Optimal taxation

William M. Gentry
Columbia University

A set of normative prescriptions for tax policy usually based on maximizing social welfare for a given revenue requirement.

Optimal tax theory addresses such questions as: Should the government use income or commodity taxes? Within commodity taxes, how should tax rates vary across commodities? How progressive should the tax system be?

Optimal tax theory encompasses a range of models that focus on particular aspects of the tax system. These different models share three features. First, each model specifies a set of feasible taxes for the government, such as commodity taxes, and the government's revenue needs. The models typically rule out lump-sum taxes, which would cause no economic distortion. Second, each model specifies how individuals and firms respond to taxes. That is, individuals have preferences about goods and leisure; firms have a given technology for producing goods; and individuals and firms interact in a given market structure (often perfect competition). Third, the government has an objective function for evaluating different configurations of taxes. In the simplest models, the government's objective is to minimize the excess burden generated by the tax system while raising a set amount of revenue. The more complicated models balance efficiency considerations with equity concerns. The models that include equity are usually more concerned with vertical equity rather than either horizontal equity or the benefit principle.

One of the oldest strands of the optimal tax literature is the optimal configuration of commodity tax rates. The basic question is whether uniform commodity tax rates—taxing all goods and services at the same rate—are optimal. This problem is commonly referred to as the Ramsey problem after the solution proposed by Frank Ramsey in his 1927 article. The short answer is that, abstracting from the collection costs of administering differentiated tax rates, uniform commodity taxes are rarely optimal.

The simplest version of the Ramsey problem is a static model (i.e., a one-period model without saving) with a representative consumer (alternatively, the model could have many consumers with the same demand functions). The government's objective is to raise a given amount of revenue while minimizing the distortions (excess burden) created by the tax system. This formulation minimizes economic distortion without concern for the fairness of the tax system. The feasible set of taxes includes flat rate taxes on different goods and services but excludes taxes on wage income. Uniform commodity taxes have the appeal of raising all prices by the same magnitude, and thus not distorting the relative prices of different goods. This simple intuition has two problems. First, it ignores the fact that commodity taxes cannot directly tax one especially important good: leisure. Second, it implicitly assumes that supply curves are perfectly elastic so that consumers bear the entire incidence of the taxes.

By maintaining the assumption that supply of all goods is perfectly elastic, Ramsey's solution to this problem yields an elegant rule: The optimal set of commodity taxes leads to an equal percentage reduction in the compensated (Hicksian) demands for all goods. (The compensated demand for a good is derived by fixing utility and calculating how demand changes with a change in price. The compensated demand functions capture the substitution effect of price changes without measuring the income effect.) Thus, rather than having each *price* change by an equal percentage as would be implied by uniform taxation, the optimal tax system has an equal percentage change in the *quantities* of each good. Corlett and Hague (1953) proposed an alternative interpretation of the Ramsey rule. They point out that the optimal tax rates on different goods depend upon the relationship between the demand for the good and leisure. The optimal configuration of commodity taxes has higher tax rates on complements to leisure and lower tax rates on complements to working. The intuition is that, because leisure is the untaxed good, taxing goods that are complementary to leisure implicitly taxes leisure.

Some of the many extensions to the Ramsey problem provide intuition about possible policy prescriptions. In the special case that demands for different goods are unrelated (i.e., the demand for one good does not depend on the price of other goods), the Ramsey rule simplifies to the "inverse-elasticity rule." The inverse-elasticity rule states that tax rates should be inversely proportional to their elasticity of demand. Goods for which demand is inelastic should have a high tax rate since changing their prices does not create much distortion. Conversely, the government should set lower tax rates on price-elastic goods since small price changes may create large distortions in the quantity demanded.

One criticism of the Ramsey solution, especially the special case of the inverse-elasticity rule, is that the solution may require higher taxes on necessities than on luxury goods since necessities often have relatively inelastic demands. Diamond (1975) extends the Ramsey problem to allow for households

with different tastes and incorporates concerns for fairness among the different types of households. In Diamond's model, the government's social welfare function is a weighted average of the utilities of individual consumers. The social welfare weights for the households could depend on the well-being of the household, with higher weights for less-advantaged households. Incorporating fairness into the Ramsey problem modifies the basic result so that the percentage reduction in goods consumed heavily by the households favored by the government (often assumed to be the poorer households) is smaller than the percentage reduction in the goods consumed by households with lower weights in the social welfare function. Thus, equity can be introduced into the optimal commodity tax system by having higher taxes on the goods consumed predominantly by the rich. This result accords with the intuition behind many state governments exempting groceries from their sales tax bases: Because poor people spend a higher fraction of their income on groceries than rich people, the exclusion of groceries from the sales tax base adds fairness to the tax system. This exemption is counter to the basic Ramsey rule because grocery demand is relatively price inelastic.

Another branch of the optimal taxation literature addresses the optimal design of income (direct) taxes. As with optimal commodity taxation, the basic models are static, so they focus primarily on labor income rather than saving decisions or capital income. However, more recent models have added intertemporal saving and investment decisions.

Static models of optimal income taxation are of two types: linear and nonlinear (general) income taxes. Linear income tax systems have two parameters, a demogrant and a marginal tax rate. The demogrant can either be a lump-sum grant of money to each individual, in which case it provides a guaranteed income to each individual, or a lump-sum tax. The marginal tax rate on income distorts the labor supply decision and thus has an efficiency cost. By choosing both parameters, the government can simultaneously raise revenue and redistribute income across income groups. The optimal choice of parameters depends on: (1) how much revenue the government needs to raise; (2) society's preferences for redistribution, as summarized by a social welfare function; (3) how responsive individuals' labor supply decisions are to changes in the after-tax wage; and (4) the distribution of pretax wages in the economy, which determines the inequality of the pretax income distribution. Stern (1976) provides examples suggesting that (1) the optimal linear income tax is quite sensitive to these parameters, and (2) even if society has an extreme aversion to inequality, the marginal income tax rate is less than 100 percent.

General, nonlinear income tax systems allow the marginal tax rate to change continuously with the level of income. As with linear income tax systems, the goal of a nonlinear tax system is to raise revenue (as evidenced by positive average tax rates) in an equitable fashion while minimizing economic distortions created by nonzero marginal tax rates. The problem facing the government is that people have different innate ability levels that the tax authorities cannot observe. If the government could observe these ability levels, then it could levy nondistortionary individual-specific taxes on ability. As a proxy for taxing ability, the government taxes income but must recognize that the income tax gives people incentives to change how hard they work to escape taxation.

The degree of abstraction in models of optimal nonlinear income taxes has limited the policy relevance of their results. One often-cited result is that the marginal tax rate on the highest-income person (who has, presumably, the highest ability) is zero (see Seade 1977). The intuition behind this result is that a nonzero marginal tax rate distorts the labor supply of the highest-ability person. If this tax rate were changed to zero, the highest-ability person might work more, which would make that person better off (having the choice of whether to work more). However, government revenue would not change, because with a positive tax rate, this labor is not provided, and with a zero tax rate, the extra labor supply is not taxed. The logic of this argument applies only at the top of the income distribution, because changes in marginal tax rates below this level affect the taxes paid by people with higher incomes. Unfortunately, this result does not give any information about how high marginal tax rates should be just below the top of the income distribution. Also, from a practical standpoint, it is almost impossible to determine the "top" of the ability or income distribution.

As suggested from these results, the outcomes from optimal tax models depend on the set of possible taxes the government can implement. A longstanding debate surrounds the choice between indirect (e.g., commodity) and direct (e.g., income) taxation. That is, when the government can use both direct and indirect taxes, what is the optimal mix of taxes? Atkinson and Stiglitz (1980, ch. 14) show that commodity taxes are a relatively inefficient way of increasing the equity of a tax system that includes an optimally designed income tax. However, there may be administrative reasons for using indirect taxes.

One major consideration in designing an optimal tax system is how taxes interact with market imperfections. Externalities, such as pollution, are one example of a market imperfection that can affect optimal tax policy. Taxes on activities that create externalities can be one mechanism to reduce the economic inefficiency caused by externalities. For example, a tax on polluting may have the social benefit of reducing the level of pollution. Optimal tax models aimed at correcting externalities suggest that the optimal tax balances the marginal social damage from the externality with the marginal social benefit of the activity that generates the externality. The optimal tax does not necessarily eliminate the activity that generates the externality; for example, even with an optimal tax there may still be some pollution. For more on the corrective role of taxes in the case of externalities, see Baumol and Oates (1988).

While the optimal taxation literature is large and complex, there are several helpful reviews of the material. Rosen (1992, ch. 15) provides a useful introduction to the issues. Auerbach (1985), Stern (1987), and Stiglitz (1987) offer more technical summaries of optimal commodity and income taxation. Slemrod (1990) presents a critical review of the modern optimal tax literature and argues for including issues of administrative costs and compliance to the models.

Additional readings

Atkinson, Anthony B., and Joseph E. Stiglitz. *Lectures on Public Economics*. New York: McGraw-Hill, 1980.

Auerbach, Alan J. "The Theory of Excess Burden and Optimal Taxation." In *Handbook of Public Economics*, vol. 1, edited by Alan Auerbach and Martin Feldstein, pp. 69–127. Amsterdam: North-Holland, 1985.

Baumol, William J., and Wallace E. Oates. *The Theory of Environmental Policy*. 2d ed. New York: Cambridge University Press, 1988.

Corlett, W.J., and D.C. Hague. "Complementarity and the Excess Burden of Taxation." *Review of Economic Studies* 21 (1953): 21–30.

Diamond, Peter A. "A Many-Person Ramsey Rule." *Journal of Public Economics* 4 (1975): 335–42.

Mirlees, James A. "An Exploration in the Theory of Optimum Income Taxation." *Review of Economic Studies* 38 (1971): 175–208.

Ramsey, Frank P. "A Contribution to the Theory of Taxation." *Economic Journal* 37 (1927): 47–61.

Rosen, Harvey S. *Public Finance*. 3rd ed. Homewood, Ill.: Irwin, 1992.

Seade, Jesus K. "On the Shape of Optimal Tax Schedules." *Journal of Public Economics* 7 (1977): 203–36.

Slemrod, Joel. "Optimal Taxation and Optimal Tax Systems." *Journal of Economic Perspectives* 4 (Winter 1990): 157–78.

Stern, Nicholas H. "On the Specification of Models of Optimum Income Taxation." *Journal of Public Economics* 6 (July–August 1976): 123–62.

Stern, Nicholas H. "The Theory of Optimal Commodity and Income Taxation: An Introduction." In *The Theory of Taxation for Developing Countries*, edited by David Newbery and Nicholas Stern, pp. 22–59. Oxford: Oxford University Press, 1987.

Stiglitz, Joseph E. "Pareto Efficient and Optimal Taxation and the New Welfare Economics." In *Handbook of Public Economics* 2, edited by Alan Auerbach and Martin Feldstein, pp. 991–1042. Amsterdam: North-Holland, 1987.

Cross references: labor supply, taxes and; saving, taxes and.