

and the budget constraint for the Government becomes

$$(1-\rho)\int_{\alpha_L}^{\alpha_H} P_L h(\alpha)\,d\alpha = \int_{\alpha_H}^{1} \pi f W_H h(\alpha)\,d\alpha$$

while the objective function is

$$\max_{f,\rho}\int_{\alpha_L}^{\alpha_H}(\alpha v_L - \rho P_L)\,h(\alpha)\,d\alpha + \int_{\alpha_H}^{1}(\alpha v_H - P_H)\,h(\alpha)\,d\alpha.$$

The new problem and constraint have the same structure as Problem (3) and constraint (2) once $f\pi$ is substituted by t_H. Accordingly, the solution is

$$\rho^* = \max\left(1-\frac{v_L(v_H-v_L)}{W_L}(1-H_H)\frac{(1-H_H)(1-G_L)-(1-G_H)(1-H_L)}{h_L(v_H-v_L)(1-G_H)(1-H_H)+h_H v_L(1-G_L)(1-H_L)};0\right)$$

$$f^* = \frac{t_H^*}{\pi}.$$

Thus, Central Government sets the fine at the lowest level not allowing tax evasion. This means that in the presence of a merit good it is not optimal to artificially decrease the price of the good produced in the private sector through tax evasion. In this system tax evasion might of course still exist if, as it is plausible to assume, Central Goverment is not able to observe the technology of production and the exact cost of production.[8] If this is the case, there will be tax evasion in equilibrium, but at the cost of decreasing total welfare. This means that even in this very simple model where the costs of tax evasion in terms of controls and marginal cost of public funds (Levaggi, 2007) are not considered, tax evasion is not welfare improving. Thus, tax evasion is not always an optimal tax device, something that has been pointed out also by Davidson, Martin and Wilson (2006) themselves. We belive that the article proposed by the authors is a good starting point for studying the problem from a different perspective, in ways that the literature has not explored so far, but the models should also take account of the nature of some of the goods that form public expenditure and for whose provision taxation is widely used.

References

[1] Davidson C., L. Martin and J.D. Wilson, 2005, Tax evasion as an optimal tax device, Economics Letters, **86**, 285-9

[8] For example, if the fine is levied, as in DMW, on the total assets of the firm, the value of capital might not be observed with precision.

[2] Davidson C., L. Martin and J.D. Wilson, 2007, Efficient black markets, J*ournal of Public Economics,***91**(7-8), 1575-1590

[3] Levaggi R., 2007, Tax Evasion and the Cost of Public Sector Activities, *Public Finance Review*,**35**, 572-585

[4] Musgrave, R. (1987). "Merit goods" *The New Palgrave: A Dictionary of Economics*, 3, pp. 452-53.

[5] Musgrave, R. and P.B. Musgrave (1973). *Public Finance in Theory and Practice*, pp. 80-81.

Appendix: Demonstration of Proposition 1

Given Problem (1) and the constraint (2), we can write the Lagrangean using the function H defined in (3) as follows

$$\mathcal{L} = \int_{\alpha_L}^{\alpha_H} (\alpha v_L - \rho P_L)\,\omega(\alpha)\,h(\alpha)\,d\alpha + \int_{\alpha_H}^{1} (\alpha v_H - P_H)\,\omega(\alpha)\,h(\alpha)\,d\alpha \quad (3)$$

$$+\lambda\left((1-\rho)\int_{\alpha_L}^{\alpha_H} P_L h(\alpha)\,d\alpha - \int_{\alpha_H}^{1} t_H W_H h(\alpha)\,d\alpha\right) \quad (4)$$

$0 \leq \rho \leq 1$

where: λ is the Lagrangean multiplier. The system of the first derivatives of $\mathcal{L}$ with respect to t_H, ρ, and λ is

$$\frac{\partial\mathcal{L}}{\partial\rho} = W_L\lambda\frac{W_L(1-\rho)(-h_H v_L - h_L v_H + h_L v_L) - W_H t_H h_H v_L}{(v_H - v_L)v_L} - ((G_H - G_L) + \lambda(H_H - H_L))\,W_L$$

$$\frac{\partial\mathcal{L}}{\partial t_H} = W_H\lambda\frac{W_L h_H(1-\rho) + W_H t_H h_H}{v_H - v_L} - ((1 - G_H) + \lambda(1 - H_H))\,W_H$$

$$\frac{\partial\mathcal{L}}{\partial\lambda} = (1-\rho)\,W_L H_H - H_L - t_H W_H\,(1 - H_H)$$

where $H_H \equiv H(\alpha_H)$, $H_L \equiv H(\alpha_L)$, $h_H \equiv h(\alpha_H)$, $h_L \equiv h(\alpha_L)\,; G_H \equiv H(\alpha_H)\,\Omega(\alpha_H)$, $G_L \equiv H(\alpha_L)\,\Omega(\alpha_L)$, $g_H \equiv h(\alpha_H)\,\omega(\alpha_H)$, and $g_L \equiv h(\alpha_L)\,\omega(\alpha_L)$

The second and the third derivatives can be equalised to zero since the budget is binding; the first one has to be solved using Khun Tucker Conditions. If $0 < \rho < 1$, the three equations can be solved as equalities and the solution can be written as:

$$\rho^* = 1 - \frac{v_L(v_H - v_L)}{W_L}(1 - H_H)\frac{(1-H_H)(G_H - G_L) - (1 - G_H)(H_H - H_L)}{h_L(v_H - v_L)(1 - G_H)(1 - H_H) + h_H v_L(1 - G_L)(1 - H_L)}$$

$$t_H^* = v_L(v_H - v_L)\frac{(1-H_H)(G_H - G_L) - (1 - G_H)(H_H - H_L)}{h_L(v_H - v_L)(1 - H_H)^2 + h_H v_L(1 - G_L)(1 - H_L)}\frac{H_H - H_L}{W_H}$$

The distribution $\omega(\alpha)$ determines whether the Khun Tucker conditions are binding.Let us consider two extreme cases. If Central Government is not interested in redistribution $\omega(\alpha) = 1$, i.e. weights are uniform. In this case $G_i = H_i$ and $\rho^* = 1$ as expected. The other extreme is to assign all the weight to the individual with the lowest preference for the merit good ($\alpha = 0$) using Dirac's Δ distribution to represent the weights[9]. In this case the optimal unconstrained ρ would be equal to -∞. The Khun Tucker condition is binding and $\rho = 0$.In general, the value of ρ depends on the combined effect of the distribution of the population and the function representing the weighs. To give a flavour of the result, we present a numerical example based on the following assumptions: a uniform distribution for the population ($h(\alpha) = 1$); a linear distribution for the weights $\varpi(\alpha) = \left(1 + \frac{b}{2}\right) - \frac{b}{2}\alpha$; $v_L = 4$; $v_H = 5$; $W_L = .7$; $W_H = 1$

The relative weights given to individual with low income is determined by b. For $b = 0$, all the individuals are given the same weights, $b = 2$represents the maximum redistributive power of this function as shown in figure1

[9] See http://en.wikipedia.org/wiki/Dirac_delta_function for a definition of the function.

The optimal ρ for such example is presented in figure 2 ρ decreases the steeper the distribution of weights as expected.

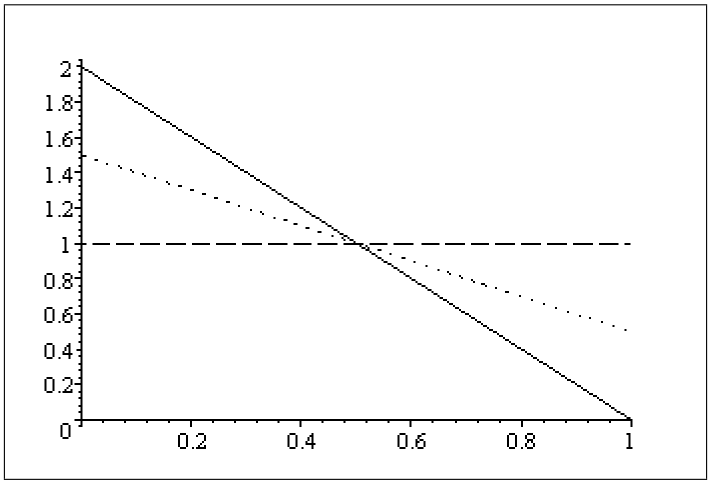

Figure 1: Value of weights $\varpi(\alpha)$ with b=0(dashed line); b=1(dotted line); b=2 (solid line)

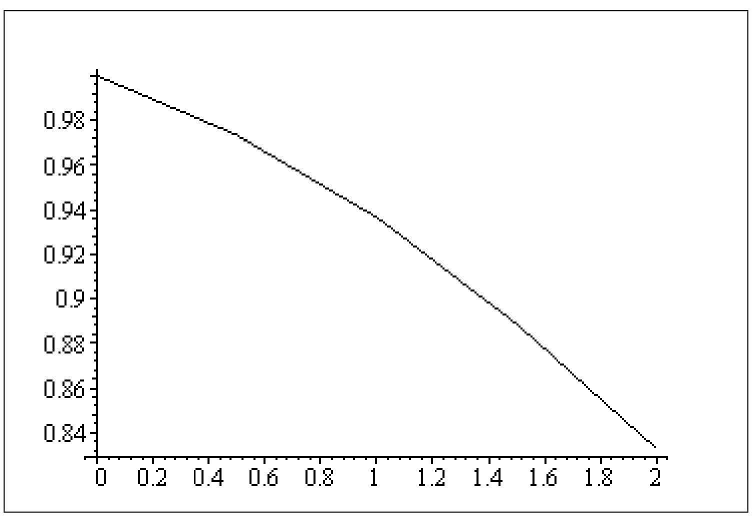

Figure 2: Value of ρ according to different values of b