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Abstract

Various economic literatures address the question whether first-best prescriptions for government policy require modification because redistributive income taxation distorts labor supply and cannot achieve the distributive ideal. Perhaps second-best rules for public goods provision, corrective taxation, public sector pricing, and other government activity should reflect concerns about distribution and labor supply distortion. Recent work demonstrates, however, that in basic cases first-best principles remain applicable. Demonstrations make use of income tax adjustments that preserve not only budget balance but also the pre-reform distribution of utility.

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Optimal policy analysis is complicated by problems of the second best. Two of the most important – nonideal distribution and labor supply distortion – are intimately connected with limitations of income taxation. In a first-best world, individualized lump-sum taxes can be used to achieve any desired distribution without causing distortion. Accordingly, the optimal design of other government policies is dictated by familiar first-best rules: the Samuelson cost-benefit test for public goods, the Pigouvian prescription for externalities to equate the full marginal social costs and benefits, marginal cost pricing for publicly provided goods and services and for regulated utilities, and so forth.

In practice, however, informational limitations require the use of distortionary instruments, notably labor income taxation, so even at the optimum (Mirrlees, 1971) the distributive ideal is not achieved. Due to the second-best nature of the optimal income taxation problem, it is natural to consider whether first-best prescriptions for other government policies should be modified in order to assist the redistributive function. In addition, such other policies – most obviously but not exclusively those that raise or expend revenue – may affect labor supply, which also may require modification of standard policy rules. Particularly since the explosion of interest in optimal taxation in the 1970's, extensive literatures have developed to address these issues in each particular context. Much work focuses on distortion, some on distribution, and a portion considers both simultaneously. A range of adjustments to first-best formulas have been proposed, revisions that in general depend on the initially prevailing income tax and on the modification thereof that is assumed to accompany the underlying policy reform.

Another strand of research offers a new view of the second-best problem in each of these areas and allows a substantial synthesis across these seemingly different contexts. To analyze these issues, this literature employs a construction under which the income tax modification hypothesized to accompanying any policy change is one that, in combination with the altered policy, holds the distribution of utility constant. In a simple, standard model, it turns out that first-best policy principles are applicable without refinements: There is no need for distributive adjustments since distribution is unaffected; and, as it happens, holding distribution constant also leaves labor supply unchanged, rendering unnecessary any adjustments on account of labor supply distortion.

The analysis of income taxation and optimal government policy is best introduced in the most fundamental setting, in which the only question is whether a labor income tax should be supplemented by differential commodity taxes. As will be elaborated in the first section below,

the answer is negative in simple cases regardless of whether the initial income tax is optimal, a result that in an important sense displaces principles of Ramsey taxation (and, as will subsequently be noted, other applications of Ramsey principles as well). The next section explains how a range of government policies – including public goods provision, regulation of externalities, and public sector pricing – are all formally analogous to differential commodity taxation. Hence, the results (and qualifications) can readily be extended, which allows for the understanding of second-best problems in these disparate fields to be unified substantially. Two final sections relate the analysis to classical and contemporary work and explore further implications of this approach for second-best policy analysis.

1. COMMODITY TAXATION.

The problem of optimal commodity taxation with labor income taxation can be stated as follows. Individuals choose commodity vectors $\boldsymbol{x}$ and labor effort l to maximize the utility function $u(v(\boldsymbol{x}), l)$, where v is a subutility function. This form of the utility function entails what is referred to as weak separability of labor: For a given level of after-income-tax income, individuals will allocate their disposable income among commodities in the same manner regardless of the level of labor effort required to earn that level of income.

An individual's budget constraint requires that expenditures, $\rho\boldsymbol{x}(wl)$, not exceed before-tax income, wl, minus income taxes, $T(wl)$, which can be negative, allowing for net transfers; ρ is the consumer price vector, w is an individual's wage, and $\boldsymbol{x}(wl)$ denotes the consumption vector chosen by an individual who earns wl. Individuals' wages w have density $f(w)$, and the government is assumed to know this density but not each individual's wage, which renders individualized lump-sum taxes infeasible. The consumer price vector ρ is understood as the sum of a producer price vector (taken to be constant and equal to production costs) and a vector of commodity taxes (which, if negative, are subsidies).

The government's maximization problem is to select commodity taxes (equivalently, ρ) and an income tax schedule $T(wl)$ to maximize a standard concave social welfare function, subject to meeting a given revenue requirement and to incentive compatibility constraints deriving from individuals' maximization problems. If commodity taxes are taken to be zero, we have the optimal nonlinear income tax problem of Mirrlees (1971).

Atkinson and Stiglitz (1976) demonstrated that, when the income tax is set optimally, commodity taxes should be undifferentiated in this basic setting. The derivation to follow is taken from Kaplow (2005), who does not require that the income tax be optimal and provides a more intuitively accessible approach.

For any commodity tax reform, which changes the consumer price vector from ρ to ρ^*, suppose that the income tax schedule is initially adjusted from $T(wl)$ to $T^\circ(wl)$ such that $V(\rho^*, T^\circ, wl) = V(\rho, T, wl)$ for all wl, where V is an indirect subutility function indicating the maximized value of $v(\boldsymbol{x})$, subject to the budget constraint, where ρ, T, and wl are taken as given. That is, one adjusts the income tax schedule to the $T^\circ(wl)$ that restores the original level of subutility achieved at each level of disposable income; hence, $T^\circ(wl) - T(wl)$ is the schedule of

utility-compensating changes in disposable income.

This income tax schedule adjustment has a number of properties. First, if individuals do not change their level of labor supply, they achieve the same utility, for u depends only on v (which is held fixed, given l) and l.

Second, faced with this income tax adjustment, individuals will not in fact change their level of labor supply: Each individual's (each type w's) total utility u for any choice of l after this combined reform of commodity taxes and the income tax precisely equals the total utility for that choice of l before the reform; therefore, whatever l previously maximized utility must continue to do so.

Third, the hypothetical reform will in general affect government revenue. Specifically, it can be shown that there will be a surplus if and only if the reform increases efficiency in the narrow sense – by reducing aggregate distortion among commodities – a condition that will prevail, for example, if all commodity taxes (and subsidies) are moved proportionally toward zero, including the case of complete abolition of differential commodity taxation. The reason is that reducing consumption distortion, ceteris paribus, raises individuals' utilities; because the income tax adjustment is set to hold utility constant, it must therefore reduce individuals' disposable income to offset what would otherwise be a utility increase. Accordingly, net tax collections must rise.

Finally, to complete the analysis, budget balance can be restored by further adjusting T to rebate the surplus pro rata: $T^*(wl) = T^\circ(wl) - c$, where c is some positive constant. The result is a Pareto improvement, for utility was unchanged until this final stage of the reform. To summarize, if any commodity tax reform is accompanied by an income tax adjustment that, when combined with the underlying reform, holds utility constant (until the rebate stage), there is no affect on distribution, labor supply is unchanged, and there is a surplus, allowing a Pareto improvement, if and only if the underlying commodity tax reform is efficient in a narrow, conventional sense.

It is useful to consider the intuition behind this result. It is familiar from the general theory of second-best analysis (Lipsey and Lancaster, 1956) that first-best conditions do not generally govern once some distortion is introduced. However, in the present setting, the only unavoidable distortion is of the labor-leisure choice, and differential commodity taxation does not help to alleviate it. Thus, differential taxes involve the cost of distorting consumption without any offsetting benefit. The reason that differential commodity taxes cannot help offset the labor-leisure distortion is the assumption of weak separability. Just as different levels of labor supply do not change preferences among commodities, so different consumption allocations do not change the disutility of labor.

This result on the inefficiency of differential commodity taxation provides an important benchmark for understanding and analysis. The conclusion is subject to many qualifications, each of which is best appreciated by reference to this basic starting point. First, as follows immediately from the preceding remarks, weak separability may be violated. This is the point,

first elaborated by Corlett and Hague (1953), that it tends to be efficient to tax leisure complements (perhaps beach attendance or reading) and subsidize complements to labor (possibly central city transit or amenities). Second, preferences were taken to be homogeneous, but if preferences depend on unobservable ability, it would be optimal to tax commodities preferred by the more able (independent of income per se), perhaps high-brow art, and to subsidize those preferred by the less able. Additional qualifications have been offered, including importantly concerns with administration and tax avoidance that may affect income taxation, especially in developing countries.

The foregoing analysis is usefully contrasted with that of Ramsey (1927) taxation, which involves a substantial, widely known literature that itself provides the foundation for much economic analysis of myriad other policy applications (including all those examined in the following section). Most familiar is the rule that commodity taxes should be inversely proportional to the elasticity of demand, with refinements for demand interdependencies. Also well known are modifications due to distributive concerns, which favor taxing luxuries and subsidizing necessities, commands that often conflict with the inverse elasticity rule and thus require tradeoffs (Feldstein, 1972; Diamond 1975). As initially emphasized in Atkinson and Stiglitz (1976), however, neither prescription is apt if there is an income tax. In the original Ramsey model in which all individuals are identical and thus there are no distributive concerns, the optimal tax is a uniform lump-sum extraction (a limiting case of an income tax), which, it should be noted, neither requires information about individuals' types nor is distributively objectionable in this setting. When differences in earning ability are admitted, the optimal tax is a nonlinear income tax, and in typical cases the lump-sum component involves a uniform lump-sum subsidy. Nevertheless, optimal commodity taxation still is not guided either by the familiar inverse-elasticity rule or by the general preference for harsher treatment of luxuries than of necessities; as noted, in the basic case, optimal differentiation is nil regardless of the demand elasticity or how demand changes with income.

Paradoxically, the literatures that build upon Ramsey's path-breaking contribution are motivated by second-best concerns, yet it turns out that a more complete second-best analysis – notably, incorporating the income tax, the primary distributive tool and also a central cause of unavoidable distortion that calls for second-best inquiry – returns us to a simple, first-best rule in the benchmark case. Here, that prescription is against differential commodity taxes on account of the resulting distortion of consumption. As will now be explained, this pattern of analysis is replicated with regard to a broad range of government policies.

2. GOVERNMENT POLICIES GENERALLY.

The foregoing framework can be employed to address the optimal provision of public goods, the optimal control of externalities, and other government actions, as developed by Kaplow (1996, 2004). The reason is that departures from first-best rules in these contexts are formally analogous to differential commodity taxation and hence are inefficient in the basic case (a conclusion that also is subject to similar qualifications).

To see this, suppose now that individuals have the utility function $u(v(\boldsymbol{x}, \boldsymbol{e}, \boldsymbol{g}), l)$. Here, $\boldsymbol{e}$

is a vector of externalities (suppose for example that each element of $\boldsymbol{e}$ is the population's total consumption of the corresponding commodity in the vector $\boldsymbol{x}$), and $\boldsymbol{g}$ is a vector of public goods. This functional form maintains the assumption that labor is weakly separable from other sources of individuals' utility.

We can again consider reforms, here of commodity taxes (and subsidies) ρ, but now with the thought of internalizing externalities, or of $\boldsymbol{g}$. Again, we can construct $T^{\circ}(wl)$ such that individuals' subutility v is kept constant if they choose to supply the same level of labor. As before, this reform is distribution neutral and in fact induces all individuals to supply the same labor effort. (A review of the foregoing analysis will confirm that nothing depended on the fact that the reform was only of commodity taxes or that there were no externalities or public goods involved.)

The question, then, is whether the intermediate adjustment of the income tax schedule, from $T(wl)$ to $T^{\circ}(wl)$, will produce a surplus or a deficit. With externalities, if one for example sets all commodity taxes equal to the marginal external effect of consumption on individuals' utilities – the traditional Pigouvian (1920) prescription – there will be a surplus: Individuals may be better or worse off because of being subject to a different vector of commodity prices, and they may be better or worse off on account of changes in the levels of externalities; however, it can be demonstrated that the net effect on revenue is positive, essentially because of traditional efficiency considerations. (Note that the income tax adjustment from $T(wl)$ to $T^{\circ}(wl)$ taxes away all sources of surplus and compensates for any disutility; hence, the sign of the net revenue effect is given by the sign of the total of all changes in individuals' surplus from the underlying reform.) Observe that this result is very similar in spirit to that on commodity taxation without externalities. There, the optimum involves setting consumer prices equal to true marginal resource costs of commodities; with externalities, the same principle holds, but true resource costs now include not only production costs but also effects on others' utilities.

For public goods, the total revenue effect has two components: The first (which is negative) is the production cost of the public goods, and the second is (by the method of construction of $T^{\circ}(wl)$) the integral of individuals' surplus from changes in the levels of the public goods. Hence, there is a surplus (deficit) if and only if the reform passes (fails) the Samuelson (1954) cost-benefit test, which asks whether the integral of individuals' benefits exceeds the cost of producing the public goods. The essence of the argument is again similar to that for the basic case with commodity taxation. For example, supplying less of a public good than dictated by the Samuelson test corresponds to imposing a differential tax on a private good. To push the analogy further, consider a hypothetically decentralized regime in which consumer prices for private goods correspond to Lindahl prices for public goods, and commodity taxes on public goods are defined as the difference between the price charged to a consumer in the imaginary regime and that consumer's marginal rate of substitution. The source of the allocative inefficiency is again a failure of the prices faced by consumers to equal true marginal resource costs.

In the present setting, therefore, moving to the first best – now regarding internalization of externalities or provision of public goods rather than setting commodity taxes in a simpler

world – makes possible a Pareto improvement. Concerns about distribution and labor supply effects caused by the income tax can be ignored because they are moot.

Similar logic can be employed to address other areas of government policy, most obviously regulations that mimic corrective taxation but also seemingly unrelated fields like public sector pricing and utility regulation. Thus, marginal cost pricing will be optimal in spite of distributive concerns or the distortionary cost of raising funds to meet deficits because, if the income tax is adjusted in the manner described, distribution will be unaffected and there will be a net surplus if the reform is (narrowly) efficient in the basic case.

3. HISTORICAL DEVELOPMENT OF SECOND-BEST POLICY RULES.

First-best principles have a long and familiar lineage. The command to internalize externalities is inspired by Pigou's (1920) classical treatment, and the cost-benefit test for public goods is due to Samuelson's (1954) elegant formulation. It is notable that Samuelson (1954) explicitly said that he was considering a first-best setting in which individualized lump-sum taxes permitted any social welfare optimum to be implemented.

Second-best qualifications start with another of Pigou's (1928) books, in which he observed that, on account of the resource cost of raising revenue, public goods probably should have to meet a higher standard. Refinements appeared in Atkinson and Stern (1974), Diamond and Mirrlees (1971), and Stiglitz and Dasgupta (1971), with subsequent research crystalized by Ballard and Fullerton (1992). Analogous work on environmental taxation – addressed to the possibility of a "double dividend" (a tax might both internalize an externality and raise revenue distortion-free) and qualifications implying a more negative view of corrective policies – became intense in the 1990's (see Bovenberg and Goulder, 2002; Goulder, 2002). Largely separate literatures proposed second-best adjustments to account for distributive effects (Weisbrod, 1968; Drèze and Stern, 1987). See also Bös (1985) on public sector pricing.

Much of this work builds on Ramsey's (1927) model of taxation and extensions thereto. Often, such analyses employ the original representative-individual model in which distribution is immaterial; yet, at the same time, the possibility of income taxation is ignored (specifically, the possible use of a uniform grant that, as noted above, makes commodity taxation unnecessary) or the income tax adjustments that are stipulated turn out not to be distribution-neutral. Literature focusing on distribution also often ignores the availability of the income tax.

The lessons presented in the prior sections arise from another line of work that developed intermittently and largely independently of the foregoing literatures. Hylland and Zeckhauser (1979) used a distribution-neutral income tax adjustment with a special case of individuals' utility functions to show that distributive weights are inappropriate in cost-benefit analysis. Shavell (1981) offers a similar demonstration for legal rules. Christiansen (1981) and Boadway and Keen (1993) show that, with an optimal income tax, the basic cost-benefit test for public goods is appropriate. Kaplow (1996, 2004, 2005) considers both distribution and labor supply distortion, does not require the income tax to be optimal, and examines a broad range of government policies.

4. IMPLICATIONS.

Ever since Lipsey and Lancaster (1956), economists have sought to develop principles to provide guidance in a second-best world; indeed, in the area of taxation, the search had already begun. The inability to achieve an ideal distribution without distortion is one of the most important unavoidable deviations from the first best. Thus, not surprisingly, substantial research addresses second-best concerns regarding income taxation and commodity taxation as well as all manner of government policies that may have distributive effects or influence government revenue.

Perhaps surprisingly, a number of first-best principles prove to be rather robust in basic, benchmark cases. Important caveats were noted, but, importantly, they are largely orthogonal to the original second-best concerns that motivate most research in these fields.

One further qualification deserves attention: The present analysis assumes that the income tax will be adjusted in a distribution-neutral manner. This is hardly an unnatural assumption. For example, if the initial income tax does not optimally trade off distribution and distortion, the divergence may arise from political forces that dictate some other degree of redistribution. If so, particular reforms might be expected to leave that distributive balance unaltered.

Nevertheless, consider the possibility of non-distribution-neutral adjustments of the income tax. As suggested in Kaplow (1996, 2004), a simple two-step decomposition is illuminating in this case:

1. Assume that, initially, the underlying policy is implemented in the previously hypothesized distribution-neutral fashion.
2. Assume also that, a moment later, a further income tax adjustment transforms the policy in step 1 into the actually imagined policy.

Analysis of step 1 can proceed as before. Step 2, observe, is a purely redistributive reform. Accordingly, the analysis is in the province of optimal income taxation and involves the familiar distribution-distortion tradeoff. Significantly, the analysis of step 2 is generic – that is, it is the same regardless of whether step 1 involves changing commodity taxes, one or another regulation, the level of some public good, or indeed nothing at all (a purely redistributive overall reform). For economists, this allows substantial specialization. Step 2 analysis must be undertaken anyway and, as noted, tends to be independent of step 1. Step 1 analysis can be undertaken by experts on gasoline taxes, health care, electric utilities, and so forth, who need not concern themselves with redistribution. Policy-makers can combine analyses as appropriate.

Specialization has an additional virtue in this context: It facilitates communication, both among researchers and to policy-makers. For example, a study of a highway project that does not focus on step 1 will need to include analysis of (a) direct effects of the highway project (such as on pollution or congestion), (b) what other, budget-accommodating tax adjustment will in fact be made in the long run (an exercise in political economy), (c) an analysis of the effects of the resulting change in the extent of redistribution, and (d) a social welfare assessment, requiring choice of a social welfare function. Relatedly, when studies of a highway project reach different conclusions, the discrepancies may arise from any combination of these four components,

making it difficult to compare and synthesize research.

A particular concern arises with much work in these literatures, both abstract and highly applied, because step 1 is often combined with an incomplete analysis of step 2. For example, work might identify a redistributive benefit from a policy; yet, if there is not a complete analysis of redistributive taxation, the likely associated increase in labor supply distortion may be overlooked. Contrariwise, much work identifies increases in distortion, failing to recognize that the increases are due to effects on labor supply that accompany an implicit increase in redistribution, the benefit of which is omitted. Because of the original second-best problem, involving redistribution through distortionary taxation, redistribution is not an unambiguous good because (usually) it comes at a cost, and distortion – particularly of labor supply – is not an unmitigated evil because (frequently) it is symptomatic of an underlying benefit. Analysis that incorporates one side of the balance while excluding the other may be the worst approach of all.

To summarize, Ramsey principles are widely acknowledged and broadly employed as a foundation for second-best policy analysis. However, at least in developed economies in which an income tax is feasible, the model's most familiar implications for differential commodity taxation are inapt and, by extension, so are its applications to public goods provision, regulation of externalities, public sector pricing, and other policy areas. In the basic case, the problem of optimal redistribution – involving the tradeoff of distribution and labor supply distortion – is separable from these other realms. Accordingly, traditional first-best principles that focus on efficiency in the area under consideration provide a useful benchmark. Complications abound, but for the most part they do not replicate the adjustments called for by the original Ramsey model or typical applications thereof. Instead, they are best understood by direct reference to the problem of redistributive income taxation.

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