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The Journal of Economic Perspectives, Vol. 4, No. 1. (Winter, 1990), pp. 157-178.

Stable URL:

http://links.jstor.org/sici?sici=0895-3309%28199024%294%3A1%3C157%3AOTAOTS%3E2.0.CO%3B2-D

The Journal of Economic Perspectives is currently published by American Economic Association.

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"Optimal tax formulas are either guides to action or nothing at all."

Frank Hahn (1973)

Should additional revenue be raised by introducing a value-added tax, increasing income tax rates, or by enforcing the existing income tax more effectively? Should the attempt to tax income progressively be abandoned? Should the income tax be scrapped entirely, and replaced with a consumption tax? A normative theory of taxation, as a guide to action, should illuminate these and other fundamental questions of current and future tax policy.

The theory of optimal taxation has, for the past two decades, been the reigning normative approach to taxation. During its reign it has generated several useful insights about the relationships between assumptions about the set of tax instruments available to the government, the structure of the economy, and the objectives of tax policy. However, I will argue in this paper that in its current state optimal tax theory is incomplete as a guide to action concerning the questions that began this paper and for other critical issues in tax policy. It is incomplete because it has not yet come to terms with taxation as a system of coercively collecting revenues from individuals who will tend to resist. The coercive nature of collecting taxes implies that the resource cost of implementing a tax system is large. Furthermore, alternative tax systems differ greatly in the resource cost of operation. Differences in the ease of administering various taxes have been and will continue to be a critical determinant of appropriate tax policy.

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As a prelude to my argument, I will first walk the reader through three of the principal propositions of optimal tax theory, pointing out along the way the key assumptions of the restricted problem under consideration.[1] Next, I comment on the influence of the theory on recent tax policy developments. I conclude by sketching an alternative to optimal taxation, which I call the theory of optimal tax systems. This theory embraces the insights of optimal taxation but also takes seriously the technology of raising taxes and the constraints placed upon tax policy by that technology. A theory of optimal tax systems has the promise of addressing some of the fundamental issues of tax policy in a more satisfactory way than the theory of optimal taxation.

Three Cornerstones of the Theory of Optimal Taxation

Common Structure

A typical exercise in optimal taxation has three key aspects. First, there is an explicit representation of individuals' preferences, technology (usually constant returns to scale), and market structure (usually perfect competition). Second, the government must raise a fixed amount of revenue with a limited set of tax instruments which can be administered costlessly. Lump-sum taxes, for which the tax liability is unrelated to any economic decision, are often ruled out. Given the assumptions about the economy, any choice of tax instruments is associated with a consumption bundle for each individual. Finally, there is a criterion function which ranks outcomes and chooses the best ("optimal") tax system among the limited set available. In models with one representative individual, this criterion is simply his or her level of utility. In models with heterogeneous individuals, a utilitarian social welfare function is used to aggregate the individuals' levels of utility into a measure of social welfare.[2]

The spirit of the optimal tax literature is that the efficiency costs of taxation are potentially large, and therefore it is worthwhile to focus attention on how to minimize these costs. In the simplest of the models, minimizing efficiency costs is the only objective. In more sophisticated models, tax systems are also evaluated by how they affect the distribution of welfare, and the efficiency costs must be balanced against the distributional implications.

Optimal Commodity Taxation

In the basic problem of optimal commodity taxation, the government must raise a fixed amount of real resources and can levy only commodity taxes. All taxpayers are identical (in tastes and endowment), so the government need not be concerned with

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[1]For more thorough surveys of the theory of optimal taxation, see Auerbach (1985), Stern (1987), and Stiglitz (1988).

[2]The theory of optimal taxation does not consider the political process that generates tax policy and does not deal with the possibility that policymakers' objectives may not be maximizing social welfare. It also attaches no weight to the pre-tax distribution of income. The desirability of any tax policy is judged solely by its consequences for individuals and is not judged independently on how closely it meets abstract principles such as fairness and efficiency. A concern for fairness may, though, be imbedded in the concavity of the social welfare function, and the desire for efficiency will be reflected in the decrease in individual welfare levels caused by inefficiency.

questions of vertical equity (how the tax burden varies across taxpayers of different means) or horizontal equity (how the tax burden varies across taxpayers of identical means). Any pattern of taxes can be raised without administrative or compliance cost.

What set of commodity taxes will raise the required revenue and leave the taxpayer as well off as possible? Or to put it another way, what set of taxes minimizes the efficiency cost of the tax burden? Frank Ramsey solved this problem more than 60 years ago, though its solution may still come as a surprise to those readers whose first instinct is to assume that the lowest efficiency cost will be achieved with the fewest distortions in relative prices. Ramsey (1927) showed that a uniform commodity tax system, which alters none of the relative prices of goods, is in general not optimal. Instead, efficiency cost minimizing commodity taxes will in general differ by commodity, such that more inelastically demanded goods tend to attract higher tax rates. In fact, with certain strong simplifying assumptions, an "inverse elasticity rule" applies exactly; the tax rate is inversely proportional to a good's own compensated elasticity of demand.

Why the apparently benign rule of uniform taxation is generally not optimal should become clear once the second-best nature of the problem is understood. The first-best solution is to impose a lump-sum tax on the representative taxpayer. In that way the required revenue can be achieved with no efficiency cost at all. Because lump-sum taxes are ruled out by assumption, any tax system will inevitably cause some distortions as individuals substitute away from relatively highly taxed goods to relatively lightly taxed goods. A uniform tax on all commodities (other than leisure) reduces the relative price of leisure with respect to each commodity, causing an inefficiently large consumption of leisure. The optimal tax pattern should take advantage of commodities' relative substitutability or complementarity with leisure. A complement to leisure, such as skis, should be taxed relatively heavily and a substitute for leisure (complement to labor), such as work uniforms, should be taxed relatively lightly. The extent to which this relative substitutability should be exploited is limited by the fact that non-uniform taxes do cause inefficiency in the consumption pattern of non-leisure goods. Uniform commodity taxation is optimal under very restrictive conditions.[3]

Can these prescriptions for optimal commodity taxation be made operational? Deaton (1987), for one, has expressed considerable skepticism. He first points out that common restrictions on preferences that are made to facilitate estimation presuppose the optimal tax solution. For example, given a linear expenditure system, uniform taxation is optimal regardless of the system's parameters. Thus, estimation done within that framework is pointless. With the right kind of data, preferences can be represented by a flexible enough functional form so that measurements are not merely assumptions in disguise. However, note that calculating the optimal commodity tax rates may require knowing price and income responses at points quite different from

[3]Uniformity is optimal only if there is implicit (also known as quasi) separability between leisure and goods; that is, when all goods complement leisure equally. Formally, two goods are quasi-separable from leisure if the expenditure function can be written $e(w, f, (q, U), U)$, where w is the wage rate, q is a vector of goods prices, and U is utility (Atkinson and Stiglitz, 1980, p. 379).

the current position or anything else previously observed. Deaton concludes that such global knowledge of preferences is probably unobtainable. Stern (1987) is less pessimistic. While he acknowledges the difficulties involved in estimation, he claims (p. 86) that we do know a lot about the relevant relationships [elasticities] and will therefore be "negligent...if we suppressed or ignored this information." Because predicting the effects of small changes from a given tax system requires only knowledge of the current position and derivatives of demand functions, some have suggested that the main use of optimal tax theory is for tax reform, and that policy should focus on tax reform.

If taxpayers have different endowments, then the optimal commodity tax structure must consider not only its efficiency cost, but also its effect on the distribution of consumer welfare. Not surprisingly, in this case the optimal tax on luxury goods is higher than otherwise and the optimal tax on necessary goods is lower than otherwise. Of course, when one can also choose an income tax at the same time as commodity taxes, then the income tax can accomplish much of the redistributional task. The presence of this additional instrument critically changes the nature of the optimal commodity tax structure. Atkinson and Stiglitz (1976) have shown that, when a general income tax structure is available, commodity taxes will not be part of the optimum tax structure whenever the utility function is weakly separable between labor and all goods together.[4]

In the past decade, Feldstein and others have argued that the quantitatively significant distortions caused by the tax system are intertemporal rather than intratemporal, and have focused attention on the taxation of capital income and away from the taxation of commodities at a point in time. By distinguishing goods according to date of consumption, the insights of optimal commodity taxation have been usefully applied to the question of whether capital income ought to be taxed. To see this, consider a two-period model with three goods: first-period consumption, first-period leisure, and second-period consumption. It is assumed that the individual chooses how much to work in the first period, but does not work in the second period. The government must raise a fixed amount of revenue in present value, and can levy commodity taxes on consumption in either period.

In this model the tax treatment of capital income is implicit in the relative tax impact on consumption in the two periods. Imposing equal tax rates on consumption in each period is equivalent to a wage tax or consumption tax. Similarly, when the tax rate on second-period consumption exceeds (is less than) the tax on first-period consumption, capital income is subject to a positive (negative) tax.[5]

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[4]A utility function is weakly separable when the marginal rate of substitution between any two goods is not affected by the quantity of leisure consumed. Note that this condition is quite different than the quasi-separability required for optimal uniform commodity taxes (equivalent to a tax only on earnings) in a one-person world with no lump-sum taxes available.

[5]The lifetime budget constraint of a representative individual can be written as

$$(A\text{-}1) \qquad\qquad C_1(1 + t_1) + \frac{C_2}{1 + r}(1 + t_2) + wL = w,$$

The theory of optimal commodity taxation tells us that the efficient pattern of taxation depends on the relative substitutability of consumption in each time period for leisure. If first-period consumption is relatively more substitutable for first-period leisure, then it should be taxed relatively lightly, implying a positive tax on capital income. If, on the other hand, second-period consumption is relatively more substitutable, then a subsidy to capital income is called for. In the event they are equally substitutable, a zero tax on capital income (that is, a consumption or wage tax) is optimal, so that the tax rate on first-period and second-period consumption should be equal.

Feldstein (1978) argued that reasonable values for the wage elasticity of labor supply and the interest elasticity of savings imply that capital income was taxed too highly at that time. He estimated that eliminating capital income taxation and replacing the lost revenue with higher taxes on labor would reduce the efficiency cost of taxation by 18 percent of tax revenue. King (1980), though, points out that these reasonable parameter values used by Feldstein happen to imply the optimality of consumption taxation. In any event, Deaton's pessimism over the ability of econometricians to provide the parameters of optimal tax formulae applies even more strongly to the structure of intertemporal preferences than it does to preferences at a point in time. I am very doubtful that we'll ever know much about the relative substitutability of leisure with consumption of different periods. In fact, many attempts to estimate intertemporal preferences empirically begin with functional form restrictions that practically guarantee the dominance of consumption taxation over income taxation.

In a model of overlapping generations without bequests, the effect of taxation on the capital-labor ratio becomes an additional issue. When, in the absence of taxation, the steady-state capital-labor ratio would be below the level that maximizes utility, an

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where C_1 and C_2 are first and second-period consumption, respectively, t_1 and t_2 are the two consumption tax rates, w is the wage rate, r is the rate of interest, and L is leisure (out of a unit time endowment). When t_1 equals $t_2 (= t)$, the budget constraint can be recast as either

$$(A\text{-}2) \qquad C_1 + \frac{C_2}{1 + r} = w(1 - L)\left(1 - \frac{t}{1 + t}\right),$$

which shows the equivalence of uniform commodity taxes to a wage tax at rate $t/(1 + t)$, or

$$(A\text{-}3) \qquad \left(C_1 + \frac{C_2}{1 + r}\right)(1 + t) = w(1 - L),$$

which shows the equivalence to a general consumption tax. Rewriting (A-1) as

$$(A\text{-}4) \qquad C_2 = \left[w(1 - L)\left(1 - \frac{t_1}{1 + t_1}\right) - C_1\right]\left[(1 + r)\left(1 - \frac{t_2 - t_1}{1 - t_2}\right)\right]$$

makes clear that when t_2 exceeds t_1, capital income is subject to a positive tax, and when t_1 is less than t_2, capital income is subsidized.

optimal tax policy must not only consider the distortion in the lifetime consumption pattern but also whether it moves the capital-labor ratio closer to or farther from its optimum level and how it affects the intergenerational distribution of welfare. Summers (1981) has suggested that the intertemporal elasticity of substitution may be so high that these other issues dominate the life cycle distortion issue. This occurs because tax-induced changes in the initial after-tax interest rate cause so much response in saving and, eventually, the capital-labor ratio that the new equilibrium after-tax interest is not much changed, so that life-cycle consumption decisions are not much affected. Then the critical question becomes what tax structure is most effective in raising the capital-labor ratio. This may depend critically on the timing of the tax liability and on the government's ability to use debt policy to affect saving.

Production Efficiency

Now suppose that, in addition to commodity taxes, the government can also raise revenue by levying various kinds of production taxes on firms and on suppliers of inputs. To what extent should these taxes be used to supplement (or replace) commodity taxes?

The short answer to this crucial problem, provided by Diamond and Mirrlees (1971), is that as long as commodity taxes can be set without constraints (and therefore optimally) and if there are no privately received economic profits (either because there are constant returns to scale or because of 100 percent profits taxation), then taxes should be set to achieve production efficiency. In other words, all firms (both private and government enterprises) should face the same vector of prices.

The intuition behind this result is straightforward. With no constraint on commodity taxes, any set of after-tax prices, including the optimal one, can be achieved with commodity taxes alone.[6] Any other taxes may increase the efficiency cost and cannot improve on the minimal efficiency cost achieved in their absence.

This result is potentially important because achieving production efficiency rules out a long list of taxes. On the proscribed list are corporation income taxes, origin-based commodity or capital income taxes, tariffs, sector-specific investment or employment incentives, taxes on intermediate goods, and the tax exemption of non-market labor supply.

However, the conditions necessary to seek production efficiency, and to therefore rule out such taxes, are not realistic. Production efficiency is in general not desirable when there are constraints on how commodities and profits can be taxed. For example, if a commodity tax cannot be imposed on some good, a tax on factor income earned in that sector may serve as a partial substitute. If certain commodities must be taxed at identical rates, then differential taxation on factors in those industries is generally desirable. Furthermore, if 100 percent taxation of profits cannot be achieved, differential taxation of factors can serve as a substitute for the profits tax; the greater the share of profits in an industry, the larger should the differential factor tax be. In

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[6]The assumptions of the model imply that the welfare of any consumer depends only on his endowment and the vector of prices he faces.

the absence of 100 percent taxation of profits, the structure of optimal commodity taxes as well as the optimal structure of factor taxes is changed.

Administrative problems are often at the heart of why optimal commodity and profits taxation are not implemented, thus opening the way for taxes which interfere with production efficiency.[7] It is difficult to tax the rental value of owner-occupied housing and other consumer durables, consumption of family-provided domestic services, and consumption of nonmarketed agricultural produce. It is difficult to tax labor used in household production. The cost of administering any tax system increases with the number of different tax rates that are imposed, so that only a small number of tax rates may be desirable. It is difficult to distinguish between capital and wage income in unincorporated enterprises; therefore it is difficult to maintain different rates of tax. Because of the difficulty of separately measuring pure profits and capital income, 100 percent taxation of profits is problematic at best.

Thus, problems that arise in administering real tax systems may often make some forms of production tax appropriate, even if such a tax works against production efficiency. The importance of feasibility constraints in defining and collecting taxes will be a recurring theme of this paper.

Optimal Tax Progressivity

Many analyses of taxation address the problem of taxing a single representative consumer, but this convenient assumption sidesteps the thorny issues of interpersonal comparisons of welfare. When the assumption of a representative consumer is abandoned to face the reality of heterogeneous individuals, optimal tax solutions get more complicated. As mentioned earlier, the optimal commodity tax solution must be modified to account for the income elasticity of commodities and the social weight put on redistributing welfare through the fiscal systems. Production efficiency is no longer necessarily desirable (Dasgupta and Stiglitz, 1972).

Restricting attention to commodity taxes at various rates is surely inappropriate once redistributional issues are admitted. On the other hand, commodity taxes which vary with the circumstances of the buyer are conceivable but usually impractical. Personal income taxes, though, are flexible enough that the average tax rate may vary by individual (although not without cost), thus allowing the pursuit of redistributional goals.

Mirrlees (1971) initiated the modern debate on how progressive the income tax should be. In his formulation, the government seeks to maximize a utilitarian social welfare function, and must choose an income tax schedule subject to raising some given amount of total revenue.[8] A progressive tax on ability, which would cause no efficiency cost, is ruled out on the grounds that ability is impossible for the government to observe. Mirrlees first investigated what characterizes the optimal income tax for any set of assumptions about the social welfare function, the distribution of

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[7] A formal model of the impact of costly administration on the desirability of production efficiency is presented in Heller and Shell (1974).

[8] Because a tax schedule may feature rebates rather than taxes at some levels of income, it is really the optimal tax-and-transfer system that is at issue.

endowments, and the behavioral response (utility) functions. He concluded that only very weak conditions characterize the optimal tax structure in the general case: that the marginal tax rate at all levels of income lies between zero and 100 percent, and that in most of the interesting cases some of the population will choose not to work at all. Clearly these requirements offer us little concrete guidance in the construction of a tax schedule.

But one result of this general literature is surprising—that the marginal tax rate at the highest level of income should be precisely zero.[9] This is true as long as there is a known upper bound to the income distribution and regardless of the form of the social welfare function, provided that the welfare of the most well off individual carries some positive weight.[10] To see the intuition behind this result, first consider an income tax schedule in which the marginal rate applicable to the highest observed income is positive. Now consider a second tax schedule which is identical to the first except that it allows the highest-earning household to pay no taxes on any excess of income over what it would have earned under the first tax schedule. When faced with the second tax schedule this household is certainly better off, works more hours, and pays no less tax than under the first schedule. All other households are at least as well off (and may be strictly better off if the top marginal tax rate is set to be slightly positive and the increased revenue from the highest-earning household allows a reduction in average tax rates in the lower brackets). In other words, raising the marginal tax at the top above zero distorts the labor supply decision of the highest earner but raises no revenue.

This result calls to mind Edgeworth's (undated, p. 9) comment about Marshall's discovery of the Giffen good: "Only a very clever man would discover that exceptional case; only a very foolish man would take it as the basis of a rule for general practice." The result does not imply that marginal taxes should be zero or very low near the top, only precisely at the top. In fact, numerical calculations by Mirrlees (1976, p. 340) suggest that zero "is a bad approximation to the [optimal] marginal tax rate even within most of the top...percentiles."

Although I feel that this result should not be taken seriously as a practical guide to tax policy, it does provide some insight into the question of optimal tax progressivity. It highlights the possibility that a utilitarian social objective function, even one that places a large weight on the welfare of the poor, is not necessarily maximized through high marginal tax rates on the rich. In fact, the poor can only be made less well off by a non-zero marginal tax rate at the very top. The numerical examples I discuss below indicate that, more generally, the poor may be best served by tax systems which are less leveling than intuition might suggest.

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[9]Even more surprising is the result that, when there exist two types of labor (skilled and unskilled), the marginal tax on the most able individual should be negative. This causes a second-order efficiency loss, but redistributes welfare to less able individuals because it increases the relative wage of unskilled labor.

[10]Note that this result, when combined with Mirrlees' finding that the marginal tax rate must be nonnegative at all income levels, implies that the optimal income tax system cannot have continuously increasing marginal tax rates. It does not, though, say anything about what the average tax rate at the top should be.

The literature offers no other completely general results. In their absence, the approach has been to make specific assumptions about the elements of the model and in some cases to limit the class of income tax system under study (usually to linear or flat-rate schedules), and then to calculate the parameters of the optimal income tax system. This approach is meant to suggest the characteristics of the optimal income tax under reasonable assumptions and to investigate how these characteristics depend on the elements of the model.

Mirrlees pioneered this approach in his 1971 article. Assuming a simple utilitarian social welfare function, a lognormal distribution of ability, and an identical Cobb-Douglas utility function of goods and leisure for each individual, he calculated that the optimal tax structure is approximately linear (that is, it has a constant marginal tax rate and an exemption level below which tax liability is negative) and has marginal tax rates which were quite low by then current standards, usually between 20 and 30 percent and almost always less than 40 percent.[11]

Subsequent work investigated the sensitivity of the optimal income tax to the parametric assumptions. Mirrlees showed that widening the distribution of skills increased the optimal marginal tax rates, though he considered the dispersion of skills necessary to imply much higher rates to be unrealistic. Atkinson (1973) explored the effect of increasing the egalitarianism of the social welfare function. Even in the extreme case of the Rawlsian maximin social welfare function, where social welfare is judged solely on the basis of how well off the worst-off person is, the model generated optimal tax rates not much higher than 50 percent. Finally, Stern (1976) suggested that the degree of labor supply responsiveness implied by the Cobb-Douglas utility function is excessive and thus overstates the costs of increasing tax progressivity. He claimed that when a more reasonable estimate of labor supply responsiveness is used (with an elasticity of substitution of 0.4 rather than the unitary elasticity of the Cobb-Douglas formulation) the value of the optimal tax rate is substantially higher than otherwise, 54 percent in his central case compared to 20 or 30 percent in the Cobb-Douglas case.[12]

In sum, simple models of optimal income taxation do not generally point to sharply progressive tax structures, even if the objective function puts relatively large weight on the welfare of less well-off individuals. This conclusion does, though, depend on the wage elasticity of labor supply. Low elasticities, which imply a low marginal cost of redistributing income through the tax system, can imply highly progressive tax structures, so that lack of consensus about elasticities precludes consensus about optimal progressivity. Furthermore, the models that have been applied to this question have been very stylized, for the most part ignoring such issues as uncertainty, dynamic factors such as bequests and inheritance, tax evasion, and tax arbitrage.[13] For

[11]Note that, although the marginal tax rate is approximately constant, the average tax rate (tax liability divided by income) increases with income due to the presence of the positive exemption level.

[12]The revenue requirement in this example was about 20 percent of net output.

[13]Stiglitz (1988) has also criticized the literature's reliance on a utilitarian social welfare function which embodies value judgments about interpersonal welfare comparisons. He has advocated disentangling the latter from efficiency considerations, and concentrating on the characteristics of Pareto-efficiency tax structures.

example, considering only linear tax schedules (with one marginal tax rate and a demogrant) undoubtedly sacrifices some flexibility in redistribution. However, eliminating the graduated rate structure promises substantial simplification in the tax system by minimizing the incentive to arrange transactions to move income from high tax rate to low tax rate individuals. The tradeoff between the distributional flexibility of graduated income tax systems and the benefits of a flat rate is ignored in the standard models which either assume a flat rate or do not consider tax arbitrage.

The Guiding Principles of Recent U.S. Tax Reform

Recent changes in the statutory progressivity of the individual income tax are an apparent testimony to Keynes' statement about the policy influence of academic scribblers. When the optimal progressivity literature first surfaced in the early 1970s, the top marginal tax rate in the U.S. stood at 70 percent. (It had been 91 percent as recently as 1963.) As of January 1, 1988, the marginal tax rate on the highest income has fallen to 28 percent, a remarkably steep drop. In fact, the top marginal income tax rate has fallen in nearly every OECD country, in many cases quite substantially. The most recent drop in the top U.S. marginal rate was accompanied by broadening the tax base, in particular by subjecting realized nominal capital gains to full taxation, when only 40 percent of long-term gains had been taxable previously. The optimal progressivity literature does not directly address the appropriateness of lowered marginal tax rates when achieved by eliminating aspects of preferential tax treatment. Nevertheless, a key message of the optimal progressivity literature, that high marginal rates may not be appropriate even for egalitarian social welfare functions, has apparently won the day.

Judging by the recent debate over tax reform, the lessons of the optimal commodity tax literature have not had much of an impact on tax policy. The U.S. Department of the Treasury's initial proposal in 1984 favored a comprehensive income tax and defended it on, among other things, efficiency grounds (p. 25): "A comprehensive tax base is... necessary for economic neutrality, since... discrimination between various ways of earning and spending income distort economic decisions." This statement is incorrect if one interprets "economic neutrality" to mean causing no distortions, as that can be achieved only with a lump-sum tax. The theory of optimal commodity taxation suggests that minimal (as opposed to zero) distortion is achieved with a comprehensive income tax base only if utility functions satisfy fairly strong conditions which certainly have not been decisively established by econometric investigation. Yet the tax reform movement championed minimal tax differentiation of sources and uses of income. Interestingly, the Tax Reform Act of 1986 did not substantially change the average rate of tax on saving and investment, rejecting the intertemporal version of uniform taxation of goods which would exempt capital income from taxation in favor of a consumption base.

The desirability of production efficiency, usually referred to as a "level playing field," was a consistent theme of many tax reform proposals, including the Treasury's

initial proposal and the Tax Reform Act of 1986. These proposals sought to reduce the apparently widespread disparities in effective capital income tax rates across industries and types of capital investments. Production efficiency precludes the differential taxation of the inputs to firms, whether the tax is differentiated by section of use or by type of input, since either would distort production decisions.

The apparent triumph of production efficiency as a goal is somewhat surprising in view of the strong assumptions needed to demonstrate its desirability. The wide acceptance of this goal led Feldstein (1985) to point out that as long as the income from some capital goods would be untaxed (as would characterize the return to owner-occupied housing in all the major proposals), it is not in general optimal to tax uniformly the income from those forms of capital which are taxable. Summers (1987) further argued that the potential efficiency gain from eliminating differential taxation of different types of capital income is small, and that attention paid to this problem diverts attention from the overall level of taxation of capital income, which in his view is far more important in determining the efficient operation of the economy.

Clearly the *spirit* of optimal taxation theory, that tax-induced inefficiencies are potentially large and must be considered in the design of policy, has infused the recent tax reform movement.[14] However, policymakers have been selective in adopting the lessons of the theory. Marginal tax rates have come down significantly, and a partial move toward undifferentiated capital income taxes has been accomplished. However, little attention has been paid to differential commodity taxes or to changing the effective rate of tax on saving and investment. I suspect that the ascendancy of uniform taxation, at least in its intratemporal version, is due to the lack of strong evidence pointing to a clear alternative and the sense that a uniform tax system is less susceptible to political pressures favoring tax changes that serve special interests and are unrelated to optimal tax considerations.[15]

What strikes me most about the tax policy debates of recent years is that many of the critical issues lie outside the usual domain of optimal taxation theory. Simplification, tax shelters, and inflation-induced problems were of major concern during the debate leading up to the Tax Reform Act of 1986. Since 1986 debate has focused on the appropriate level of enforcement of existing tax laws, the taxation of capital gains, and whether a value-added tax should be added to the federal arsenal of tax instruments. Although optimal taxation theory is useful for analyzing some aspects of some of these issues, in many cases it cannot address the principal questions.

One reason that the theory of optimal taxation is incomplete as a guide to action is that its models, like all models, are imbedded in stylized versions of the environment and tax systems. The usual stylizations exclude such potentially important features of the world such as imperfect competition, increasing returns to scale, and unemploy-

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[14]See McLure (1984) for an interesting perspective on the effect of academic thinking on the tax reform movement. The policy influence of the high distortionary cost of taxation is somewhat ironic because the profession has since moved away from its belief in high behavioral elasticities. In particular, the median professional estimate of the intertemporal elasticity of substitution is undoubtedly much lower now than in the early 1980s. For example, compare Hall (1988) and Summers (1982).

[15]See Hulten and Klayman (1988) for a statement of this view.

ment. I believe that its critical problem is the failure to consider the technology of collecting taxes. In the next section I argue it is this omission which severely limits applicability of optimal taxation theory to many current policy problems.

Optimal Tax Systems and the Technology of Tax Collection

The leap from the blackboard to the real world is a large one when it comes to taxation. In the United States, operating the tax system requires the participation of over 100 million taxpayers, hundreds of thousands of tax professionals, and a multi-billion dollar budget for the Internal Revenue Service and its state counterparts. The resource cost of operating the income tax system alone, including the administrative cost borne by the government and the compliance cost borne by the taxpayers, has been estimated to be as high as $35 billion annually, or about 7 percent of revenue (Slemrod and Sorum, 1984). This cost is large both in absolute terms and relative to the distortionary costs of taxation. For example, it is more than twice as high as recent estimates of the efficiency cost of the nonuniform taxation of assets used within the corporate sector (Summers, 1987).

More important than the magnitude of the costs, though, the ease of administering various taxes has critical implications for the optimal structure of tax systems. As discussed earlier, tax codes which are based on unobservable and practically unmeasurable quantities (such as an ability tax) often look desirable on paper. The choice among real tax systems must confront the fact that some taxes can be administered more easily than others. If optimal tax theory is to be a reliable guide to action, it must consider the issues that arise in operating the tax system.

Integrating the issue of administrative ease into optimal tax theory will require a shift of emphasis away from the structure of preferences, which has been the principal focus of optimal tax theory, toward the technology of tax collection. In what follows, I will use the term optimal tax systems to refer to the normative theory of taxation that considers not only the structure of preferences but also takes seriously the technology of collecting taxes.

The Choice of Tax Instruments

With some exceptions, optimal tax theory has dealt with the issue of administering a tax by making extreme assumptions about what kinds of taxes are available to the policymaker. Each of the three cornerstones of optimal tax theory depends on implicit assumptions about which taxes can be administered and which cannot. The problem of optimal commodity taxation is interesting only because the possibility of lump-sum taxation is ruled out, presumably because it is infeasible. Production efficiency is desirable only if all commodities can be taxed and 100 percent taxation of profits is feasible (or if no profits exist). When consumers are not identical, an ability tax dominates an income tax because it causes no distortion in behavior. The study of optimal income taxation is appropriate when ability taxes are ruled out, usually by appealing to the difficulties of measuring ability.

Extreme assumptions about the feasibility of tax instruments are analytically convenient but incorrect. Ability can be measured, although with some expense and error. On the other hand, income cannot be measured perfectly, and the degree of accuracy in income measurement depends on the resources expended toward this goal.

Extreme assumptions about the feasibility of tax instruments may also preclude consideration of fundamental changes in policy.[16] For example, a common assumption made in optimal taxation models of developing countries is that income and consumption arising in the agricultural sector are not taxable, although marketable surplus is taxable. Much interesting analysis proceeds from this assumption, but none asks at what point it makes sense for a country to attempt to tax agricultural income, even assuming that it will have only limited success in doing so. There is strong evidence (Riezman and Slemrod, 1987) that countries with low literacy rates tend to rely on highly distorting but (relatively) easily collectable import and export taxes, and shy away from efficient but administratively difficult land taxes. Under what conditions should an imperfect land tax be tried? The answers to these questions depend on the resource cost of administering the new tax instrument relative to its effectiveness, or degree of success. This latter notion has several dimensions, including the true revenue yield and the extent and nature of the mistakes that are made in administration.

Some initial progress has been made in analyzing the optimal choice of tax instruments. Stern (1982) models the choice between two distinct tax systems: an optimal nonlinear income tax, where income is costlessly observable, and a system of differential lump-sum taxes based on characteristics of taxpayers which can be ascertained with some error. The lump-sum tax system is superior if there are no errors in classifying individuals but, when enough mistakes are made, income taxation may be the preferred system.

Stern's analysis recognizes that the two tax systems each have their own information requirements (the lump-sum system requires classifying individuals, the income tax system requires observing incomes). The two systems will also likely have different administrative costs as well, although Stern assumes these costs are identical for the sake of simplicity. Greater accuracy in the classification of individuals could be achieved with higher cost, as could more accurate measurement of income.

Yitzhaki (1979) investigates the optimal commodity tax base when there is a resource cost to adding goods to the tax base. If, as he assumes, preferences over all goods are Cobb-Douglas, then uniformity of rate for all taxed goods is optimal. Expanding the tax base to cover more goods will reduce the excess burden of taxation, but increase the administrative cost. The optimal tax system equates the marginal

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[16]The desirability of making the choice between tax instruments an endogenous variable has been noted by, among others, Hahn (1973) and Atkinson and Stiglitz (1980, p. 363), who state that "for a complete theory of the choice of tax base, a fully articulated model is necessary of the information available to the government and cost of observing the different characteristics." Diamond (1987, p. 640) agrees that this would be ideal, but adds that the standard simplifications "may do little damage to the policy conclusions if the set of feasible policies is well chosen, although the problem of choosing well is a difficult one."

excess burden of the taxes to the marginal administrative cost, and thus minimizes the total resource cost of raising revenue.

The fact that changes in administrative costs are likely to be discontinuous with respect to changes in tax policy is troubling in more general treatments of the optimal set of tax instruments. The theory of optimal taxation tells us that, in general, all goods should be taxed at different rates. But administrative cost is likely to be lower whenever the rate on substitutable goods is uniform. It may be that the cost depends on the number of different tax rates, rather than the number of commodities taxed, as Yitzhaki assumed.

The cost of administering a commodity tax system undoubtedly depends not only on the number of commodities covered, but also on the number of different rates imposed. This is not an issue when a demand structure that implies uniform optimal taxes is assumed (that is, Cobb-Douglas), but is very important under a more general demand structure.

Many of these concerns are relevant to the debate in the U.S. over introducing a value-added tax to raise additional revenue. The cost of the new administrative machinery would not be trivial. The Treasury Department (1984) estimated it would cost about $700 million per year, and require about 20,000 additional employees. The British experience with the VAT (see Sandford, et al. 1981) suggests that the cost borne by taxpayers is probably five times higher, bringing the total collection cost to nearly 3 percent of the revenue raised from a 7 percent VAT.[17] Obviously these costs could be avoided if additional revenue came from existing taxes rather than introducing a new tax.

One argument for the value-added tax is that it can be self-enforcing. Under the invoice method of value-added taxation, each firm pays tax on its sales and receives a credit for taxes invoiced by its suppliers. Thus evasion by suppliers through understating tax collected is counteracted by purchasers' interest in ensuring that all tax paid is recorded. Similarly, evasion by purchasers in overstating tax paid runs counter to the interest of suppliers. Of course, this self-enforcement aspect of value-added taxes can be eroded by, for example, counterfeiting of invoices. Moreover, this tendency to self-enforcement is not effective at the retail level, which can comprise as much as half of the tax base. Although the European experience suggests that this advantage is not fully realized in practice, the revenue loss from evasion (estimated in the United Kingdom to be 1.5 percent of potential revenue (Hemming and Kay, 1981), is probably very low compared to the revenue loss from income tax evasion.[18]

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[17]According to the U.S. Treasury Department (1984), the base of a value-added tax that excluded the rental value of housing, medical care, food, and certain other items would be $2.06 billion. Thus a 7 percent value-added would raise $144.2 billion, compared to an estimated collection cost of $4.2 billion. There is a large element of fixed cost, so that the collection cost per dollar raised falls as tax rates increase.

[18]Such high rates of compliance apparently do not apply to all countries. Evasion of the value-added tax in Italy, for example, has been estimated to reduce collections by as much as 40 percent (Pedone, 1981). Income tax evasion is notoriously high in Italy as well.

The European experience with the value-added tax also suggests that the potential simplicity of the value-added tax is seriously eroded when differentiated rates and exemptions (usually designed to lessen regressivity) are introduced, as they have been in all European countries and would likely be in the United States (Aaron, 1981). Thus, any desire to discriminate among commodities on optimal tax grounds must be balanced against the additional cost of administering such a system.

Although the apparent discontinuity of administrative cost functions poses analytical difficulties, a more profound problem is that the quality of tax administration is variable. Until now, in treating the question of whether to have or not have a particular tax, I've assumed that a tax is perfectly enforced after it is enacted. In fact, for any given tax structure more resources expended in enforcement can reduce the extent of tax evasion and therefore produce more revenue, reduce distortions, and improve horizontal equity.

Tax Evasion

The Internal Revenue Service (1988) has estimated that in 1987 noncompliance with the individual and corporation income tax cost the Treasury $84.9 billion, comprising over 20 percent of tax liability. Since 1973 the lost revenue had been rising faster than nominal income for each year until 1986. Although comparable studies for other countries do not exist, anecdotal evidence suggests that the extent of tax noncompliance is even larger in other countries.

Tax evasion is widespread, and its presence has serious implications for the equity, efficiency, and collection cost of alternative tax systems. Skinner and Slemrod (1985) discuss some of these implications. Yet its existence has not penetrated the standard (positive or normative) models of taxation, in which the effect of a tax levy is treated identically to an upward shift in the supply curve generated by, say, increased input prices. There is, though, a fundamental difference between the two cases. In the latter case the purchaser presumably must pay the higher price to continue to receive the good from the supplier. The higher equilibrium price is self-enforcing. When a tax is levied, though, neither party to the transaction has a direct incentive to collect the tax. In the absence of enforcement, only particularly dutiful individuals would forward the taxes to the government. Since no quid pro quo is attached to the payment of taxes, all parties would attempt to be free riders.

More generally, all taxpayers have the incentive to misrepresent their activities which have tax implications to reduce or eliminate their tax liability. For this reason no tax structure can stand alone without an enforcement mechanism supporting it. A theory of optimal tax systems must encompass not only the choice of tax rules but also how they are enforced.

Allingham and Sandmo (1972) were the first to analyze an individual's decision about whether and how much to comply with the tax law as a choice under uncertainty. An individual, by understating taxable income, receives the reward of a lower tax liability if the evasion is undetected, and pays a penalty if the evasion is

detected. The decision will depend on the terms of the gamble (the chances of being caught, the penalty if detected) and on the individual's attitude toward risk. Subsequent work has modeled the labor supply decision and tax evasion decision jointly and introduced more general penalty and tax functions than considered by Allingham and Sandmo.

Sandmo (1981) built on this model of the taxpayer decision to evade to consider the simultaneous choice of the parameters of a linear income system tax and its enforcement structure. His model contains two types of people—nonevaders who work only in the regular economy, and evaders who divide their time among leisure, taxed work in the regular market and untaxed work in the underground economy. In this model, the presence of the underground economy will lower the optimal marginal tax rate if it implies that regular income is a less reliable indicator of economic welfare, because in this case a more progressive tax system accomplishes less redistribution from the truly well off to those truly not. It also lowers optimal progressivity if it increases the compensated wage elasticity of regular labor supply. The tendency for a higher marginal tax rate to increase the supply of labor to the underground economy is not, however, an argument for a lower marginal tax rate. If anything, the reverse is true, because the increased supply of labor is a move in the direction of the undistorted level of labor supply to the underground economy.

Sandmo also derives the condition characterizing the optimal amount of resources to be devoted to the detection of evaders, which unsurprisingly reduces to equating the marginal resource cost of increasing the probability of detection to its marginal social benefit. The trick here is correctly interpreting the marginal social benefit of strengthening enforcement. As stressed by Slemrod and Yitzhaki (1987), it does not directly include the revenue gained via increased voluntary compliance; that represents a transfer from the private to the public sector. Thus, there are no normative implications of the claim of every IRS commissioner that each additional budget dollar allocated to the IRS will return on the order of ten dollars in increased revenues. The marginal social benefit does, though, include the value to risk-averse taxpayers of paying the required expected tax payment in a less risky manner, which occurs because the higher probability of detection deters tax evasion gambling. In a more general model, the marginal social benefit of increased enforcement would also include such factors as the efficiency gain from reducing the resources attracted to evasion-facilitating activities and the reduced horizontal inequity from favoring people with relatively less risk-averse preferences.

Mayshar (1986), adapting a model introduced by Usher (1986), places administration and sheltering costs within a formal model of optimal taxation. The standard result from the theory of optimal commodity taxation continues to hold: any tax instruments that are used ought to equalize at the margin the excess burden per dollar raised. The measure of excess burden, though, must be modified to include the cost of administration and the resource cost of sheltering income from the tax authorities, which includes the uncertainty of tax payment. The optimal level of enforcement of the tax laws, viewed as one of several tax instruments, is similarly characterized at the

margin–the ratio of excess burden (broadly defined) to revenue raised should be the same as the ratio that applies to increasing tax rates of existing taxes.

Can Capital Income Tax Be Collected?

The collection of taxes is greatly facilitated when it is based on easily observable transactions. This has important implications for the implementation of an income tax, because some income flows are not reflected in any transaction. This problem applies often, but not exclusively, to capital income. The service flow from owner-occupied housing represents income to the owner, but is not accompanied by a market transaction. The same story applies to the change in the value of an asset. Sometimes there is an observable transaction, but at a price which misrepresents the flow of real income. I have in mind the payment of interest on nominal bonds, where the interest payment exceeds the real flow of income because it does not take account of the decline in the real value of the principal.

Tax policy reflects this problem. The imputed income from owner-occupied housing is untaxed in the United States, although a few other countries attempt to tax it, usually ineffectually. Capital gains in the United States are taxed not upon accrual but only upon realization of the gain through sale or transfer to another party. The measurement of capital income is exacerbated by the presence of inflation, because it is nominal rather than real gains that enter the tax base.

The attempt to use transaction-based measures to measure income flows causes its own difficult problems, about which optimal taxation theory is virtually silent. An intertemporal version of the theory can, for a given utility function, prescribe the optimal tax rate on present and future consumption, and thus the optimal tax rate on capital income. But a tax imposed on, for example, capital gain realizations is not a tax on second-period consumption, but rather on the activity of adjusting one's portfolio or one way of drawing down one's assets for consumption. The apparent high responsiveness of capital gains realizations to taxation reflects the availability of highly substitutable financial strategies, and is not related to any characteristic of utility functions such as the elasticity of intertemporal substitution.

The difficulty of measuring capital income flows leads inevitably to a situation in which the effective rate of tax on capital income varies widely depending on the form and intermediation process for holding wealth.[19] Unfortunately, economic distortions and unintended distributional consequences arise whenever a tax system differentiates both on the basis of the financial arrangements for holding wealth and on the recipient of the income flow from that wealth, as it does under a progressive tax system. What tends to occur is high tax rate individuals using lightly taxed financial arrangements for holding wealth and low tax rate individuals using highly taxed financial arrangements. In the extreme case, individuals simultaneously hold a long

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[19]Measurement difficulties are not the only source of differential taxation of capital income. The government often intentionally subsidizes particular strategies for holding wealth, as in the case of the exemption from federal tax of the interest from state and local government securities.

position in a lightly-taxed asset and a short position in an identical (or similar) asset that is highly taxed. The net result of these phenomena, generally referred to as tax arbitrage, is that the government may collect little or no revenue from its attempt to tax capital income progressively, although in the process cause significant economic inefficiency. Steuerle (1985) and Gordon and Slemrod (1988) argue that this state of affairs in fact characterized the United States of the early 1980s. The Tax Reform Act of 1986, by flattening the schedule of marginal tax rates and reducing the differentials in taxation of capital income, undoubtedly has mitigated this problem somewhat.

Differential taxation of financial assets and wealthowners will generally result in not only production inefficiency, but also inefficient allocation of risk-bearing and capricious distributional consequences. Positive and normative modelling of this phenomenon is in its infancy. A difficult fundamental problem is how to characterize an equilibrium, in particular what limits individuals' profiting from tax arbitrage opportunities.

The problems that stem from the difficulty of measuring income have led some scholars (notably Bradford, 1980) to advocate the scrapping of income taxation in favor of a consumption-based tax. Of course, the change from an income tax to a consumption tax might also be supported on optimal taxation grounds, depending on the nature of utility functions. The problem of tax arbitrage suggests that the rate of tax on capital income is not as important as its uniformity with respect to the financial structure, intermediation process, and the identity of the wealth owner. A move toward either a truly comprehensive income tax, which taxes capital income uniformly at a positive rate, or a move toward a consumption tax, which taxes capital income uniformly at a zero rate, may be an improvement. Which is preferable depends on which system is more likely to be able to sustain uniformity. Bradford argues that, because consumption is easier to measure than income, a consumption tax is superior. Graetz (1979) and the American Bar Association (1985), though, conclude that a consumption tax would not be significantly less complex than a comprehensive income tax.

From this perspective the winner of the great debate over the relative merits of the consumption versus the income tax rests on an issue of measurability and thus is firmly in the realm of optimal tax systems rather than optimal taxation. Earlier we saw that the question of whether to sacrifice the redistributional flexibility of a graduated tax system in favor of a flat-rate tax also rests heavily on the administrative advantages of the latter. A comprehensive income tax with a flat rate would arguably offer nearly as much gain in simplicity as would a tax based on consumption rather than income.

A Look to the Future: Some Speculation and a Research Agenda

Changing Technology

I have argued in this paper that future research in the normative theory of taxation ought to shift its focus from the structure of consumer preferences to the

technology of collecting taxes and those aspects of the economy which affect tax collection, and from optimal tax rate structure to optimal tax systems. This is an exciting and challenging change in perspective. It is exciting because preferences (economists are accustomed to assuming) are relatively stable over time, but technology is clearly not stable, whether one is discussing the technology of producing steel or of collecting taxes. Changing technology implies that what is an optimal tax system today for the United States is not likely to be optimal 20 years from now.

Compared to 20 years ago, the Internal Revenue Service of today has a tremendously improved capacity to match information reports of parties to transactions to information reported on tax returns. It also faces an immensely more sophisticated financial system in which the transaction costs of hiding income have shrunk. This technological change may, for example, greatly diminish the ability of governments to cheaply enforce a residence-based capital income tax. When funds can evade taxation by crossing borders, countries may be forced to rely on origin-based taxes such as the value-added tax. Some have argued (like Bird, 1988) that the attempt to measure the portion of the income of multinational firms that originates in any country may have to be abandoned in favor of a formula apportionment rule similar to that used in state corporation income tax systems.

I have shown earlier that increasing financial sophistication places great strains on tax systems which attempt to tax capital income in an incoherent fashion and on any system of graduated tax rates. There is a growing awareness that the kinds of behavioral responses to taxation that matter in the real world have little to do with the structure of utility functions, but with the availability of financial strategies that circumvent the intent of the tax laws.

Scholars of the historical evolution of tax structure, notably Hinrichs (1966) and Musgrave (1969), have stressed the importance of tax administration issues. Modern tax structure development has generally been characterized by a shift from excise, customs, and property taxes to corporate income and progressive individual income taxes.[20] This shift has been made possible by the expansion of the market sector and relative decline of the rural sector, the concentration of employment in larger establishments, and the growing literacy of the population. Further changes in the technology of tax administration may now be pushing us away from progressive income taxes toward tax systems that rely more on broad-based consumption taxes such as the value-added tax and much flatter rate structures for income taxation.[21]

A Research Agenda

The shift in focus to a theory of optimal tax systems is challenging as well as exciting because it requires a rethinking of both theoretical and empirical research.

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[20]Although Hinrichs points out that tax structure development began with direct taxes rather than indirect taxes. See also Kau and Rubin (1981).

[21]The Danish tax reform passed in 1985 is a fascinating recent development. It creates a separate tax schedule for capital income (interest, dividends, taxable capital gains, rents, and profits from business enterprises) and personal income (predominantly labor income). Capital income is taxed at a flat 50 percent rate, and capital income losses are not deductible from personal income. One objective of this system is to reduce the revenue losses from the kind of tax arbitrage discussed in the text.

The normative theory must come to terms with such issues as the choice of tax instruments, the optimal design of enforcement policy, the tax treatment of financial strategies (as opposed to goods or income flows) and more generally, must develop a descriptive and normative framework in which to evaluate the issue of tax arbitrage. These are difficult issues, although progress is being made.

To make the theory of optimal tax systems operational, empirical work must proceed on the technology of collecting taxes. (This is the analogue to the critical role for optimal taxation theory of the empirical investigation of the structure of individuals' preferences.) This effort includes estimating the collection cost of alternative tax systems (for example, Sandford, 1987; Slemrod, 1989). It is important that the inputs to this process be related to a multidimensional measure of output. More resources devoted to tax collection may certainly increase revenue, and can also reduce the horizontal and vertical inequities that accompany tax evasion. The deterrent effect of enforcement is another critical topic for empirical research. Of course this does depend critically on one aspect of preferences: taxpayers' attitudes toward bearing risk. Although plagued by data inadequacies, some research has begun on this topic (Clotfelter, 1983; Dubin and Wilde, 1986).

During its reign as the predominant normative theory of taxation, optimal taxation has generated many valuable insights about the relationships between policy objectives, the structure of the economy, and the availability of tax instruments. In the more general framework of optimal tax systems, optimal taxation emerges as a special case in which the set of tax instruments is fixed and enforcement of any available instrument is costless. These assumptions preclude the study of a variety of important issues. To be a guide to current and future tax policy action, the more encompassing framework of optimal tax systems is essential.

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