SHOULD THE GOVERNMENT'S
ALLOCATION BRANCH BE CONCERNED
ABOUT THE DISTORTIONARY COST OF
TAXATION AND DISTRIBUTIVE EFFECTS?

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Should the Government's Allocation Branch Be Concerned About the Distortionary Cost of Taxation and Distributive Effects?

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Abstract

Does taxation for public goods generally involve a distortionary cost? Are Pigouvian taxes desirable because they raise revenue without having to resort to distortionary taxes? Should decisions concerning public goods or Pigouvian taxes depend on whether their incidence is regressive? The answer to these questions may be negative, contrary to conventional wisdom, if one considers a different and arguably more natural method of achieving budget balance than is typically assumed.

Much work in public finance is devoted to exploring the extent to which allocation decisions should be concerned with the distortionary cost of taxation and distributive effects. The prevailing view is that the government's allocation branch should take such effects into account, because of second-best considerations involved with raising revenue and redistribution. Thus, Pigou's (1947) analysis suggests that the Samuelson (1954) rule for public goods provision (equating the sum of individuals' marginal rates of substitution to the marginal rate of transformation) is not sufficiently restrictive because public goods must be financed with distortionary taxation, while subsequent literature explores important qualifications. Others argue that Pigouvian taxes produce an additional benefit (aside from correcting externalities) of raising revenue without a distortionary cost, while subsidies entail an additional cost. Finally, distributive effects are thought to be relevant in performing cost-benefit analysis and in assessing the desirability of corrective taxes and subsidies.

This article suggests that conventional wisdom depends in substantial part on an arbitrary assumption about how budget balance is achieved -- typically, by a proportional adjustment in the tax on labor income or in all existing taxes, *without regard to the distributive effects of what is being financed*. The analysis here explores the alternative assumption that taxes are adjusted to offset the distributive effects of decisions of the allocation branch. Under this assumption, a more appropriate benchmark for allocation decisions is an assessment of their efficiency, for there will be no additional distortionary cost of taxation or distributive effects.

As a simple illustration, suppose that a proposed park would provide each individual a benefit worth $100. To finance this park, each individual's taxes could be raised by the constant amount of $100 (rather than by increasing their income tax rates uniformly. Clearly, the combination of the new park and the tax increase will have no distributive effect. (Each does not affect distribution, and the two effects would be offsetting in any event.) Moreover, individuals' labor effort is unaffected, as there is no change in the marginal benefit of labor effort (and, by construction, any income effect from the tax will precisely offset that from providing the

public good). As a consequence, if the proposed park provides aggregate benefits in excess of its direct cost, the stipulated tax increase will produce a surplus. One could then provide a rebate that made all individuals better off.[1]

In order to show that the result in this example does not depend on the particular distribution of benefits, suppose instead that the public good is additional police protection, which has a value that is proportional to income -- say, the benefit is 2%. (The more goods one has to protect, the greater the value of public protection.) As a finance mechanism, choose a proportional income tax set at 2%, a rate that captures the full benefit of the public goods. It is obvious that the combination of more police protection and the proportional tax will have no distributive effect; indeed, because they are offsetting, each individual's welfare is unaffected. Moreover, an individual's marginal benefit from increasing labor effort is held constant (additional labor allows one to spend 2% less on goods due to the tax but the value of this lower expenditure is the same as before due to the 2% benefit from additional police protection); thus, there is no net effect on labor supply. Again, a Pareto improvement is possible if the unweighted total benefits exceeds the cost of the public good. In this case, the public good viewed in isolation has distributive effects and the tax change (which is of the type typically assumed in the literature) is distortionary. But here the tax adjustment is designed to be offsetting, so a proportional tax change is used only when benefits are also proportional. The result is that there are no *net* distributive or distortionary effects.

These examples suggest that one's assumption about the method of finance affects one's evaluation of government allocation decisions. For a number of

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[1] As a further example of contemporary interest, suppose that the government decided to provide free basic health care at a level most individuals would purchase in any event, financed by a uniform increase in the tax schedule. This would be equivalent to a requirement of compulsory purchase from the government. Thus, even if the government revenue requirement grew by hundreds of billions of dollars, there need not be any distortion involved in financing the reform. (Distortion might arise if benefits were provided to individuals who could not previously afford them, but this distortion would arise from redistribution rather than the health care itself: There would be the same distortion if cash were provided instead.)

reasons, the most natural assumption is that the tax system will be adjusted to offset the distributive effects. The assumption is most obviously correct if the pre-existing tax regime was designed to achieve the optimal trade-off between distribution and incentives. In addition, the assumption would be a good positive one to make if the pre-existing regime reflects the politically feasible trade-off between distribution and incentives.[2] But even when neither perspective seems justified, the assumption seems quite useful for policy analysis. Observe that any allocation decision not financed in the assumed manner can decomposed into two parts: implementing the decision using an offsetting tax adjustment, followed by a further, purely redistributive adjustment to the tax system. The latter adjustment poses a conventional problem of redistribution, in which distributive effects and incentives are traded off, and it can be assessed as such (without regard to what is being financed).[3] Moreover, it could be enacted or repealed independently of one's decision on the first component.

The first section examines public goods provision. After discussing the current understanding of the issues, it presents more fully the argument that the simple cost-benefit rule is appropriate even in the presence of distortionary taxation and taking into account distributive effects of public goods. The section continues by commenting on the existing literature and offering qualifications.

The next section explains how similar considerations are relevant when analyzing Pigouvian taxes and subsidies. In this context, the analysis suggests that Pigouvian taxes have no special ability to raise revenue without distorting behavior (and, similarly, corrective subsidies are not to be disfavored because of the revenue required to finance them). Moreover, distributive effects of Pigouvian taxes, such as the possible regressivity of fuel taxes and sin taxes, would be irrelevant in evaluating them.[4]

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[2] Tax and expenditure reforms are often packaged in a manner designed to be distributively neutral.

[3] From this perspective, much analysis of excess burden or the marginal cost of funds in prior literature would be directly relevant to redistribution but not to the provision of public goods. (Of course, redistribution may itself be a public good to some extent; it will nonetheless distort behavior.)

Public Goods

Prevailing views

Musgrave (1959) suggested that distinguishing the allocation and distribution functions of government provides a useful taxonomy. The allocation branch of government performs such functions as determining the mix of public goods to provide and regulating externalities by setting Pigouvian taxes and subsidies. The distribution branch sets taxes in a manner designed to achieve an appropriate distribution of income, taking into account the distortionary costs of taxation. If allocative decisions were made independently of such concerns for distortion and distribution, the Samuelson (1954) (unweighted cost-benefit) rule would indicate the appropriate level and mix of public goods.

Such an approach, however, generally is rejected on the ground that we find ourselves in a second-best world. In particular, revenue-raising and redistribution are costly, because taxation that is sensitive to distribution distorts behavior -- notably, the labor-leisure choice. (While uniform lump-sum taxes are feasible, individualized lump-sum taxes that could raise any specified amount of revenue while achieving any desired distribution of income are not.) This is the view presented, for example, in Drèze and Stern (1987) and Oakland's (1987) Handbook surveys of the theories of cost-benefit analysis and public goods. Taking distortion and distribution into account has an important effect on the way allocation decisions have come to be analyzed.

Following Pigou (1947), the optimal provision of public goods is understood to depend on the distortionary effect of taxation. Thus, an expenditure producing benefits slightly in excess of its costs (say a ratio of 1.10) would be undesirable if taxation had a sufficiently high marginal excess burden (say, .25 per dollar of revenue raised). To be sure, important

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[4] It also follows that distributive effects would not play a role in assessing the desirability of legal rules that regulate harm-causing behavior. See Shavell (1981). (Legal rules enforced by private suits are like Pigouvian taxes where the victim receives the proceeds, while rules that stipulate fines owed to a public authority are tantamount to the tax enforcement mechanism for a Pigouvian tax.)

qualifications have been offered. Atkinson and Stern (1974), Stiglitz and Dasgupta (1971), and Diamond and Mirrlees (1971) demonstrate that taxation has a revenue effect as well as a distortionary effect and that the supply of public goods may affect tax revenue. The former factor is emphasized by Ballard and Fullerton (1992), Fullerton (1991), and Mayshar (1990) in clarifying measures of the marginal welfare cost of taxation and emphasizing that the use of distortionary taxation does not necessarily imply that the marginal cost of funds for public projects exceeds one. (The basic point is that the substitution effect of raising the tax on labor income reduces revenue but the income effect enhances revenue; if the income effect is dominant, it will take less than a dollar of "direct" tax increase to raise a dollar to fund public goods.) The latter factor has received less attention.[5] It should be emphasized, however, that this subsequent work does not question the view that, presumptively, one should qualify the Samuelson rule in a second-best world.

While most of the literature on public goods provision emphasizes the distortionary cost of taxation, it is also generally believed that allocation decisions need to take into account distributive effects. Thus, following Weisbrod (1968), many favor using distributional weights in performing cost-benefit analysis. See, for example, Drèze and Stern's (1987) Handbook discussion. (Interestingly, discussions of the distortionary cost of public goods provision and of distributive effects are not usually combined. As will become apparent below, separate discussion can be misleading, because distortionary costs and distributive benefits are typically in direct opposition.)

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[5] In particular, much analysis of distortionary taxation has assumed that public goods enter utility in an additively separable manner, in which case the provision of public goods does not affect revenue directly. See, e.g., Ballard, Shoven, and Whalley (1985), Stewart (1984). This assumption may be implicit, as when utility is stated to be a function of leisure and goods, but not public goods or government revenue, while a positive revenue requirement is imposed on the problem. Browning (1993) uses the same assumption when analyzing subsidies justified by the existence of positive externalities. Browning (1987) and Wildasin (1984) emphasize the revenue effect of public goods. Some of the limitations imposed by assuming separability are analyzed in Ahmed and Croushore (1993).

What often is not apparent is that the prevailing view is based on a particular assumption about how the tax system is adjusted to achieve budget balance: usually, by stipulating a proportional adjustment to the tax on labor income or to the entire tax system. Thus, for the typical public good, the distortionary cost is determined by measuring the marginal distortion caused by the labor income tax or the entire tax system.[6] In contrast, when others discuss how distributive effects of public goods should be accounted for, there generally is no reference made to the distributive effects of the taxes used to finance the project.[7]

This article makes an alternative assumption: that the tax system is adjusted to offset distributive effects. The offsetting adjustment to the pre-existing income tax is defined as one that simply extracts the benefit of the public good from each individual -- i.e., it equals an individual's marginal rate of substitution.[8] In this case, if a public good provided a benefit of equal value to all individuals, taxes would be increased by an equal amount for everyone, as illustrated in the introduction. If a public good has a regressive incidence, budget balance would be obtained by a progressive adjustment in income tax rates, so that the rich, who benefit more from the public good, would bear correspondingly more of the tax increase.

When budget balance is achieved with offsetting tax adjustments, the results differ substantially from those in the literature. The reason is that the use of an offsetting tax to finance public goods eliminates both the distortionary cost of taxation and distributive effects, making the Samuelson rule -- the simple cost-benefit rule -- an appropriate benchmark.

The argument, implicit in the introduction's examples, is as follows. First, since each individual's benefit from the public good just equals the

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[6] See, for example, the articles cited in note 5.

[7] See, for example, Drèze and Stern (1987).

[8] Here, as in other work on the subject, individuals are implicitly assumed to differ only in their ability. The case of heterogeneous preferences is addressed below.

additional tax he pays, the direct effect of the public good combined with such a tax is to leave everyone as well off as before. Obviously, there will be no distributive effects. Second, such a tax will produce a budget surplus whenever the sum of individuals' benefits exceeds the cost of the project. Rebating this surplus uniformly would produce a Pareto improvement.[9]

This does not complete the argument, however, because providing the public good and changing individuals' tax rates may change labor effort, and this change in behavior may, in turn, affect revenue.[10] Indeed, such effects have been the focus of the public goods provision literature over the past two decades.

It can be demonstrated, however, that individuals' behavior does not change when the tax adjustment is offsetting, if one assumes that individuals' utility is weakly separable in the disutility of labor.[11] (More on this caveat below.) The reason is that, *for any level of before-tax income one might earn*, the offsetting tax leaves individuals with the same utility from the combination of private and public goods. In particular, there is more utility from public goods and less from private goods. The offsetting tax is constructed so that the reduction in expenditures on private goods for a given level of before-tax income produces a reduction in utility just equal to the increase in utility from the public goods. Thus, any chosen level of labor effort will produce precisely the same utility with public goods and the offsetting tax adjustment as it produced without them. Because the utility-

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[9] More precisely, one can uniformly decrease the tax schedule slightly until one reaches the point at which the budget balances. As one rebates the surplus, there will be effects on behavior (an income effect). But as long as changes in labor effort are continuous (except perhaps for a set of individuals having measure zero), there will exist a modification that involves a positive rebate to everyone while balancing the budget.

[10] The change in behavior may also be seen as affecting individuals' utility directly. Such changes could, of course, only increase utility. At the margin, however, there is no effect (by the envelope theorem).

[11] That is, individuals have utility functions $U(v(c,g),\ell)$, where c is consumption, g the level of the public good, and ℓ labor effort. To prove the argument that follows (a more complete statement appears in the appendix), begin by observing that $dv/dg = v_c c_g + v_g$. The amount of the offsetting tax is given by an individual's marginal rate of substitution, so $c_g = -v_g/v_c$. Therefore, $dv/dg = 0$. As a result, regardless of an individual's ability level, his choice of ℓ will be unaffected.

opportunity set is unaffected, individuals' choice of labor remains the same.[12]

In summary, the result is that when public goods are financed with offsetting taxes, there are no distortionary or distributive effects. The reason is that the public goods and offsetting taxes may each produce their own distortionary and distributive effects, but the effects of the offsetting taxes precisely offset the effects of providing the public goods. Thus, the simple cost-benefit rule is an appropriate benchmark, even in a second-best world, if budget balance is achieved with offsetting taxes.

Discussion

The point about offsetting taxes is in essence that made by Hylland and Zeckhauser (1979) in an important (but surprisingly overlooked) article demonstrating that distributional objectives should not affect program choice in cost-benefit analysis.[13] The analysis is generalized and extended in Christiansen (1981) and Boadway and Keen (1993), who investigate public goods provision in the presence of optimal nonlinear income taxes.[14] The argument in the present article incorporates these subsequent generalizations to

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[12] See note 11. The argument in the text shows that when benefits exceed costs, there exists a potential Pareto improvement. (And similarly, if benefits are less than costs, one can improve welfare by reducing public goods and reducing taxes in an offsetting manner.) Consider briefly the converse. When the sum of individuals' marginal rates of substitution is less than one, can there exist some method of financing the public good (other than an offsetting tax) that would increase welfare? The work of Christiansen (1981) and Boadway and Keen (1993) shows that this is not the case in the presence of an optimal nonlinear income tax. (The intuition is that, in such an instance, any small adjustment to the tax system -- including an offsetting tax -- to raise or rebate a given amount of revenue will have the same welfare cost.) But if the prevailing tax regime were not optimal, it would be possible to increase the level of public goods and improve welfare even when the program was otherwise undesirable if the adjustment to the tax system moved it sufficiently closer to the optimal system. But any such benefit is more naturally attributed to the tax reform itself rather than to providing more of the public good.

[13] The idea is also used by Shavell (1981) to show that distributional objectives should not affect the choice of legal rules regulating activity that produces externalities.

[14] Mirrlees (1976) briefly analyzes public goods provision with optimal nonlinear income taxation. There also has been work restricting attention to linear taxation. See, e.g., King (1986), Wilson (1991).

Hylland and Zeckhauser, but does not depend on the assumption that the initial tax system is optimal.

These prior investigations have not been considered in, much less integrated into, the extensive literature on public goods provision. This literature, as noted previously, assumes that stipulated tax changes provide the marginal revenue source, regardless of the incidence of the contemplated government action. In addition, the distortionary effects of taxation are emphasized while distributive effects are ignored.[15] It should now be apparent that the results of this literature provide an incomplete and potentially misleading account of the problem of providing public goods.

To further illustrate the differences, consider the simple case in which public goods substitute for private consumption. The prior literature on public goods provision suggests that such an assumption would produce the Pigouvian result that public goods provision is distortionary. For example, Ballard and Fullerton (1992) explain that, in such a case, the income effects of the tax (which raises labor supply and thus produces a positive revenue effect) would be fully offset by the opposing income effects of the public good, leaving only the substitution effect of the tax, which entails distortion. But if an offsetting tax is used to finance the good, whatever substitution effect is caused by the tax will be precisely offset by that caused by the public good.

The standard distortionary effect identified in the literature thus arises because, in essence, it is implicitly assumed that the finance mechanism (say, a proportional income tax) will have a more progressive incidence than the benefits of the public good (taken to be uniform).[16] I have already questioned whether this is the most appropriate assumption about project

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[15] See, e.g., Auerbach (1985), Ballard and Fullerton (1992).

[16] Ballard's (1991) survey identifies consensus on the view that if a project is a close substitute for cash, the marginal cost of funds for labor taxes or lump-sum taxes will be higher than for a project producing separable benefits. He further suggests that an evaluator needs to know the marginal cost of funds and the (non-tax) costs and benefits of the project. The marginal cost of funds is understood to be independent of the particular project, implying that there is some given tax source (such as a proportional increase in all taxes).

finance. But if this assumption is to be made, the distributional benefit of the more progressive tax/expenditure system should be included in the final account, rather than ignored. After all, the motivation for using income taxation, rather than relying on uniform lump-sum taxes that would not distort behavior, is the difference in distribution that results.

Consider now another simple case, in which public goods produce additively separable benefits -- the most common assumption in the literature.[17] Because the benefits of the project are then identical for each individual, it is natural to ask why a (uniform) lump-sum tax is not appropriate. While feasible, such taxation is usually opposed on distributive grounds. But since the benefits of the project financed by the tax are the same for everyone, it may not appear that there is a distributive objection.

Such a view, however, is incomplete. The lump-sum tax is paid in income, which is subject to diminishing marginal utility. But when utility is additively separable in the consumption of private and public goods, expenditures on public goods do not augment effective income in an offsetting manner. Thus, the utility cost of the uniform tax to the poor exceeds that to the rich, while they receive the same utility benefit from the public good. This may appear to restore the conventional story: Greater expenditure on public goods raises the revenue requirement, requiring higher distortionary taxes. Indeed, the literature on optimal income taxation indicates how a higher revenue requirement reduces the degree of redistribution that is optimal.

This is not a sufficient reason, however, to deviate from the Samuelson rule, which depends on individuals' marginal rates of substitution. The rich,

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[17] See note 5. One suspects that, for many public goods, the truth may lie between the separable case commonly analyzed in the public goods provision literature and the perfect substitution case, particularly since many governmentally provided goods are not "public goods" as economists describe them: Public health care substitutes for private insurance expenditures and medical outlays; repair of roads reduces costs of automobile repair; greater police protection reduces spending on private security measures; more and better parks reduce expenditures on yards and swing sets; expanded extracurricular activities in public schools reduces similar private expenditures. See Ahmed and Croushore (1993), Aschauer (1985), Browning (1987).

after all, have a higher marginal rate of substitution for a project producing uniform, separable benefits: higher income reduces the marginal utility of income, which implies a higher ratio of the marginal utility of the public good to that of private goods. Thus, the offsetting tax on the rich will be higher, taking this distributive effect into account. But, combined with the public good, this offsetting tax will not be distortionary, for the reasons described previously. (Also note that, the greater the revenue requirement -- i.e., the more is already expended for other public goods -- the lower will be individuals' after-tax income and thus the higher will be their marginal utility of income. As a result, the sum of their marginal rates of substitution for an additional project will be lower, so the Samuelson rule implicitly accounts for the magnitude of the revenue requirement.)

Qualifications

When, then, is it appropriate to deviate from the conventional cost-benefit rule? Some relevant qualifications are noted here. (The conclusion adds the caveat that individual and government actors may not behave in the manner assumed here.)

Utility interactions between labor effort and goods. The simple cost-benefit rule should be adjusted when private or public goods are a substitute for or complement with leisure.[18] (This is the possibility ruled out above by assuming weak separability of the utility function.) This caveat corresponds to the demonstration in Atkinson and Stiglitz (1976) that optimal commodity taxes are zero in the presence of an optimal nonlinear income tax except to the extent that commodities are substitutes for or complements with leisure.[19]

Variation in incidence within income classes.[20] A further qualification

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[18] See Boadway and Keen (1993), Christiansen (1981). While their analysis assumes that optimal nonlinear income taxation is employed, the preceding discussion indicates that this assumption is unnecessary for present purposes.

[19] Another qualification arises when individuals' tastes vary in a manner related to their unobservable ability. In that instance, public goods preferred more by the less (more) able would be more (less) desirable than otherwise. Mirrlees (1976). (For example, if higher ability increases appreciation for sophisticated art, the optimal subsidy for lowbrow art would exceed that for highbrow art.)

arises when the benefits of public goods vary within income classes due to differences in tastes or opportunities.[21] To the extent such differences were observable, one could adopt taxes that take this into account. For example, if a project will benefit a particular region, the corresponding adjustment to the income tax could apply solely to that region.

Suppose, however, that the underlying differences were unobservable.[22] The problem might then be viewed as one involving horizontal inequity: unequal treatment of individuals with equal incomes. As is suggested in Kaplow (1989, 1993), however, it is more useful to view this as a problem of vertical equity or, from an appropriate ex ante perspective, as equivalent to one involving the imposition of risk.[23] The measure of the cost at any income level is given by a risk premium, measuring the utility cost of being exposed to a gamble with payoffs equivalent to the resulting income levels. This is a real, distributive cost of the project. But no simple "weighting" of costs or benefits would measure this, because the problem is one of heterogeneity among individuals of the same income level. (For example, if a program benefits the poor at the expense of the rich, but differentially within each group, this dispersion would be a distributive cost. Any distributive benefit of the redistribution from the group of rich to the group of the poor could have been achieved using the income tax and produces the same distortion as if it were.)

In essence, the problem of heterogeneity may make it impossible to implement precisely offsetting taxes, because of the well known problem of determining particular individuals' preferences for public goods. With

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[20] Similar observations are made by Hylland and Zeckhauser (1979).

[21] For the case in which public goods produce separable benefits, there would be no need to take differences into account in a utilitarian framework, because an unequal distribution of benefits would not affect individuals' marginal utilities of income.

[22] The most important source of unobservable differences probably is variation in preferences rather than in opportunities. While a strict utilitarian would wish to account for this, others may argue that such heterogeneity should be ignored in setting government policy.

[23] The vertical equity comparison also is suggested in Atkinson's (1980) discussion of how measuring the inequality resulting from a reform can be misleading if one examines the post-reform averages for groups of pre-reform equals who are not treated equally by the reform.

perfectly offsetting taxes (equivalent to Lindahl pricing), there is "full compensation," so the cost-benefit criterion becomes the Pareto criterion. With unobservable heterogeneity, compensation is imperfect so there is "redistribution." But this redistribution is not of a conventional sort -- as in changing the progressivity of the overall tax/expenditure system. (To the extent it is of this sort, one can offset it completely by adjusting the income tax schedule.) Rather, any unavoidable redistribution is within income groups; more progressive finance cannot remedy this problem.

Summary. The assumption that public goods are financed by offsetting taxes (to the extent feasible) is not sufficient for optimal public goods decisions to be made without regard to the distortionary cost of taxation or distributive effects. But this hardly warrants adjustments of the sort suggested in the literature: namely, computing a marginal cost of funds that depends primarily on characteristics of the tax system in place (to account for distortionary effects) or using distributional weights in cost-benefit analysis. Rather, adjustments to the simple cost-benefit rule would depend on subtleties concerning how labor effort enters utility or on the extent of uncorrectable heterogeneity of benefits within income classes.

Pigouvian Taxes

Prevailing views

If one ignored budgetary consequences and distributive effects, it would be optimal to set Pigouvian taxes and subsidies to internalize externalities to the extent feasible. But second-best considerations have also been raised in this context. Thus, Pigouvian taxes are seen as raising revenue without distorting behavior (indeed, in the process of correcting behavior). When raising revenue is otherwise costly because of the distortionary costs of general taxation, this is viewed as an added benefit.[24] Similarly, subsidies are disfavored because they raise the revenue requirement.[25] In addition,

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[24] See, e.g., Ballard and Medema (1993); Cordes, Nicholson, and Sammartino (1990).

[25] See Browning (1993), Ng (1980).

corrective taxes are sometimes opposed because they are regressive.[26]

Offsetting taxes

Studies examining Pigouvian taxes and subsidies make similar assumptions
to those on public goods concerning how budget balance is to be achieved.[27]
But if one instead assumes that the tax adjustment will be offsetting, affects
on the revenue requirement and distribution disappear.

Consider, for example, a gasoline tax. For simplicity, suppose further
that the demand for gasoline is proportional to income. Then the gasoline
tax, in addition to reducing gasoline use, would have an effect on labor
supply equivalent to that of a proportional income tax. Thus, a gasoline tax
would not succeed in raising revenue without distorting the labor-leisure
choice. An offsetting tax adjustment would entail an equal-proportionate
reduction in the income tax, which would have an effect on labor supply
precisely opposite to that of the gasoline tax.

Now, suppose that the gasoline tax is regressive. Then, it would raise
revenue in a manner that distorts behavior less than would a proportional
income tax. Thus, one would seem to have a distributive cost as well as a
benefit of reducing distortion. (This illustrates the sense in which analyses
of public goods and Pigouvian taxes that focus solely on distortion or solely
on distribution may be misleading.) Here, finance by an offsetting tax would
involve adjusting the income tax schedule to raise less revenue, and in a
somewhat more progressive manner. The net effect of the gasoline tax and the
adjustment to the income tax would be to raise the same revenue with the same
distributive effect and the same labor-leisure distortion as existed
previously.

Under either assumption about incidence, the desirability of the gasoline
tax in reducing fuel consumption would be the only relevant basis for

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[26] Such opposition motivates much analysis of the incidence of energy taxes
and is often given as a basis for assessing whether such taxes should be
implemented. See, e.g., Casler and Rafiqui (1993). That the degree of
regressivity would affect the labor-leisure distortion is not noted.

[27] See, e.g., Ballard and Medema (1993), Ng (1980).

evaluating the tax, if budget balance is achieved with an offsetting tax
adjustment. If the change in incidence were believed to be desirable in light
of both the distributive and distortionary effects, this change could be
accomplished independently of adopting a gasoline tax, by adjusting the income
tax.

It should be apparent that the basic approach here is analytically similar
to that offered in the case of public goods provision, although the details
differ somewhat. There, the offsetting tax adjustment was designed to offset
the benefits of the public good. Here, the offsetting tax adjustments are
designed in significant part to offset the Pigouvian tax payments (or subsidy
receipts).

First, one can achieve revenue neutrality with a proportionate adjustment
in the income tax. For example, if a Pigouvian tax is to be levied on a
single good, one can reduce the income tax in an amount that restores budget
balance.[28] But since the consumption of various goods may depend on income,
revenue neutrality for the government does not imply neutrality for
individuals of all income levels: the incidence may, for example, be
regressive. At this point, one can make a second adjustment to the income tax
schedule to provide distribution neutrality as well as revenue neutrality.
This second adjustment for any given income level would simply equal the
difference between the additional payments on the good subject to the
Pigouvian tax and the reduction in income tax payments on account of the first
adjustment.

If a Pigouvian corrective scheme is implemented in this manner, it thus
will be revenue and distribution neutral with regard to the taxes and
subsidies themselves. Correction of the externality may, however, have its
own effects. Any distributive effects can be nullified by a further tax
adjustment, as described in the discussion of public goods. Moreover, such a

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[28] This is equivalent to a uniform reduction in the tax on all goods, which
preserves the differential effect on goods created by the original Pigouvian
tax.

tax adjustment will, in the simple case, neutralize any effect that reducing the externality would have on labor effort.

Thus, after making all the necessary adjustments to construct the offsetting tax, the only remaining effect of the Pigouvian tax will be on the relative consumption of the goods. Thus, as a benchmark, the optimal scheme would be one that fully internalizes the externality. Of course, there remain the qualifications noted in the discussion of public goods, when the external harm is not separable from leisure in the utility function and when there is unobservable heterogeneity.

Discussion

The analysis suggests, first, that there is no benefit from Pigouvian taxation of being able to raise revenue without distorting the labor-leisure decision. Any revenue thus gained could be gained by an equivalent adjustment in the income tax schedule. If this change in the income tax distorts labor effort (as it plausibly would in cases of interest), so does the Pigouvian tax -- to precisely the same extent. If the Pigouvian tax did not distort labor effort, it must be that there exists an equivalent revenue-raising change in the income tax -- which could be adopted independently of whether a corrective subsidy-tax was implemented -- that would not either.

The logic also applies to a subsidy for the case of a positive externality, casting into doubt arguments like those in Browning (1993) and Ng (1980) calling for reduced subsidies or no subsidies due to the distortionary cost of raising revenue.[29] Both authors take the form of taxation as given.[30] Suppose (as in their models) that individuals have identical utility functions and thus purchase amounts of the good that depend on its consumer price and income. Then the subsidy would affect individuals' income and marginal

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[29] The same point applies to Ballard and Medema's (1993) argument that Pigouvian taxes, which raise revenue, are superior to subsidies, which reduce revenue, when the tax and subsidy schemes are designed to have equivalent effects on the externality.

[30] Browning stipulates the marginal welfare cost of an exogenously determined tax instrument. Ng assumes that finance is by a proportional income or uniform commodity tax.

utility. An adjustment to the income tax that precisely offset the incidence of the subsidy would have offsetting effects on distribution and the labor-leisure choice. The only residual effect, from the subsidy and the tax that finances it, would be the increase in demand for the good producing the positive externality. This suggests that the optimal level of the subsidy would fully account for the externality.

Second, the potential regressivity (progressivity) of a Pigouvian tax should not in principle be an argument against (for) it. If the Pigouvian tax is indeed regressive, this is equivalent to raising revenue through a regressive increase in the income tax. If one adopted the Pigouvian tax and simultaneously decreased the income tax by the corresponding amount, one could nullify the revenue and distributive effects of the Pigouvian tax. If one wanted the revenue, one could raise it (or some other amount) by whatever further adjustment in the income tax schedule was thought to be appropriate. Thus, one could counter the regressive effect of the Pigouvian tax with a progressive change in the income tax. While the latter would distort behavior more, the former would have raised revenue while distorting behavior less than if the incidence had been more favorable; these two effects are precisely offsetting.

The perspective on Pigouvian taxes offered here is related to Atkinson and Stiglitz's (1976) argument that it is not optimal to employ differential commodity taxes in the presence of an optimal nonlinear income tax (subject to the previously noted qualification concerning utility interactions between particular goods and leisure). To reinforce one's understanding of this idea, observe that taxing a commodity more will distort the labor-leisure choice because bundles of goods will be more expensive. One could raise the same revenue, with the same distributive incidence, by adjusting the nonlinear income tax, but without distorting individuals' choices among goods. Thus, while it is not generally correct simply to count distortions in a second-best world, it is correct in this instance because (absent a utility interaction between particular goods and leisure) there is no way that differential commodity taxes can reduce the distortion caused by the nonlinear income tax. To this one may add the point that the optimal price ratios consumers should

face include not only producers' costs but also external costs. Thus, the optimal Pigouvian taxes and subsidies will fully internalize externalities, even after one takes into account effects on revenue and distribution.

Conclusion

Public finance has become ever more sophisticated in taking into account the budgetary implications of government action, such as public goods provision and Pigouvian taxes and subsidies. This article suggests, however, that the results of much recent analysis may be misleading. While it is true that government action financed, say, by a proportional adjustment in the income tax will have the consequences that many authors have identified, these consequences are often, as a practical matter, separable from those directly attributable to the government action. Thus, if one favored the distributive consequences of such a tax adjustment, one could achieve them directly, without providing the public good or implementing the Pigouvian tax. And if one disfavored the distributive effect or objected to the distortionary consequences, one often could avoid them when providing the public good or implementing the Pigouvian tax, by using an offsetting tax adjustment of the sort described herein.

There is in all instances a caveat: the analysis assumes that the distributive effects of public projects and Pigouvian taxes will be perceived by individuals who react to them and government officials who set policy, just as it typically is assumed that the effects of the income tax will similarly be appreciated. This assumption seems to be a reasonable first approximation, at least in instances in which the effects are substantial, as are those of a government sector that consumes a quarter to a half of national product. The increasing use of distributional tables in assessing government policy in all areas and in packaging proposals (as in simultaneously adopting a gasoline tax believed to be regressive and making progressive adjustments to the income tax) suggests that the assumption is increasingly accurate in the case of some government decisions.

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Appendix

Individuals have utility functions $U(v(c,g),\ell)$, where c is consumption, g the level of the public good, and ℓ labor effort.[31] (This formulation involves the effect of labor effort on utility being weakly separable from the effects of consumption and the public good.) Individuals vary in their wage (ability) w. Each individual chooses ℓ to maximize $U(v(c,g),\ell)$ subject to the budget constraint

$$c = w\ell - T(w\ell),$$

where $T(\cdot)$ is the tax one pays as a function of the income one earns (which is all that the government observes). Tax revenue is expended on the public good.

It is now demonstrated that any change in g that produces positive net unweighted benefits -- i.e., for which the sum of individuals' marginal rates of substitution exceeds the cost -- can be financed in a manner that results in a Pareto improvement.[32] As suggested in note 11, begin by observing that

$$\frac{dv}{dg} = v_c c_g + v_g.$$

The value of c_g corresponds to the change in one's tax to finance the incremental change in the public good. With an offsetting tax, this is given by an individual's marginal rate of substitution, so $c_g = -v_g/v_c$. Therefore, $dv/dg = 0$. As a result, individuals' choices of ℓ will be unaffected. The reason is that, regardless of an individual's ability level, each choice of ℓ will be associated with the same total utility after the change in g -- financed by the stipulated change in $T(\cdot)$ -- as it was before the change.[33]

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[31] The proof does not require that all individuals have the same utility function, but only that the subutility functions $v(\cdot,\cdot)$ be the same for all individuals who earn a given level of income. Compare Boadway and Keen (1993).

[32] It should be apparent that this result includes the case of the public good of correcting an externality, where g would indicate the level of the externality. One could interpret c as a vector, an element of which involves an externality, and modify the budget constraint on the left side to include a price vector equal to the sum of the producer price vector and the Pigouvian tax or subsidy vector.

The marginal revenue from the tax adjustment is the sum of individuals'
marginal rates of substitution. If this sum exceeds the program cost (which,
at the margin, equals one), the net effect is to produce a budget surplus.
Finally, one can uniformly decrease the tax schedule slightly until one
reaches the point at which the budget balances.[34] Then, a marginal increase
in g financed by this modified tax schedule will increase the utility of all
individuals.

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[33] Equivalently, the derivative of the individual's first-order condition for
the choice of ℓ with respect to g, after substituting the marginal rate of
substitution for the tax change, can be shown to equal zero. (The only
qualification is that some individuals may have multiple optima. If one
assumes that they make the same choice independent of the regime or that such
individuals comprise a set of measure zero, the conclusion is unaffected.)

[34] As one rebates the surplus, there will be effects on behavior (an income
effect). But as long as changes in labor effort are continuous (except
perhaps for a set of individuals having measure zero -- see note 33), there
will exist a modification that involves a positive rebate to everyone while
balancing the budget.