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Louis Kaplow

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ABSTRACT

This Handbook entry presents a conceptual, normative overview of the subject of taxation. It emphasizes the relationships among the main functions of taxation — notably, raising revenue, redistributing income, and correcting externalities — and the mapping between these functions and various forms of taxation. Different types of taxation as well as expenditures on transfers and public goods are each integrated into a common optimal tax framework with the income tax and commodity taxes at the core. Additional topics addressed include a range of dynamic issues, the unit of taxation, tax administration and enforcement, and tax equity.

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Table of Contents

- 1 Introduction
- 2 Framework
 - 2.1 Purposes of taxation
 - 2.2 Integrated view
 - 2.3 Social objective
- 3 Optimal Income Taxation
 - 3.1 Model
 - 3.2 Linear income tax
 - 3.3 Two-bracket income tax
 - 3.4 Nonlinear income tax
 - 3.5 Elaboration
 - 3.5.1 Taxation of earning ability
 - 3.5.2 Additional considerations
- 4 Commodity Taxation
 - 4.1 Model
 - 4.2 Analysis
 - 4.3 Qualifications
 - 4.4 Ramsey taxation
- 5 Other Types of Taxation
 - 5.1 Capital taxation
 - 5.1.1 Income versus consumption taxation
 - 5.1.2 Capital taxation more generally
 - 5.1.3 Corporate taxation
 - 5.2 Transfer (estate and gift) taxation
 - 5.3 Social security taxation
 - 5.4 State and local taxation
 - 5.5 International taxation
- 6 Taxation and Transfer Payments
 - 6.1 Optimal transfers
 - 6.2 Categorical assistance
 - 6.3 Work inducements
 - 6.4 Cash versus in-kind transfers

- 7 Taxation and Public Goods
 - 7.1 Distributive incidence and optimal redistribution
 - 7.2 Distribution and distortion
 - 7.3 Benefit taxation

- 8 Corrective Taxation
 - 8.1 Pigouvian taxes and subsidies
 - 8.2 Choice of instruments
 - 8.3 Distribution and distortion

- 9 Additional Dynamic Issues
 - 9.1 Inflation
 - 9.2 Risk-bearing
 - 9.2.1 Uncertain labor income
 - 9.2.2 Uncertain capital income
 - 9.2.3 Other losses
 - 9.3 Transitions and capital levies
 - 9.4 Capital gains
 - 9.5 Human capital
 - 9.6 Lifetime horizon
 - 9.7 Budget deficits and intergenerational redistribution

- 10 Unit of Taxation
 - 10.1 Framework
 - 10.2 Intrafamily sharing
 - 10.3 Economies of scale
 - 10.4 Altruism
 - 10.5 Children
 - 10.6 Incentives

- 11 Tax Administration and Enforcement
 - 11.1 Choice of tax systems
 - 11.2 Optimal administration and enforcement
 - 11.3 Elasticity of taxable income

- 12 Additional Features of Tax Systems
 - 12.1 Tax base
 - 12.1.1 Exclusion of nonpecuniary income
 - 12.1.2 Business versus personal expenditures
 - 12.1.3 Retirement savings
 - 12.1.4 Tax expenditures
 - 12.2 Forms of consumption taxation
 - 12.2.1 Cash-flow consumption taxation
 - 12.2.2 VAT and sales taxation

- 13 Tax Equity
 - 13.1 Welfarism
 - 13.2 Choice of social welfare function
 - 13.3 Other normative criteria
 - 13.3.1 Traditional principles
 - 13.3.2 Horizontal equity
 - 13.3.3 Inequality, poverty, progressivity, and redistribution

- 14 Conclusion

1. Introduction

The subject of taxation is vast and has been a major focus of numerous economists over the ages. Accordingly, a single survey must be highly selective. Because there exists a four-volume *Handbook of Public Economics* (1985, 1987, 2002a, 2002b), a substantial portion of which is devoted to taxation, and numerous other survey articles on various aspects of taxation, this review does not attempt to cover all the traditional topics, which would be impossible in any event. Instead, it aims to offer a guide that will complement existing work.

Specifically, this essay presents a conceptual, normative overview of the subject of taxation.¹ It emphasizes the relationships among the main functions of taxation – notably, raising revenue, redistributing income, and correcting externalities – and the mapping between these functions and various forms of taxation. In presenting a unified view, one grounded directly in a standard social welfare function, it should help expose and clarify connections among particular subjects in ways that often are beyond the purview of more focused treatments that consider, in much greater depth, a single piece of the larger puzzle.

Implicit in a conceptual approach is that empirical literature will not be a focus. Also excluded will be most aspects of tax incidence, questions of political economy, and macroeconomic issues. In other respects as well, this survey will not attempt to be comprehensive. Nevertheless, it covers a wide canvas and seeks to go into enough depth on the matters it does address to provide significant illumination.

Core features of the analysis appear in the preliminary sections. Section 2 considers the purposes of taxation, discusses the need for an integrated view that relates different policy instruments to specific objectives, and motivates and introduces the standard welfare economic approach to taxation. Section 3 presents optimal income taxation analysis, emphasizing the main conclusions, the intuitions underlying them, and the results of simulations.

Section 4 extends the analysis of section 3 to consider optimal commodity taxation in a setting in which an income tax is available. This extension proves particularly valuable in later sections because so many forms of taxation and other policies are analogous to differential commodity taxation. Some of the payoff appears in section 5, which considers other types of taxation, including income taxes that apply to capital as well as labor income (and the contrast between such income taxes and a personal consumption tax), corporate taxation, transfer (estate and gift) taxation, social security taxation, state and local taxation, and international taxation.

Because raising revenue and redistributing income are two central functions of taxation, a complete understanding requires further attention to government expenditures. Accordingly, section 6 analyzes income transfer payments and section 7 incorporates public goods into the framework. An additional function of taxation, the correction of externalities, is the subject of section 8.

¹Many of the topics considered here are also examined in greater depth in my in-progress book, *Taxation and Redistribution*, which has a similar motivation.

A range of further topics are related to the central framework in the remaining sections. Section 9 examines a number of issues that arise in a dynamic setting: inflation, risk-bearing, transitions, capital gains, human capital, a lifetime horizon, and budget deficits and intergenerational redistribution. Section 10 addresses how different types of family units (single individuals, married couples, households with children) should optimally be treated relative to each other. Section 11 introduces problems of administration and enforcement. Section 12 briefly considers other important features of tax systems: the choice of the tax base and the differences among various forms of consumption taxation. Section 13 discusses tax equity, including the question whether social welfare functions should depend only on individuals' utilities, the choice of social welfare function, and other normative criteria sometimes suggested to be pertinent to tax policy.

2. Framework

2.1. Purposes of taxation

Raising revenue to fund government expenditures on public goods and services is a fundamental purpose of taxation. This task of raising revenue is intimately related to the second purpose of taxation, achieving an acceptable distribution of income. The reason is that, if all individuals were identical or if raising revenue was the only objective, the revenue need could be met in developed economies without distortion through the use of a uniform, lump-sum tax, sometimes referred to as a head tax or poll tax. Substantial reliance on constant per capita levies is unacceptable precisely because of distributive concerns.² And once distributive concerns are admitted, it is familiar that economic distortion becomes a central problem. Hence, using tax and other instruments to optimize the tradeoff between distribution and distortion is a principle focus of the economic analysis of taxation.

Taxation is also employed to achieve additional goals. The correction of externalities will be considered in section 8, while other objectives, notably economic stabilization, are beyond the scope of this survey.

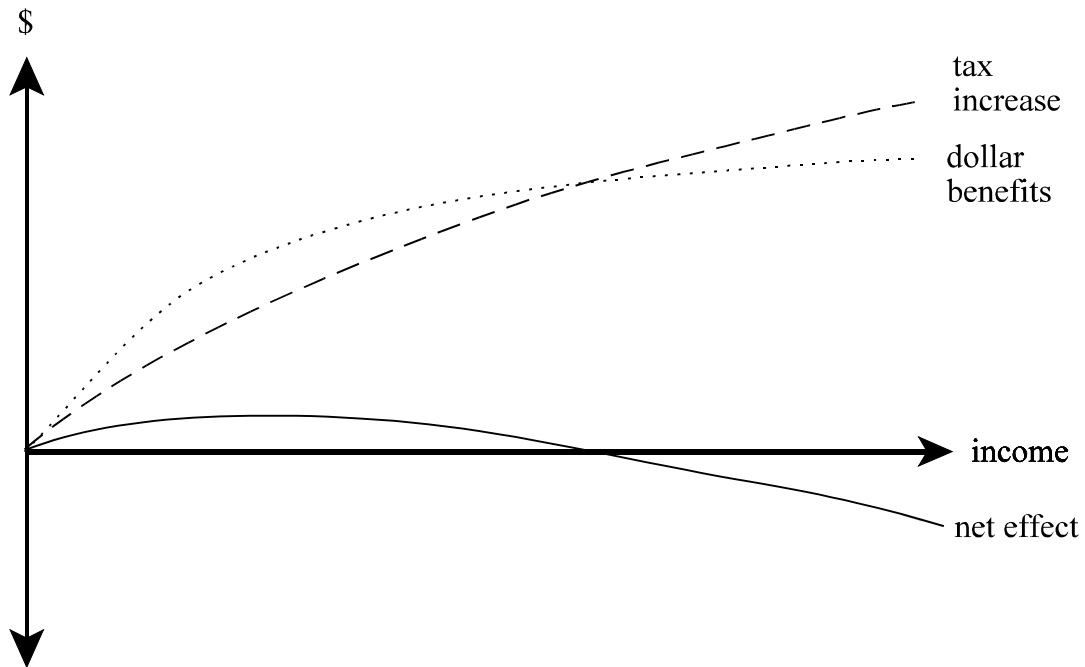
2.2. Integrated view

To analyze a type of taxation or a particular tax reform proposal, it is helpful to bear in mind a number of considerations that involve the relationships among various components of the fiscal system. First, it is important to specify a policy completely rather than to consider individual pieces in a vacuum. For example, a gasoline tax increase may appear to be moderately regressive, which is to say that the average tax burden may increase less than proportionately with income.³ See the dashed line, "tax increase," in Figure 2.1.

²See also subsection 4.4 on Ramsey taxation.

³Progressive, proportional, and regressive taxes are ordinarily defined as ones whose *average* rates rise, are constant, or fall with income. Occasionally, these terms are associated with *marginal* rates, but that usage will not be followed here. A motivation for focusing on average rates is that "progressive" taxes are often associated with redistributive taxes, and as subsection 3.2 will make clear, a tax with constant marginal rates (a flat tax) can be highly redistributive, in which case it will have rising average rates.

Figure 2.1
Government Expenditure Financed by Gasoline Tax Increase



A tax increase, however, generates revenue that upsets budget balance, so a complete specification of this policy requires identification of how the funds will be spent. Suppose that the revenue will be expended on a public good (or a reduction in some other tax), and that the incidence is favorable to the rich, but to an extent that is less than proportionate with income. See the dotted line, “dollar benefits,” in Figure 2.1. The net effect, depicted by the solid line, is to redistribute toward poor and moderate-income individuals. Hence, what appeared to be a regressive gasoline tax increase, considered in isolation, has a net redistributive effect. Obviously, a different conclusion could be reached with different assumptions about expenditures, and the same point holds if the initial tax increase had instead been proportional or progressive. Because individual tax changes (and expenditure decisions) are part of a larger system with many instruments that may be adjusted in various ways, it is often unhelpful and potentially misleading to characterize any one instrument in a vacuum.

Second, particular policy instruments, such as forms of taxation, should be matched to those objectives to which they are most suited. For example, if consumption of gasoline causes pollution, a gasoline tax would likely be a superior means of correcting this externality than an income tax, though the latter does tend to reduce consumption as a whole, including the consumption of gasoline. Conversely, if the objective is income redistribution, an income tax is likely to be more appropriate than a gasoline tax (which, as the preceding example indicates, is capable of income redistribution in combination with other instruments).

It turns out that most types of taxation are optimally utilized in specialized ways. A general income tax (or personal consumption tax) tends to be best to address redistribution, while most other forms of taxation are primarily justified because they target particular externalities or

other imperfections, or because they address administrative and enforcement problems associated with other taxes. Although it is familiar that addressing a specific externality is best accomplished, if feasible, with a highly focused instrument, such as a corrective tax based on the externality itself, the notion that redistribution should be addressed almost exclusively with the income tax is less widely understood and thus deserves some further elaboration.

Consider, for example, whether luxury taxes should be employed to aid in the redistribution of income. (A complete analysis appears in section 4, on commodity taxation.) Initially, observe that any redistribution thereby accomplished could instead have been achieved with an adjustment to the income tax. That is, whatever is the incidence of the luxury taxes across the income distribution, one instead could have modified the income tax schedule to obtain the same result. Moreover, the use of luxury taxes tends to be a less efficient means of generating the same extent of redistribution. The reason is that luxury taxes distort both the consumption choices of the rich – who are induced to shift away from the taxed luxuries – and also the labor-leisure choice of the rich for, just as with an income tax increase, the effect of luxury taxes is to reduce the earner’s benefit from additional labor effort. This lesson generalizes to other forms of taxation (and to government expenditures and regulation; see sections 7 and 8).

Given this conclusion, it is often useful to assess tax and other policy changes – other than pure reforms of the income tax and transfer system – using a *distribution-neutral* approach, as outlined in Kaplow (1996a, 2004, 2006a). That is, for any given policy, say a proposed increase in luxury taxes or in the gasoline tax, one can imagine that it is accompanied by an offsetting adjustment to the income tax and transfer system – one that, as a whole, keeps the distribution of utility constant. When such a policy experiment is examined, the relevant effects will tend to be solely the efficiency consequences regarding the specific target of the instrument in question: reduction in the consumption of luxuries or in the use of gasoline. In the former case, this consequence would tend to be inefficient (assuming the absence of externalities) whereas in the latter case the result would enhance efficiency (assuming that the externalities to gasoline consumption were not already fully internalized). The question in assessing the desirability of various forms of taxation then becomes, for individuals at a given level of income: Do we wish to relatively discourage – or in the case of subsidies or selective tax exemptions, relatively encourage – particular behaviors? For example, in examining the taxation of transfers (gift and estate taxes), questions of distribution, labor supply, and revenue-raising can largely be cast aside – for these are held constant by the offsetting income tax adjustment – and one would focus instead on whether it is desirable to discourage private income transfers relative to expenditures on direct consumption for oneself.

Relatedly, the foregoing distribution-neutral approach is extremely useful in examining policy packages that may not be distribution-neutral. In such cases, one can perform the following two-step decomposition: (1) Implement the target policy with a hypothetical adjustment to the income tax and transfer schedule that is distribution-neutral overall. (2) Implement a further reform that replaces the foregoing income tax adjustment with the one in the originally specified (and non-distribution-neutral) policy package. Step 1 can be analyzed as suggested previously. Step 2, it should be observed, is a purely redistributive adjustment to the income tax. Accordingly, for a vast range of policy packages – involving various mixes of

taxation, expenditure, and government regulation – one can employ a generic approach to step 2. Furthermore, the necessary analysis for this step is the same as that required to assess pure questions of redistribution, as developed in section 3.

Use of a distribution-neutral approach (employing, where necessary, the proposed two-step decomposition) has many virtues. Most important, it greatly facilitates the analysis of the intrinsic effects of a policy, permitting specialization by analysts and comprehension of results by policy-makers. Note that if this approach is eschewed, anyone analyzing a gasoline tax increase, for example, would not only have to determine and assess the intrinsic effects of taxing gasoline, but would also have to determine what degree of redistribution should be assumed to accompany the reform, undertake an analysis of this redistribution (including the choice of labor supply elasticities and other parameters), and choose a social welfare function (SWF) to evaluate the consequences.⁴ Likewise, two studies of a given gasoline tax increase could reach different conclusions for a variety of reasons that could prove difficult to untangle. Indeed, different conclusions are likely even if the studies agree on the intrinsic effects of the gasoline tax increase, that is, on the analysis of step 1 of the decomposition. A further benefit of this separation is for policy-makers, who may well wish to make their own choices regarding redistribution, applying their own assessments thereof. The two elements of the decomposition can in fact be implemented independently of each other, and enactment of only a single component will often be sensible, notably, if the intrinsic policy is efficient but the redistributive effect is deemed undesirable, or vice versa. For all of these reasons – though primarily for the greater conceptual clarity that results – a distribution-neutral approach will be utilized in much of this survey (though obviously not when analyzing pure redistribution) in attempting to illuminate the distinctive features of various forms of taxation.

2.3. Social objective

Evaluation of purely redistributive changes to the tax system, the focus of section 3 on optimal income taxation, requires specification of the social objective, in the guise of a social welfare function. The need for an explicit statement of the social objective is heightened by a number of considerations: Not all reforms affecting distribution can readily be classified as more or less redistributive (replacing a graduated income tax with a flat tax may benefit both the poor and rich at the expense of the middle class), subtle effects on distribution are caused by important tax policy choices (adjusting the accuracy of the tax system will increase the tax burdens of some and reduce those of others), and heterogeneity (especially among different types of family units)

⁴It is common for analysts of other policy reforms to choose an income tax adjustment in a simple but essentially arbitrary manner, for example, by assuming that individuals' tax burdens adjust by a constant amount or proportionately. There is no accepted standard approach, and those most commonly used often involve redistribution (whether more or less redistribution depends on the target policy under consideration). Analysts also may consider actual reform proposals, although these often evolve and themselves may be incomplete (for example, they may not involve budget balance but instead increase a deficit that must in principle be financed by future tax adjustments). Although this survey does not consider matters of political economy, it should be noted that the political assumption implicit in the distribution-neutral approach – that the particular reform in question will not change the existing equilibrium of political forces with regard to the extent of redistribution – appears more plausible (on average and over time) than an arbitrary specification of how redistribution would change or an assumption that all reforms, regardless of their individual or cumulative distributive effects, would be financed in a particular, pre-specified manner.

is an important feature bearing on redistribution in complex ways.

Despite the need for explicit use of a social welfare function, tax policy analysis has often adopted a looser approach. Standard treatments such as Musgrave and Musgrave (1973) and Stiglitz (2000) list multiple objectives of tax policy, like efficiency, fairness or equity (itself consisting of various dimensions or principles), revenue adequacy, simplicity, and administrability. Some of these criteria seem to be proxies for or subsets of others (simplicity is not a good in itself, but bears on efficiency and fairness) and others, especially various notions of fairness (such as “ability to pay”) are notoriously vague, subject to competing interpretations, and in some instances largely free of content.

Mirrlees (1971) seminal contribution on optimal income taxation, it should be noted, was motivated in significant part by the desire to link positive analysis of the effects of taxation to a normative framework that allowed for a rigorous synthesis of concerns for efficiency and distribution. This framework is provided by the standard welfare economic approach of basing all policy assessment on effects on individuals’ utility and employing a social welfare function to aggregate individuals’ utilities to make a comprehensive appraisal. This approach will be outlined here and followed throughout this essay. The justification for focusing exclusively on individuals’ well-being, the choice of social welfare function, and the possible relevance of other equity criteria will be considered in section 13.

A social welfare function $SW(x)$ indicates how any regime or social state x (taken as a complete description thereof) is evaluated, where higher values indicate superior outcomes. Here, we are concerned with so-called individualistic SWF’s, wherein social welfare depends only on individuals’ utility or well-being. The functional form of SW incorporates a view of distributive justice. In the present context of assessing redistributive taxation, it is standard to use an additive form that assumes a continuous population.

$$(2.1) \quad SW(x) = \int W(u_i(x))f(i)di,$$

where u is a utility function, the subscript i indexes individuals’ types, and $f(i)$ is the density of type i individuals in the population. The functional form of W on the right side of (2.1) incorporates a view of distributive justice, as can be seen from the following common formulation.

$$(2.2) \quad SW(x) = \int \frac{u_i(x)^{1-e}}{1-e} f(i)di, \text{ for } e \neq 1$$

$$= \int \ln u_i(x) f(i)di, \text{ for } e = 1,$$

where e indicates the degree of aversion to inequality in the distribution of utility levels.⁵ If $e = 0$, social welfare is the sum (integral) of utilities, so the SWF is utilitarian. Higher levels of e correspond to increasing degrees of social aversion to inequality in the distribution of utilities. In the limiting case, as e approaches infinity, one has the maximin formulation associated with Rawls (1971) under which all weight is placed on the utility of the least-well-off individual.

It is useful to distinguish between two sources of aversion to inequality in the distribution of incomes. First, there is concavity in individuals' utilities as a function of consumption. To focus on this feature, consider the utilitarian SWF ($e = 0$). Furthermore, consider the case in which (abstracting from the effect of labor effort on utility) individuals' utility functions are given by $\ln c$, where c denotes consumption. Marginal utility equals $1/c$, so the marginal utility of a poor person with consumption of \$10,000 is ten times that of an upper-middle-income person with \$100,000 and one hundred times that of a rich person with consumption of \$1,000,000. If one considered a utility function with constant relative risk aversion of 2 (instead of 1, as in the preceding case), marginal utility would equal $1/c^2$; then these multipliers would be one hundred and ten thousand respectively. These factors indicate how much distortion would be tolerable in redistributing income: For example, when the factor is ten, then further redistribution would raise social welfare as long as less than 90% of what the higher-income individual pays is lost in the redistributive process. Clearly, concavity of individuals' utility functions is an important source of a social preference for redistribution.⁶

Second, concavity in the SWF itself – in the W function in (2.1), corresponding to $e > 0$ in (2.2) – further favors redistribution. The relative importance of this factor will depend on the concavity of individuals' utility functions. If they are highly concave, then concavity in W may not contribute that much more to the social preference for equality.

Analysts sometimes, such as in performing optimal income tax simulations, use a single concavity parameter to refer to the overall concavity of social welfare as a function of individuals' consumption, in which case one may interpret any results as produced by varying combinations of concavity in the underlying u and W functions. Nevertheless, the two sources of concavity are conceptually distinct: The degree of concavity in u is an empirical question, whereas the degree of concavity in W is a normative matter.

For most of this essay, the degree of concavity in either u or W will not have a qualitative effect on the analysis. In section 3, addressing the optimal extent of redistribution, concavity will obviously be quantitatively important. In most other sections, there will not even be a quantitative effect because, as subsection 2.2 explained, the extent of redistribution will be held constant. However, in addressing some topics, such as in section 10 on taxation of different family units, it turns out that the extent of concavity may have qualitative effects, for subtle

⁵To motivate the latter version in (2.2), for the case in which $e = 1$, the numerator in the former may alternatively be written as $u_i(x)^{1-e} - 1$ (subtracting the constant having no effect on the ordering of states). Then, taking the limit as e approaches 1 (using l'Hôpital's rule) yields the latter expression.

⁶As is familiar from Edgeworth (1897), any concavity in u would, but for incentive and any other cost concerns, be sufficient to warrant complete equalization in individuals' levels of consumption.

reasons that will be elaborated.

3. Optimal Income Taxation

3.1. Model

The analysis of optimal income taxation addresses the question of how an income tax should be designed in order to maximize a standard SWF subject to a revenue constraint, thus integrating consideration of the revenue-raising and distributive objectives of taxation. The standard model considers a one-period setting in which individuals only choice variable is their degree of labor effort, there is a single composite consumption good, and government expenditures on public goods are taken as given. A variety of extensions will be examined in subsequent sections.

An individual's utility is given by $u(c, l)$, where c denotes consumption, l denotes labor effort, $u_c > 0$, and $u_l < 0$.⁷ An individual's consumption is given by

$$(3.1) \quad c = wl - T(wl),$$

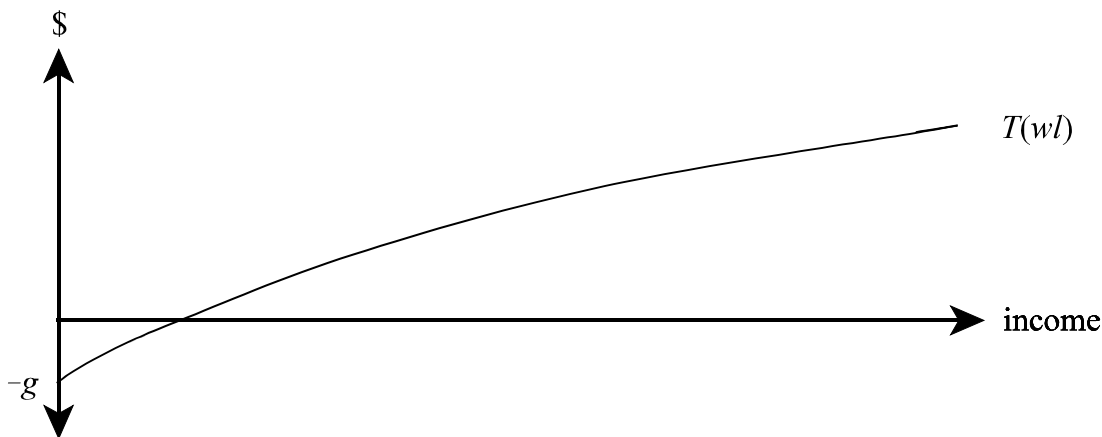
where w is the individual's wage rate and T is the tax-transfer function (usually referred to simply as a tax function or schedule). Each of these components deserves further elaboration.

The motivation for redistributive taxation is that individuals differ, in particular in their wages, that is, their earning abilities. The distribution of abilities will be denoted $F(w)$, with density $f(w)$, the population being normalized to have a total mass of one. Individuals' abilities are indicated by their given wage rate, taken to be exogenous. Their pre-tax earnings are the product of their wage rate and effort level. More broadly, one can interpret effort as including not only hours of work but also intensity, and not only productive effort but also investments in human capital.

Taxes and transfers, $T(wl)$, at any income level may be positive or negative. The (uniform) level of the transfer received by an individual earning no income, that is, $-T(0)$, is usually referred to as the grant g . See Figure 3.1.

⁷Much literature on optimal labor income taxation expresses utility as a function of leisure, or $1-l$, where "1" denotes a normalized available amount of time for each individual. Additionally, it is common to use indirect utility functions, perhaps expressed as a function of lump-sum or virtual income and of a net-of-tax wage rate. Though these devices offer advantages, for purposes of the present exposition the use of direct utility expressed as a function of consumption and labor minimizes notation and is more transparent.

Figure 3.1
Nonlinear Income Tax and Transfer Schedule



The tax schedule $T(wl)$ is taken to represent the entire tax-transfer system. Taxes may include sales taxes or value-added tax (VAT) payments in addition to income taxes. Transfers include those through the tax system, such as the Earned Income Tax Credit (EITC) in the United States, welfare programs (see section 6), and under some interpretations public goods (see section 7).⁸

Taxes and transfers are taken to be a function of individuals' incomes, assumed to be observable, and it is this dependence of taxes on income that is the source of distortion. If taxes could instead depend directly on individuals' abilities, w , individualized lump-sum taxes would be feasible and redistribution could be accomplished without distorting labor supply. Ability, however, is assumed to be unobservable.

Individuals choose the levels of labor effort l that maximize $u(c,l)$ subject to their budget constraints (3.1). An individual's first-order condition is

$$(3.2) \quad w(1 - T'(wl))u_c + u_l = 0,$$

where a prime denotes the derivative with respect to a function's only argument. In this case, $T'(wl)$ indicates the marginal tax rate of an individual earning income of wl .

The government's problem is taken to be the choice of a tax-transfer schedule $T(wl)$ to maximize social welfare, which (appropriately modifying expression (2.1)) can be expressed as

$$(3.3) \quad \int W(u(c(w), l(w))) f(w) dw,$$

⁸The inclusion of transfers is extremely important both practically, since they are in fact significant, and conceptually, since otherwise redistribution would be limited to transfers between the rich and middle class, once the poor were exempted from the tax system.

where c and l are each expressed as functions of w to refer to the level of consumption achieved and labor effort chosen by an individual of type (ability) w . This maximization is subject to a revenue constraint and to constraints regarding individuals' behavior. The former is

$$(3.4) \int T(wl(w))f(w)dw = R,$$

where R is an exogenously given revenue requirement.⁹ Here, revenue is to be interpreted as expenditures on public goods that should be understood as implicit in individuals' utility functions; because these expenditures are taken here to be fixed, they need not be modeled explicitly. Regarding the latter constraints, individuals are assumed to respond to the given tax schedule optimally, as described by their first-order conditions (3.2), which determine the functions $c(w)$ and $l(w)$.¹⁰

Mirrlees's (1971) original exposition has been followed by subsequent elaborations, much of which is synthesized in Atkinson and Stiglitz (1980), Stiglitz (1987), Tuomala (1990), and Salanié (2003). Because the problem is formidable, the present survey will be confined to stating basic results, such as are embodied in first-order conditions and produced by simulations.

3.2. Linear income tax

A linear income tax is defined as a tax schedule

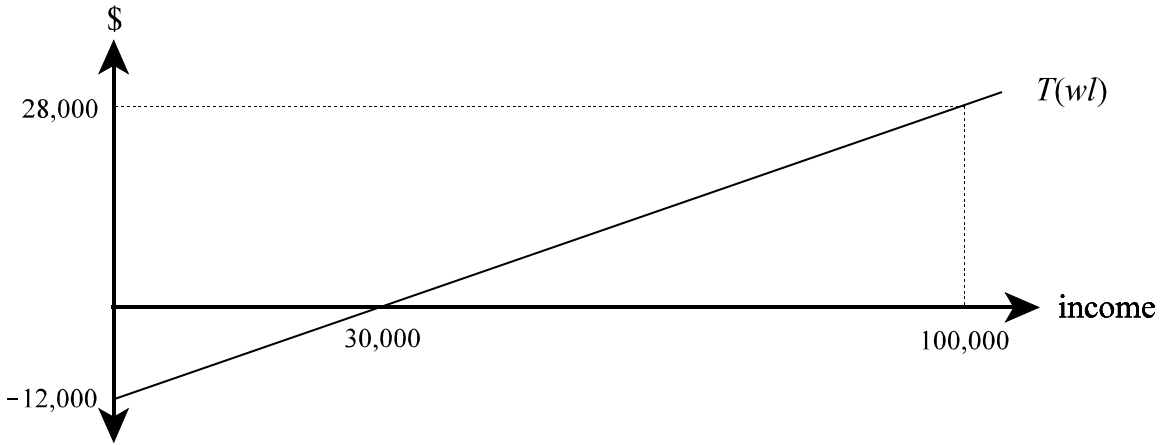
$$(3.5) T(wl) = twl - g,$$

where t is the (constant, income-independent) marginal tax rate and g , as previously noted, is the uniform per-capita grant. For example, consider the linear (flat) tax depicted in Figure 3.2.

⁹Some of the literature equivalently expresses this constraint in terms of aggregate resource balance, which requires that the sum of resources devoted to private and public goods equals the amount produced by all individuals' labor efforts.

¹⁰Substituting individuals' first-order conditions can be problematic when there may be multiple local optima, as recognized and addressed by Mirrlees (1971). Though much subsequent work sets aside such complications, the matter is potentially important because, as will be seen, optimal tax schedules can involve falling marginal tax rates, which produce nonconvexities. In such instances, changing marginal rates can cause individuals to "jump" to a different level of income, a phenomenon found to be important in Slemrod et al. (1994).

Figure 3.2
Linear Income Tax Schedule, $t = 40\%$ and $g = \$12,000$



In the literature, the schedule $T(wl)$, as mentioned, refers to a unified tax-transfer schedule. Note that this can be reinterpreted to align more closely with existing institutions and understandings. For example, the portion of the schedule to the right of \$30,000 of income can be understood as an ordinary (positive) flat or proportional income tax, with a marginal rate of 40% and an exemption for the first \$30,000 of income. The portion to the left of \$30,000 can be viewed as a transfer program having a value of \$12,000, a 40% phase-out rate, and a breakeven point of \$30,000. (Numerous other interpretations are also possible, including transfers that are not fully phased out until after \$30,000 but with an income tax exemption of less than \$30,000.) Further elaboration regarding transfers will be offered in section 6.

Expression (3.5) and Figure 3.2 also help illustrate how the degree of redistributiveness is not intimately connected to whether an income tax has graduated rates. Suppose, for example, that $t = 0$ and $g = 0$ (and that there is no revenue requirement). The result would be a totally nonredistributive flat tax: $T(wl)$ would be a horizontal line coincident with the x-axis. Now suppose that $t = 100\%$ and g is set equal to mean income (ignoring incentive effects). This would be a completely redistributive flat tax: $T(wl)$ would be a 45-degree line intersecting the x-axis at mean income and the y-axis at negative of the mean income. Hence, a purely proportional tax covers the full range of redistributive possibilities. It follows that nonlinearities in an optimal tax schedule, considered in subsections 3.3 and 3.4, will have less to do with the extent of redistribution and more to do with accomplishing redistribution in a more efficient manner (although the two dimensions are obviously interrelated).

To derive the optimal linear income tax, the government's maximization problem can be written in Lagrangian form as choosing t and g to maximize

$$(3.6) \int \left[W(u((1-t)wl(w) + g, l(w))) + \lambda(twl(w) - g - R) \right] f(w) dw,$$

where λ is the shadow price of revenue, referring to the constraint (3.4), and (3.5) is substituted into (3.1) so that consumption is expressed in terms of the specific linear tax system under

consideration. The first-order condition for the optimal tax rate can usefully be expressed as

$$(3.7) \quad \frac{t}{1-t} = - \frac{\text{cov}(\alpha(w), y(w))}{\int y(w)\varepsilon(w)f(w)dw},$$

where $y(w) = wl(w)$, income earned by individuals of ability w ; $\varepsilon(w)$ is the compensated elasticity of labor effort of individuals of ability w ; and $\alpha(w)$ is the net social marginal valuation of income, evaluated in dollars, of individuals of ability w .¹¹ Specifically with regard to the latter,

$$(3.8) \quad \alpha(w) = \frac{W'u_c(w)}{\lambda} + tw \left(\frac{\partial l(w)}{\partial g} \right).$$

The numerator of the first term on the right side of (3.8) indicates how much additional (lump-sum) income to an individual of ability w contributes to social welfare – u_c indicates how much utility rises per dollar and W' indicates the extent to which social welfare increases per unit of utility – and this is converted to a dollar value by dividing by the shadow price of government revenue. The second term takes into account the income effect, namely that giving additional lump-sum income to an individual of ability w will reduce labor effort ($\partial l(w)/\partial g < 0$), which in turn reduces government tax collections by tw per unit reduction in $l(w)$.

Expression (3.7) indicates how various factors affect the optimal level of a linear income tax. Beginning with the numerator, a higher (in magnitude) covariance between α and y favors a higher tax rate. In the present setting, $\alpha(w)$ will (under assumptions ordinarily postulated) be falling with income. Note that a larger covariance does not involve a closer (negative) correlation but rather a higher dispersion (standard deviation) of α and y . The dispersion of α will tend to be greater the more concave (egalitarian) is the welfare function W and the more concave is utility as a function of consumption (i.e., the greater the rate at which marginal utility falls with income). Income, y , will have a higher dispersion (again, under standard assumptions) when the distribution of underlying abilities is more unequal. In sum, more egalitarian social preferences, greater individual aversion to risk (more rapidly declining marginal utility of consumption), and higher underlying inequality will all contribute to a higher optimal tax rate.

The denominator of (3.7) indicates that a higher compensated labor supply elasticity favors a lower tax rate. The other terms in the integrand indicate that, *ceteris paribus*, the labor supply elasticity matters more with regard to high-income individuals and at ability levels where there are more individuals (typically the middle of the income distribution) because of the greater

¹¹There are many derivations of this condition, and it is expressed in a variety of equivalent ways. The present notation and manner of expression is close to that in Stiglitz (1987), page 1016, expression (29), and his derivation appears in note 31. See also Atkinson and Stiglitz (1980, pp. 407-08). These derivations, it should be noted, typically do not take into account that some individuals (those of low ability) will choose not to work, in which case (3.2) no longer characterizes their behavior (because they are at a corner solution). This problem is more often addressed in analyses of the optimal nonlinear income tax and in simulations.

sacrifice in revenue. Note further that, if this compensated elasticity is taken to be constant, as is common in performing simulations, then the denominator is just the elasticity weighted by average income.

The foregoing exposition is incomplete in not emphasizing the various respects in which income effects are relevant (they influence α and also λ) and in ignoring that the values on the right side of (3.7) are endogenous. Especially for the latter reason, the literature has relied heavily on simulations.

The most-reported optimal linear income taxation simulations are those of Stern (1976). For his preferred case – an elasticity of substitution of 0.4,¹² a government revenue requirement of 20% of national income, and a social marginal valuation of income that decreases roughly with the square of income – he finds that the optimal tax rate is 54% and that individuals' lump-sum grant equals 34% of average income. (To put these figures in perspective, it should be understood that these estimates refer to the combination of all taxes; all government expenditures and all redistribution are financed by this single tax.) To illustrate the benefits of redistribution, he finds that a scheme that uses a lower tax, just high enough to finance government programs (that is, with a grant of zero), produces a level of social welfare that is lower by an amount equivalent to approximately 5% of national income.

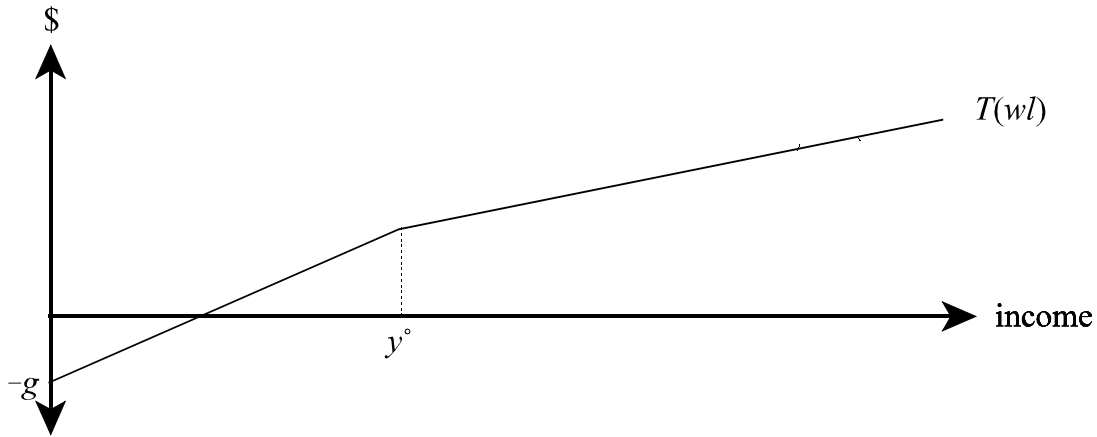
Stern considers a number of other variations. If there is virtually no weight on equality, the optimal tax rate is only 25%, whereas if there is extreme weight on equality, specifically, the maximin case, the optimal tax rate is 87%. Returning to his central case, an extremely low labor supply elasticity implies an optimal tax rate of 79%, and an elasticity as high as had been used in some earlier literature implies an optimal tax rate of 35%. Additionally, his central estimate assumes that (nonredistributive) government expenditures are approximately 20% of national income. In the absence of the need to finance such expenditures, the optimal tax rate is 48%, and if expenditures were twice as high, the optimal tax rate is 60%.

3.3. Two-bracket income tax

Before proceeding to the general optimal nonlinear income tax problem, it is illuminating to consider briefly a simpler extension. A two-bracket income tax applies a constant rate t_1 to all income up to some specified level y° and another constant rate t_2 to all income over the specified level y° . See Figure 3.3 for an illustration in which $t_1 > t_2$.

¹²In many simulations, including this one by Stern, investigators calibrate labor supply responsiveness by the elasticity of substitution between consumption and labor in a CES (constant elasticity of substitution) utility function. Such elasticities do not directly correspond to a compensated or uncompensated elasticity of labor supply. In fact, Stern's 0.4 elasticity of substitution corresponds to a case in which the uncompensated labor supply elasticity is negative.

Figure 3.3
Two-Bracket Income Tax Schedule



Here, the government chooses t_1 , t_2 , y° , and g to maximize social welfare.

This problem has been explored by Slemrod et al. (1994). They report simulations for an optimal two-bracket income tax using functional forms and parameters similar to those employed by Stern (1976) and others. In all of the cases they consider, the optimal upper-bracket marginal tax rate is less than the optimal lower-bracket rate. Nevertheless, in all simulations in which the optimal transfer, g , is positive, the overall income tax schedule is progressive, which one should recall is defined as exhibiting rising average tax rates. In the case closest to Stern's central case, the optimal linear income tax has a rate of 58% whereas the optimal two-bracket tax has a marginal rate of 60% on low incomes and 52% on high incomes.

The intuition behind their results is that the lower rate on high-income individuals induces greater labor effort and thus raises more revenue without having to sacrifice revenue on income subject to the lower-bracket rate. This allows a larger grant g to be financed. Put another way, raising the bottom rate by Δt_1 , while keeping the top rate fixed, is inframarginal regarding upper-bracket individuals; it collects $\Delta t_1 y^\circ$ from them without distorting their labor supply. Indeed, there is also an income effect on upper-bracket individuals that further increases their labor supply and thus revenue. Interestingly, as the social preference for equality increases, not only do the tax rates and level of grant increase, but the absolute size of the gap between the two tax rates widens in their simulations; that is, a greater preference for equality makes it optimal for the marginal rate on low-income individuals to be further above the marginal rate on high-income individuals. The intuition is essentially that just noted: Allowing the first rate to be higher enables additional revenue to be raised from high-income individuals to fund a higher transfer g , and this increase in g is relatively more valuable the greater the social benefit from redistribution.

3.4. Nonlinear income tax

Returning to the more general formulation of the optimal income taxation problem described in subsection 3.1 and depicted in Figure 3.1, the government chooses a tax schedule

$T(wl)$ to maximize the SWF (3.3) subject to a revenue constraint (3.4) and constraints (3.2) requiring that individuals of all ability levels be maximizing their utility, taking the tax schedule as given. Mirrlees (1971) and subsequent investigators employ control-theoretic techniques to address this problem. In this maximization, the constraints regarding individuals' maximizing behavior entail that no individual of any type w will prefer the choice specified for any other type w° . (Readers may recognize this problem as related to the revelation principle used in work on mechanism design.¹³)

This analysis can be summarized in a first-order condition for the optimal marginal tax rate at any income level y^* , where w^* and l^* correspond to the ability level and degree of labor effort supplied by the type of individual who would earn y^* . Following the presentation in Atkinson and Stiglitz (1980), who make the simplifying assumption that utility is separable between consumption and labor effort, adding the further assumption (discussed below) that marginal utility u_c is constant, conforming the notation, and engaging in some additional reshuffling, the condition can be expressed as¹⁴

$$(3.9) \frac{T'(w^*l^*)}{1 - T'(w^*l^*)} = \frac{1 - F(w^*)}{\xi^* w^* f(w^*)} \frac{\int_{w^*}^{\infty} \left(1 - \frac{W'(u(w))u_c}{\lambda}\right) f(w)dw}{1 - F(w^*)},$$

where $\xi^* = 1/(1+l^*u_l/u_l)$ – which, when marginal utility is constant as assumed here, equals $\varepsilon/(1+\varepsilon)$, where ε is the elasticity of labor supply. (This ε is often stated to be the compensated elasticity, but with constant marginal utility of consumption there is no income effect, so the compensated and uncompensated elasticities are identical.)

To aid in understanding expression (3.9), it is helpful to have in mind a simple perturbation of the income tax schedule that is used, for example, by Saez (2001). If one begins with some tax schedule $T(wl)$, assumed to be optimal, it must be that no slight adjustment to the schedule will change the level of social welfare. Consider an adjustment that slightly raises the marginal tax rate at some income level, y^* (say, in a small interval from y^* to $y^*+\delta$), leaving all other marginal tax rates unaltered. There are two effects of such a change. First, individuals at

¹³Relatedly, following Stiglitz (1982a), many have advanced intuition and derived results by considering models with a finite number of types of individuals, often two. (This analysis parallels similar work on adverse selection in insurance models and on nonlinear pricing.) Corresponding incentive-compatibility constraints require that individuals will not wish to mimic other types, the problem in the case of redistributive taxation usually being that high-ability types may wish to mimic low-ability types in order to pay lower taxes.

¹⁴The relationship between Atkinson and Stiglitz's (1980) expression (13-54) on page 417 and that in the text is entirely straightforward except that their term ξ^* appears in the numerator rather than in the denominator. The difference in how ξ^* is defined (that here is the reciprocal of theirs) accounts for the difference in placement. The reason for the deviation is that it is convenient to follow convention and employ an ξ^* that corresponds more directly (and in particular is positively related) to the elasticity of labor supply. (Additionally, the assumption that u_c is constant allows some further simplification.) Expression (3.9) and Atkinson and Stiglitz (1980) are essentially identical to Stiglitz (1987) (expression (25) on page 1007 and the expression in note 17 on page 1008), Diamond (1998) (expression (10) on page 86), Dahan and Strawczynski (2000) (expression (2) on page 682), and Auerbach and Hines (2002) (expressions (4.12) and (4.15) on pages 1381-82). It is also similar to the two formulations in Saez (2001, p. 215).

that income level face a higher marginal rate, which will distort their labor effort, a cost. Second, all individuals above income level y^* will pay more tax, but these individuals face no new marginal distortion. That is, the higher marginal rate at y^* is inframarginal for them. Since those thus giving up income are an above-average slice of the population (it is the part of the population with income above y^*), there tends to be a redistributive gain.

Expression (3.9) can readily be interpreted in terms of this perturbation.¹⁵ Begin with the first term. Revenue is collected from all individuals with incomes above y^* , which is to say all ability types above w^* ; hence the $1-F(w^*)$ in the numerator. This factor favors marginal tax rates that fall with income: As there are fewer individuals who face the inframarginal tax, the core benefit of higher marginal rates falls. In the extreme, if there is a highest known type in the income distribution, the optimal marginal rate at the top would be zero because $1-F$ would be zero: A higher rate collects no revenue but distorts the behavior of the top individual.¹⁶ However, when there is no highest type, known with certainty in advance, this result is inapplicable. Furthermore, even with a known highest type, simulations suggest that zero is not a good approximation of the optimal marginal tax rate even quite close to the top of the income distribution, so the zero-rate-at-the-top result is of little practical importance.¹⁷

Raising the marginal rate at a particular point distorts only the behavior of the marginal type, which explains the $f(w^*)$ in the denominator of the first term. For standard distributions, this factor is rising initially and then falling, which favors falling marginal rates at the bottom of the income distribution and rising rates at the top. The denominator also contains weights of ξ^* , indicating the extent of the distortion, and w^* , indicating how much production is lost per unit of reduction in labor effort. The elasticity is often taken to be constant, though some empirical evidence on the elasticity of taxable income (see subsection 11.3) supports a rising elasticity due to the greater ability of higher-income individuals to avoid taxes.¹⁸ This consideration may favor marginal rates that fall with income. Finally, w^* is rising, which also favors falling marginal rates: The greater the wage (ability level), the greater the revenue loss from a given decline in labor effort.

The second term applies a social weighting to the revenue that is collected. The integrand in the numerator is the difference between the marginal dollar that is raised and the dollar equivalent of the loss in welfare that occurs on account of individuals above w^* paying more tax. As in the interpretation of (3.7), u_c is the marginal utility of income to such individuals, W' indicates the impact of this change in utility on social welfare, and division by λ , the shadow

¹⁵Just as when interpreting the first-order condition (3.7) for the linear income tax, income effects and the endogeneity of terms being interpreted will be ignored. The latter problem is more serious here because parameters on the right side of (3.9) depend implicitly on marginal tax rates other than at y^* (through the term $W'u_c/\lambda$).

¹⁶This result first appears in Phelps (1973) and Sadka (1976) and is explored in some detail by Seade (1977). In (3.9), $1-F$ also appears in the denominator of the second term; however, the integral in the numerator of the second term also equals zero. As w^* approaches its maximum, the second term as a whole approaches 1 minus the welfare weight on the top individual whereas the first term approaches zero.

¹⁷See, for example, Tuomala (1990).

¹⁸See, for example, Alm and Wallace (2000), Auten and Carroll (1999), Gruber and Saez (2002), and Moffitt and Wilhelm (2000).

price on the revenue constraint, converts this welfare measure into dollars.¹⁹ This integral is divided by $1-F(w^*)$, which makes the second term an average for the affected population.

This term tends to favor marginal rates that rise with income. The greater is w , the lower is W' (unless the welfare function is utilitarian, in which case this is constant) and the lower would be the marginal utility of income u_c (had we not abstracted from this effect in the assumptions); hence at higher w^* , the average value of the term subtracted in the integrand is smaller, making the entire term larger. Note further that if social welfare or utility is reasonably concave, $W'u_c$ will approach zero at high levels of income, at which point this term will be nearly constant in w^* . That is, the term favors rising marginal tax rates when income is low or moderate, but has little effect on the pattern of marginal tax rates near the top of the income distribution.²⁰

Because of difficulties in determining the shape of the optimal income tax schedule by mere inspection of the first-order condition (3.9), analysts beginning with Mirrlees (1971) have used simulations to help join the theoretical analysis with empirical estimates of labor supply elasticities and of the distribution of skills or income in order to provide further illumination. The discussion here will emphasize how the shape of the optimal nonlinear income tax varies from linearity because subsection 3.2 on the optimal linear income tax already reports how the overall level of marginal tax rates is affected by various parameters of the problem. Tuomala (1990) offers a useful survey and set of calculations. Perhaps his most notable conclusion is that, in all the cases he reports, marginal tax rates fall as income increases, except at very low levels of income. Mirrlees's (1971) original calculations had displayed a similar tendency, but subsequent researchers questioned the extent to which this result may have depended on the social preferences he stipulated or the arguably high labor supply response he assumed. Subsequent work, however, suggests that a greater social preference for equality or a lower labor supply response tends to increase the level of optimal marginal tax rates but does not generally result in a substantially different shape.

Some more recent work explores further whether there exist circumstances in which optimal marginal tax rates rise with income. Kanbur and Tuomala (1994) find that when inequality in individuals' abilities (wages) is significantly greater than previously assumed (but in ranges they suggest to be empirically plausible), optimal marginal tax rates do increase with income over a substantial range, although for upper-income individuals optimal marginal rates still fall with income. Diamond (1998) examines a Pareto distribution of skills, instead of the

¹⁹Another natural way to think of the experiment of raising the marginal rate $T'(w^*/l^*)$ is to suppose further that the additional revenue will be used to increase the uniform grant. The marginal social value of increasing the grant will, at the optimum, necessarily equal the shadow price λ of government revenue.

²⁰Brito and Oakland (1977) and Seade (1977) showed that the optimal marginal tax rate at the bottom of the distribution is zero, a phenomenon that can be understood by reference to this term: If the higher marginal rate applies to literally everyone, so they all pay the same increment in tax, then there is no redistribution, but there still is distortion of the lowest type, who is subject to a positive marginal rate. However, since it is typical that the optimum has all individuals below some low ability level not working, it is not in fact the case that there is no redistribution from applying a positive marginal rate to the lowest type who chooses to work, and Ebert (1992) shows that a positive marginal tax rate at the bottom is indeed optimal in this case.

commonly used lognormal distribution, under which the $(1-F)/f$ component of (3.9) rises more rapidly at the top of the distribution, and finds that optimal marginal tax rates are rising at the top. However, Dahan and Strawczynski's (2000) simulations indicate that Diamond's result was driven in large part by his additional assumption that preferences were quasi-linear, thus removing income effects. (Nevertheless, their diagrams do suggest that, consistent with Diamond's claim, moving from a lognormal to a Pareto distribution favors higher rates – still falling, but notably less rapidly – at the top of the income distribution.) Saez (2001), using income distribution data in the United States from 1992 and 1993, finds that the shape of the distribution of $(1-F)/wf$ is such that optimal rates should fall substantially well into the middle of the income distribution, to an income of approximately \$80,000, rise until approximately \$200,000, and then be essentially flat thereafter.²¹

Another important conclusion in Mirrlees's (1971) original work is that the optimal nonlinear income tax is approximately linear. If this is true, it may be that there is little loss in social welfare if only a linear income tax (which may have administrative advantages) is used. Subsequent investigators report a range of cases in which the optimal nonlinear income tax departs more substantially from a linear tax, but they do not generally report how much welfare loss would be involved in using only a linear scheme.

An additional result from the simulations is that, at the optimum, a nontrivial fraction of the population does not work, and this fraction is larger when social preferences favor greater redistribution and when the labor supply elasticity is higher. This outcome should hardly be surprising because, as the analysis of (3.9) and the simulations suggest, high marginal rates tend to be optimal at the bottom of the income distribution, along with a sizable grant. Relatedly, little productivity and thus little tax revenue is sacrificed when those with very low abilities are induced not to work (whereas substantial revenue is raised from the rest of the population, for whom marginal tax rates on their first dollars of income are inframarginal).

3.5. *Elaboration*

3.5.1. *Taxation of earning ability*

The need to use a distortionary labor income tax to achieve distributive objectives is premised on the infeasibility of individualized lump-sum taxes based on individuals' earning ability, which would be nondistortionary. The assumption is that differences in earning ability are unobservable, so income, a signal of earning ability, is taxed instead. However, given that income taxation is distortionary and, as a result, society cannot fully meet its desired distributive

²¹For example, in his simulation with a utilitarian welfare function, a compensated elasticity of labor supply of 0.5, and a functional form for utility that has income effects, his optimal schedule has a marginal rate near 80% at the bottom of the income distribution that falls to approximately 40% at \$80,000, and then rises to nearly 70% at the upper end, where it roughly levels off. However, his functional form for utility has income effects that rise with income to such an extent that the uncompensated elasticity approaches zero as w increases, which favors higher marginal rates at the top than otherwise. See also Dahan and Strawczynski (2004), who explore the role of varying assumptions about the concavity of utility in consumption and in leisure and about the distribution of abilities in determining the optimal asymptotic marginal tax rate.

objective, and that income itself is neither costlessly nor accurately observable (see section 11), it is worth considering the possibilities for basing taxation more directly on ability.

One strategy would be to attempt to observe individuals' wages or to infer wages from income and hours. Hours, however, are difficult to observe and both hours and wages are manipulable, such as by extending reported hours and lowering the reported wage (keeping earnings constant, and thus both employer and employee indifferent); self-employment poses a particularly serious problem. Another approach would be to measure proxies of earning ability, such as through testing. Unfortunately, skills measurable by testing explain only some of the variance in earnings ability. Furthermore, if taxes were to be based on test results or other ability measures, individuals would adjust their performance and thereby distort the measurement. A third technique – one sometimes employed – is to adjust taxes and transfers for observable attributes, such as physical disability, age, or family composition.

There has been little formal analysis of the taxation of earning ability. Stern (1982) compares an ability tax supplemented by a purely proportional income tax and an optimal nonlinear income tax. He assumes that there will be classification errors with an ability tax and considers how large the errors have to be to make the nonlinear income tax preferable. He finds that, the greater the preference for equality, the less attractive is an ability-tax scheme because mistakes in which low-ability individuals are misclassified as high types are more socially costly. Unfortunately, his comparison is not clean because he allows a more powerful (nonlinear) income tax when there is no ability tax; moreover, he uses a model with only two types of individuals, which further increases the relative power of a nonlinear income tax.

A broader approach would be to suppose that there exists an imperfect signal (or signals) of ability and allow the government to make the tax and transfer schedule a function of the signal. The signal, call it θ , could be an index of discrete classifications or a continuous variable. Then, the first-order condition for the optimal nonlinear income tax problem, expression (3.9), could be restated, showing that the tax schedule and the distribution and density functions also depend on θ , giving us $T(w^*, l^*, \theta)$, $F(w^*, \theta)$, and $f(w^*, \theta)$, respectively.²² (Note that the separate tax schedules would be linked in a common optimization by the shadow price λ .) This approach will be used in subsection 6.2 to address the optimal form of categorical assistance under transfer programs. As a special case, if one supposes that one of the groups is homogeneous (all of one type), the optimal schedule for that group would involve a zero marginal tax rate, with all redistribution to or from the group accomplished through the group's lump-sum transfer. This is the structure of Akerlof (1978), in which he assumes that a subset of the lowest-ability group can be identified perfectly ("tagged").

3.5.2. *Additional considerations*

In addition to factors explored elsewhere in this survey, a number of considerations

²²One could also allow the utility function in expression (3.9) to depend on θ , recognizing, for example, that both utility levels and the marginal utility of consumption could be affected by such observable characteristics as disabilities or family composition, the latter case being the subject of section 10.

further complicate the optimal income taxation problem. One is that income may be a noisy signal of ability, whether because of variations in occupations (for a given ability, one job may pay more to compensate for specific disamenities) or in preferences (an individual may earn more not because of greater ability but rather due to a higher marginal utility of consumption or a lower marginal disutility of labor effort). Another possibility is that individuals may have preferences concerning redistribution itself, perhaps due to altruism or envy.²³ Other topics that have been explored include liquidity constraints²⁴ and general equilibrium effects of redistribution on the distribution of pre-tax wages.²⁵ Some of these factors may make redistribution more attractive than otherwise, some less attractive, and some are indeterminate without further specification of the model or parameter values. Most of these subjects have received only modest attention despite their potential importance to the optimal income taxation problem.

4. Commodity Taxation

The analysis of labor income taxation may be extended by considering a setting in which consumption consists not of a single, composite good but a range of goods and services, and each type of consumption may be taxed or subsidized at its own rate.²⁶ Commodity taxation is important in its own right, for it is possible to tax commodities differentially and this is often done (e.g., taxes on gasoline, hotel stays, alcohol, and tobacco). Additionally, in general sales tax or value-added tax (VAT) systems, it is common to apply differential rates, such as by providing rate reductions or exemptions for purchases of food. Whether luxury taxes are desirable on redistributive grounds is another sort of question directly investigated in this section.

Moreover, commodity taxes are important conceptually because they provide a basis for analyzing (directly or by extension) a number of other subjects.²⁷ For example, taxation of savings can be viewed as differential taxation of future versus present commodities, and transfer (estate and gift) taxes are differential taxes on different forms of consumption by donors. Other subjects, including expenditures on public goods and corrective taxes, can also be analyzed by

²³See, for example, Hochman and Rodgers (1969) on the possibility that the rich benefit from redistribution to the poor, Pauly (1973) on redistribution as a local public good, Veblen (1899), Duesenberry (1949), Boskin and Sheshinski (1978), Frank (1984a, 1984b, 1985, 1999), and Tuomala (1990) on individuals' concern for status, and Easterlin (1973, 1974, 2001), Frank (1984b, 1985), and Veenhoven (1991) on the possibility that individuals' long-run preferences may be largely relative.

²⁴See, for example, Hoff and Lyon (1995), Hubbard and Judd (1986) (and Hall's and Summers's comments thereon), and Polinsky (1974).

²⁵See, for example, Feldstein (1973), Allen (1982), Carruth (1982), and Stiglitz (1982a).

²⁶Commodity taxation was traditionally referred to as a form of indirect taxation, in contrast to an income tax (or personal consumption tax), which was described as direct taxation. The standard interpretation is that direct taxes can plausibly be tailored to individuals' circumstances, allowing notably for uniform per capita taxes or transfers and for nonlinear taxation. By contrast, indirect taxes, such as commodity taxes, are impersonal; they do not allow a uniform levy because individuals cannot (at least for purposes of indirect taxes) be identified. Relatedly, nonlinear indirect taxation is presumed to be impossible because of the infeasibility of charging different rates that depend on the amount an individual consumes, which would require identification of who purchases commodities and also that resale (arbitrage between individuals whose different consumption choices lead them to face different marginal tax rates) be preventable.

²⁷Perhaps the closest case involves tax preferences such as deductions, exemptions, or credits for particular activities (such as energy conservation) in income tax systems, which are similar to direct subsidies.

reference to the basic commodity taxation model. See subsections 7.2 and 8.3. As will become apparent, this section contains a formalization of the distribution-neutral approach presented in subsection 2.2 that is applicable to a broad range of tax and other governmental policies, including most of those that are not concerned exclusively with redistribution (i.e., the pure optimal income tax problem of section 3).

To foreshadow the results, the main conclusion for the basic case is that no differentiation in commodity taxes – equivalent to a system of no commodity taxes or subsidies – is optimal. This important result was established by Atkinson and Stiglitz (1976) for the case in which the nonlinear income tax is set optimally. The exposition here will follow Kaplow (2006a), who extends their result to the more general case in which one begins with an arbitrary nonlinear income tax in an intuitive manner that uses the previously described distribution-neutral approach.²⁸ The argument shows that, in a basic setting, if the income tax is adjusted to hold distribution constant, labor supply also remains unchanged, so the only effect of commodity taxation is on the allocative efficiency of individuals' consumption decisions. The optimal result, therefore, involves no differential taxation; indeed, the elimination of differential commodity taxation can be accomplished in a manner that results in a Pareto improvement. Likewise, any reform of a system of commodity taxes and subsidies in the direction of simple efficiency with regard to consumption choices can be implemented in a way that makes everyone better off.

4.1. Model

The model employed in section 3 for studying income taxation can be modified to incorporate commodity taxation as well. Instead of a single, composite consumption good c , it is now supposed that individuals may spend their after-tax-and-transfer income, $wl - T(wl)$, on any of n commodities, x_1, \dots, x_n . Commodity prices (which equal constant unit production costs measured in units of income and thus may be thought of as prices paid to competitive producers) for goods x_i are p_i and commodity taxes are τ_i (which may be subsidies, in which case they are negative). Individuals as consumers thus face net prices of $p_i + \tau_i$, assumed to be positive.

An individual's budget constraint, instead of that given in expression (3.1), is now

$$(4.1) \sum (p_i + \tau_i)x_i(wl) = wl - T(wl),$$

where summations throughout are from i equals 1 to n and the notation $x_i(wl)$ denotes the level of x_i chosen by an individual of earning ability w (and l likewise implicitly refers to the labor effort of an individual of type w). The government's budget constraint, instead of (3.4), becomes

²⁸This approach was first used by Hylland and Zeckhauser (1979) in arguing that distributive concerns should play no role in cost-benefit analysis and was developed further in Kaplow (1996a, 2004). See subsection 7.2. Other discussions of commodity taxation in the presence of nonlinear income taxation that may not be optimal include Konishi (1995) and Laroque (2005). Additionally, Atkinson and Stiglitz (1976) and Deaton (1979) characterize the restrictions on utility functions necessary for no differentiation to be optimal when the optimal income tax is restricted to be linear.

$$(4.2) \int [T(wl) + \sum \tau_i x_i(wl)] f(w) dw = R.$$

Before undertaking the analysis, it is useful to discuss the relationship between the average overall levels of commodity taxation and of income taxation, and also related matters of normalization. Initially, observe that there are infinitely many equivalent ways to describe and implement any commodity tax system. To see this, consider uniform commodity taxes, that is, commodity tax schemes for which $\tau_i = \alpha p_i$, for all i . Compared to a baseline with no commodity taxation, if $\alpha > 0$, everyone pays proportionally more for any bundle of commodities. Such a commodity tax system is equivalent to the imposition of a linear income tax (or to a uniform adjustment of a preexisting, possibly nonlinear, income tax). To see this, examine the budget constraint (4.1) for this commodity tax system when there is no income tax at the outset.

$$(4.3) \sum (p_i + \alpha p_i) x_i(wl) = wl.$$

Factoring $1+\alpha$ outside the summation on the left, dividing both sides by $1+\alpha$, and letting $t = \alpha/(1+\alpha)$ yields

$$(4.4) \sum p_i x_i(wl) = \frac{1}{1+\alpha} wl = (1-t)wl.$$

The left side of expression (4.4) is the cost of consumption in a world with no commodity taxes, and the right side is disposable income for the case of a linear income tax (with no grant). Introducing uniform commodity taxation is indeed equivalent to a uniform shift in the level of income taxation. Put in other words, a uniform consumption tax is equivalent to a linear tax on labor income, a simple result that is useful in examining the differences between consumption taxes and general income taxes (which also reach capital income) and also in understanding the relationships among various forms of consumption taxes, including a VAT. (See subsections 5.1.1 and 12.2.)

Because varying the overall level of commodity taxes is equivalent to varying the level of marginal tax rates under an income tax, which is the subject of the optimal income taxation literature surveyed in section 3, work on commodity taxes and subsidies has focused on the question of whether and when differential commodity tax rates are optimal.

4.2. Analysis

Assume that individuals' utility functions are weakly separable between labor (leisure) and all other commodities, taken together. That is, their utility functions can be expressed as $u(v(x_1, \dots, x_n), l)$, where v is a subutility function. This formulation implies that, 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. Put another way, the ratio of the marginal utilities of consumption for any two commodities, at given levels of consumption of those commodities and of all other commodities,

is independent of the level of labor effort. (For commodities i and j , this ratio is simply $u_v v_i / u_v v_j = v_i / v_j$.) As will be seen, this further implies that changes in the allocation of after-tax income among commodities that are caused by commodity tax reforms (that are compensated in the sense of keeping utility constant) will not affect the choice of labor effort. This separability assumption will be discussed further in subsection 4.3.

Using this framework, a differentiated tax system $\{\tau_1, \dots, \tau_n\}$, $T(wl)$ is one for which there exists i, j such that $(p_i + \tau_i) / (p_j + \tau_j) \neq p_i / p_j$. In other words, the ratio of net prices of at least one pair of goods does not equal its production cost ratio.

Assume that there exists some differential taxation and consider a commodity tax reform that eliminates all differentiation, specifically, by moving to a regime in which $\tau_i = 0$, for all i . Suppose that as an initial matter this commodity tax reform is combined with a distribution-neutral (offsetting) income tax adjustment that has the feature that every individuals' utility remains unchanged. Moving to the new commodity tax vector will tend to change individuals' utility because they no longer pay commodity taxes (or receive subsidies) and because, with a new relative price vector, they will change their consumption vectors. Whatever is the net effect on utility for any ability level w and given labor effort $l(w)$, define an intermediate income tax schedule $T^\circ(wl)$ at each income level so as to offset the net effect on utility. That is, examine an income tax schedule $T^\circ(wl)$ that has the property that, if all individuals (of every type w) continue to choose the same level of labor effort $l(w)$ as under the initial tax system, then their utility will be unchanged.²⁹

This reform, consisting of the elimination of commodity taxation and an offsetting income tax adjustment, can be shown to induce individuals to choose the same level of labor effort. Initially, observe that $T^\circ(wl)$ has the property that it leaves subutility v unaffected for all levels of income. That is, stated in reduced form, $V(wl) = V^\circ(wl)$ for all wl , where V is the maximized value of v (the value of v obtained at each wl when individuals choose the x_i 's optimally, taking the commodity and income tax regime as given). This result about the subutility functions must be true because the income tax schedule $T^\circ(wl)$ is constructed such that $u(V(wl), l) = u^\circ(V^\circ(wl), l)$; because the function u does not change, the levels of subutility must be unchanged for each given level of l and thus of wl . To be sure, changing commodity taxes and changing the income tax schedule each will alter the level of subutility V produced by a given level of income wl ; however, because of how the income tax schedule adjustment is constructed, these two sets of effects will be precisely offsetting. Furthermore, if the level of subutility V is unchanged for every possible level of income, then it also must be true that, for any choice of labor effort l , each type of individual's total level of utility is the same as it was before. In other words, $U(l(w)) = U^\circ(l(w))$ for all $l(w)$, where the reduced form $U(l(w))$ refers to the level of

²⁹It is familiar to refer to this experiment as involving a (utility) compensated change, so at each level of income, wl , $T(wl) - T(wl)^\circ$ is the (Hicksian) compensating variation associated with the change in relative prices due to the commodity tax reform. (A difference is that, in the present formulation, labor supply is held constant, although it is to be demonstrated that this is indeed the case in any event.)

utility achieved for any choice of l by the given type w .³⁰ Since utility as a function of labor effort is precisely the same under the new, intermediate regime as it is under the initial regime, it follows that whatever level of labor effort $l(w)$ maximized $U(l(w))$ will also maximize $U^\circ(l(w))$. Accordingly, individuals will indeed choose the same level of labor effort under the newly constructed intermediate regime.

To complete the argument, consider the effect on revenue of the elimination of differential commodity taxation combined with the distribution-neutral tax adjustment involving the intermediate income tax schedule, $T^\circ(wl)$. The income tax adjustment, recall, derives from two effects of the commodity tax reform. First, the reform changes individuals' commodity tax payments, even assuming that they do not change their consumption decisions, and the income tax adjustment offsets this effect. Clearly, this combination will be revenue-neutral as a whole, because each type of individual's income tax payments rise or fall by just the amount that commodity tax payments fall or rise. Second, due to the changes in relative prices, individuals will be induced to change their consumption of various commodities. This change can only increase utility (for otherwise individuals would not choose to adjust their consumption choices). Hence, the income tax schedule adjustment that offsets this effect on utility will result in additional revenue being raised, generating a surplus.³¹ Therefore, one can further adjust the income tax schedule to rebate this surplus, say in equal amounts to every individual. Because everyone's utility is the same under the intermediate regime and the initial regime, it must be that, with the rebate, everyone's utility is greater in the resulting regime that eliminates differential commodity taxation than it is in the initial regime.

Accordingly, it is possible to eliminate differential commodity taxation in a manner that generates a Pareto improvement – specifically, by adjusting the income tax in a manner that produces a reform package that is overall distribution neutral. As shown in Kaplow (2006a), a similar approach can be used to show that proportional reductions in differential commodity taxation as well as other partial reforms that are efficient in the simple sense of reducing the amount of resources required to achieve individuals' initial levels of utility can be implemented in combination with an offsetting income tax adjustment so as to make everyone better off.³² In the set of cases under consideration, a distribution-neutral reform also keeps labor supply constant; hence, the income redistribution problem, concerned with both distribution and labor supply distortion, can be separated from the commodity tax problem, which only affects individuals' choices among commodities. In other words, one can legitimately ignore distribution and labor supply because the reform packages under consideration hold both constant. When this is possible, it should not be surprising that standard efficiency principles indicate which commodity tax reforms are optimal.

³⁰These functions, because denominated in utility, will differ among individuals with different earning abilities. However, with homogeneous preferences and weak leisure separability, as assumed here, the same tax adjustment (denominated in dollars) will work for all individuals.

³¹For a formal demonstration of the entire argument, see Kaplow (2006a).

³²Dixit (1975) and others characterize efficient partial reforms, although in a Ramsey model in which there is no concern for distribution and no income tax. See subsection 4.4.

4.3. *Qualifications*

There are a number of qualifications to the foregoing conclusion that differential commodity taxes and subsidies are inefficient. Most obvious is the case in which the consumption of some goods involves externalities, on which see section 8. Two additional qualifications concern the argument that a distribution-neutral (offsetting) income tax adjustment will not affect labor supply.

The assumption that individuals' utility is weakly separable in labor (leisure) rules out one source of possible labor supply effects. To illustrate the phenomenon, consider that taxing books, movie tickets, or swim suits (relative to other goods) tends to make leisure relatively less attractive. Given the distortion in favor of leisure caused by the income tax, this effect would be beneficial. Likewise, subsidizing substitutes for leisure, such as labor-saving devices, would tend to be advantageous. Because of the second-best setting that exists due to the assumed impracticality of taxing leisure directly (to offset the effect of taxing labor), it is optimal to distort other activities if (but only if) the distortion of the labor-leisure choice is thereby mitigated.³³ Some possible examples are identified in empirical work: Barnett (1979) finds that consumers substitute durable goods for leisure (and thus are a candidate for subsidies), Iorwerth and Whalley (2002) find that restaurant meals substitute for leisure whereas raw food complements leisure (implying that it may be optimal to reverse the common practice, superficially appealing on distributive grounds, of taxing restaurant meals but exempting sales of raw food from sales taxes), and West and Williams (2004) find that gasoline is a leisure complement and thus should be taxed (by more than the level of the externalities associated with gasoline consumption).

As suggested by Mirrlees (1976), the inability to tax ability directly (see subsection 3.5.1) provides another possible basis for differential taxation in cases in which preferences for some commodities depend directly on individuals' abilities (rather than on their incomes, which reflect their abilities). Specifically, it tends to be optimal to impose a heavier burden on commodities preferred by the more able and a lighter burden on those preferred by the less able. For example, efficiency may favor taxing expenditures related to fine art (acquisitions of art objects, attendance at museums and the opera, and purchases of high-brow literature) and subsidizing simpler pleasures (bowling, attendance at professional wrestling, and viewing of trashy movies). Notice, however, that this argument does not imply that one should tax luxuries in general; because higher demand for luxuries is, by definition, a consequence of higher income, taxing luxuries distorts the labor-leisure decision. The present consideration is distinctive because it depends on preferences that differ with ability per se. Put somewhat differently, assuming two individuals were to earn the same income, the relevant question is whether the higher-ability person would, relative to the other, prefer a different mix of commodities.

The strong conclusion that reducing differential commodity taxation can be accomplished in a manner that yields a Pareto improvement is qualified by a number of additional considerations: heterogeneity of individuals' preferences, administrative and enforcement

³³This point is first suggested by Corlett and Hague (1953), although in a Ramsey tax setting.

concerns, political economy considerations, and other factors. It should be emphasized, however, that most qualifications to the basic conclusion are largely orthogonal to standard redistributive considerations. Notably, one does not seek adjustments that are directly redistributive, such as by (relatively) taxing luxuries and subsidizing necessities. Indeed, as suggested by the foregoing example of expenditures on meals and on unprepared food, opposite adjustments may well be optimal.

4.4. Ramsey taxation

Most surveys and textbook treatments of optimal taxation devote substantial attention to Ramsey's model of taxation and the principles derived therefrom. See, for example, Atkinson and Stiglitz (1980), Auerbach (1985), Auerbach and Hines (2002), and Sandmo (1976). Ramsey's (1927) seminal paper addresses how to raise a given amount of revenue through commodity taxation when distributive considerations are ignored and an income tax is assumed to be unavailable. The familiar prescription is that, in the special case in which compensated demand schedules are independent (zero cross-elasticities), taxes should be inversely proportional to the elasticity of demand because distortion is less when the elasticity is lower.³⁴ The major qualification involves distribution, which favors higher taxes on goods consumed disproportionately by higher-income individuals. See, for example, Atkinson and Stiglitz (1972, 1976), Feldstein (1972), and Diamond (1975). These competing considerations pose a tradeoff, especially because it often is supposed that necessities, consumed disproportionately by the poor, have relatively inelastic demands, and conversely for luxuries.

In addition to being widely taught, the Ramsey tax model and principles have provided the basis for extensive literatures on particular subjects, such as the taxation of capital, taxation and imperfect competition, and public sector pricing.³⁵ However, the foregoing analysis of optimal commodity taxation – which suggests that uniformity is optimal in the basic case without regard to demand elasticities or whether goods are disproportionately consumed by the rich or the poor – stands in sharp contrast to the leading principles of Ramsey taxation and thus calls into question results in the many literatures that build on the Ramsey model.³⁶ It is useful to set forth this tension briefly and explain why conflicting Ramsey principles are indeed inappropriate in the presence of an income tax.

Begin with the original Ramsey model in which individuals are assumed to be identical and the government's sole objective is to raise revenue with minimal distortion. When one allows for an income tax (linear or nonlinear) – one feature of which is the possibility of a uniform lump-sum tax or subsidy (which, unlike individualized lump-sum taxation, is feasible) –

³⁴Another important result is that, with constant returns to scale in production or the availability of a 100% profits tax, production efficiency is optimal (i.e., no differential taxation of inputs). See Diamond and Mirrlees (1971) and Stiglitz and Dasgupta (1971), and also Dasgupta and Stiglitz (1972) and Mirrlees (1972a) on how this result may differ when distribution is a concern.

³⁵Regarding the latter, taxes or subsidies on private goods correspond to setting public sector prices above or below marginal cost, respectively.

³⁶Not all Ramsey principles differ, notably, Corlett and Hague's (1953) argument (noted in subsection 4.3) that leisure complements (substitutes) should be taxed (subsidized) relative to other commodities.

there is no need to rely on distortionary commodity taxation.³⁷ This result obviously does not depend on any special assumptions about the form of the utility function.

The reason that raising all revenue by uniform per capita taxes is problematic has to do with income distribution, for in a world in which individuals' abilities vary, the poor are hit hard by such a tax, whereas social welfare may be maximized when they receive net transfers. (Likewise, as noted, the simple Ramsey prescription arising from models that assume identical individuals favors commodity taxes that may fall most heavily on necessities.) When distributive concerns are incorporated, however, the analysis in subsection 4.2, drawing on the initial result of Atkinson and Stiglitz (1976), shows that differential commodity taxes also have no role in an overall optimal scheme (under simplifying assumptions examined in subsection 4.3). Although Ramsey rules modified for distributive considerations differ from the simpler prescriptions derived when individuals are assumed to be identical, they still generally involve adjustments that deviate, perhaps substantially, from uniformity – even when separability is assumed so that no differentiation is optimal with an income tax. For example, under Ramsey rules commodities consumed primarily by the rich (poor) should typically be taxed (subsidized) if inequality is sufficiently great and if distributive concerns are sufficiently important. But this result does not hold when an income tax is available. As explained above, any effect of commodity taxation regarding income distribution can better be produced directly, through the income tax, which undertakes redistribution in an across-the-board fashion. (Interestingly, the grant component of the income tax involves a uniform tax when only distortion is a concern, rendering commodity taxes unnecessary, whereas the grant is positive – a subsidy – in most simulations of an optimally redistributive income tax, under which commodity taxes are also unnecessary in the basic case.)

In sum, whether or not distribution is a concern, results derived in the original Ramsey framework, in which no income tax is available, fail to provide proper guidance in a world with an income tax. Accordingly, as Stiglitz (1987) suggests, Ramsey principles may be relevant in developing economies, in which income taxation may be infeasible (though he suggests that other modifications may be required), but not in developed economies. Likewise, as implied by Atkinson and Stiglitz's (1976) original paper and subsequently reinforced by Stiglitz (1987), various models and associated prescriptions based on the Ramsey framework are likewise poor guides when an income tax is available. See also Mirrlees (1994, p. 223) making a similar observation with regard to the analysis of public goods provision. Accordingly – and on account of space constraints – derivations of Ramsey tax principles are not covered here, and the reader is referred to the surveys cited at the outset of this subsection.

5. Other Types of Taxation

This section addresses additional major forms of taxation. As suggested in the

³⁷Following the discussion of normalizations in subsection 4.1, it is sometimes believed that a model with commodity taxation and no income taxation is equivalent to one that also allows linear income taxation. This, however, is incorrect because, as the discussion in the text (and the analysis in subsection 3.2) makes clear, an important feature of a linear income tax is that it permits a uniform lump-sum grant (or tax) g , which a system of pure, anonymous commodity taxation does not allow.

introduction and subsection 2.2, most types of taxation can best be understood and their optimal use properly determined by examining them through interpretations or extensions of the model of optimal labor income and commodity taxation. In this fashion, one can obtain an integrated view of how different tax instruments should be used together to maximize social welfare, thereby achieving the revenue-raising and distributive objectives of taxation.

5.1. Capital Taxation

In sections 3 and 4, income taxation referred to the taxation of labor income. In a static (one-period) model, the question of the optimal tax treatment of income from capital does not arise. Many forms of taxation, including the corporate tax as well as a standard income tax, do reach the returns to capital (savings), so extending the foregoing framework to capital income is important. Many dynamic issues are deferred to section 9; this section focuses on fundamentals.

5.1.1. Income versus consumption taxation

Following Atkinson and Stiglitz (1976, 1980), it is useful to begin by employing the model of commodity taxation to illuminate the difference between a classical, accrual income tax and a pure (cash-flow) consumption tax, taking advantage of the fact that consumption in different time periods can be conceptualized as consumption of different commodities. As subsection 4.1 explains, a uniform commodity tax at rate α (the same as a proportional consumption tax), which gives the budget constraint in expression (4.3), is equivalent to a linear tax on *labor* income at rate $t = \alpha/(1+\alpha)$, which gives the budget constraint in expression (4.4).

To introduce returns to capital and the possible taxation thereof, it is helpful to consider a two-period model wherein individuals work only in period 1 and consume in periods 1 and 2. (Period 1 can be thought of as an aggregate of one's working years and period 2 as retirement years; the extension to more periods or to a continuous time model is straightforward.) Suppose further that there is only one type of commodity in each of the two periods, denoted c_1 and c_2 . That is, we are considering a two-good version of the commodity tax problem in which the first commodity is period 1 consumption and the second commodity is period 2 consumption. Individuals' utility is $u(c_1, c_2, l)$. In this model, a pure labor income tax (equivalent to a uniform commodity or consumption tax) gives the budget constraint

$$(5.1) \quad wl(1 - t) = c_1 + \frac{c_2}{1 + r},$$

where r is the interest rate (and $g = 0$ to simplify the exposition).

By contrast, a standard income tax is defined as a tax on both labor and capital income at the same rate. A common statement, referred to as the Haig-Simons definition, is that the income tax base equals consumption plus changes in wealth, the latter of which in the present model arises on account of earnings on first-period savings. More generally, it includes all returns to capital, such as interest, dividends, and capital gains (the latter determined in principle

on an accrual basis) – and also allowing offsets for negative values (notably, interest payments and capital losses). When the income tax applies to labor and the returns to capital, the budget constraint becomes

$$(5.2) \quad wl(1-t) = c_1 + \frac{c_2}{1+r(1-t)}.$$

In comparing expressions (5.2) and (5.1), it is sometimes noted that a labor income tax is equivalent to an income tax that exempts the return to capital, and, given the aforementioned equivalence between a labor income tax and a consumption tax, that a consumption tax is likewise equivalent to an income tax that exempts the return to capital.³⁸

It is also illuminating to rewrite expression (5.2) as

$$(5.3) \quad wl(1-t) = c_1 + \frac{1+r}{1+r(1-t)} \frac{c_2}{1+r}.$$

Because $(1+r)/(1+r(1-t)) > 1$ when $t > 0$, expression (5.3) indicates that a full income tax is equivalent to a labor income tax combined with a differential tax on second-period consumption. Dividing both sides of (5.3) by $1-t$, this budget constraint can also be written as

$$(5.4) \quad wl = \frac{1}{1-t} c_1 + \frac{1}{1-t} \frac{1+r}{1+r(1-t)} \frac{c_2}{1+r}.$$

Expression (5.4) indicates that a standard income tax is also equivalent to a differential commodity tax scheme under which second-period consumption is taxed at a higher rate than is first-period consumption.³⁹

5.1.2. Capital taxation more generally

A standard income tax can be understood as a special case of a labor income tax combined with a supplemental tax on second-period consumption. To generalize, one can let t_r denote the tax rate applied to the return to capital, r , in which case expression (5.2) becomes

$$(5.5) \quad wl(1-t) = c_1 + \frac{c_2}{1+r(1-t_r)}.$$

³⁸In similar spirit, the Haig-Simons definition is often rearranged to state that consumption equals income minus changes in wealth (net savings or dis-savings), an identity made use of in personal (cash-flow) consumption tax proposals that define the tax base as income minus all savings plus all dis-savings. See subsection 12.2.1.

³⁹The formulations in the text examine proportional income taxes. With nonlinear taxes, one could state equivalences with regard to marginal rates.

When $t_r = 0$, we have a labor income tax or a pure (undifferentiated) consumption tax, and when $t_r = t$, we have a standard income tax. But we may also consider schemes under which t_r may take on any value, positive or negative. The choice between a standard income tax and a consumption tax thus poses a particular slice of the question of the optimal level of t_r . (Note as well that wealth taxes are equivalent to supplemental taxes on second-period consumption.⁴⁰)

The analysis in subsection 4.2 indicates that, when labor is weakly separable in the utility function, so we can write $u(v(c_1, c_2), l)$ (and other qualifications noted in subsection 4.3 are inapplicable), no differentiation is optimal, so t_r should equal zero. This means that a consumption tax is superior to an income tax and, for that matter, to any nonzero tax or subsidy on capital income. See Atkinson and Stiglitz (1976, 1980) and Stiglitz (1987).⁴¹ The intuition is that one can achieve any degree of redistribution by adjusting the rate schedule, so the only remaining question concerns efficiency, as in the original commodity tax problem.⁴² That is, we can ask whether an individual of a given earnings level should be taxed relatively more or less depending on whether more income is allocated to first-period or second-period consumption. In this basic case, neutrality is optimal because it avoids an additional distortion (of the intertemporal pattern of consumption), whereas differentiation would not help to offset the preexisting distortion (of labor supply).⁴³ This benchmark facilitates the analysis of reasons for departure from the zero-tax result, including arguments favoring capital income taxation (although it is unlikely, except on administrative grounds, that the optimal level of t_r would precisely equal t , as under a standard income tax).

One reason for departure is nonseparability. For example, if higher consumption (viewed here as an aggregate in each period) in period 1 enhanced the value of leisure whereas consumption in period 2 has no effect, it would be optimal to subsidize savings relative to first-period consumption. Another is myopia – see, for example, Laibson (1998) – which also may favor savings subsidies.⁴⁴ Additionally, in a general equilibrium setting in which wages are not given, capital taxes or subsidies may be optimal if they favorably influence the distribution of pre-tax income through the effects of changes in the capital stock on wage rates. See Stiglitz (1985b). (Compare the general equilibrium effects noted in subsection 3.5.2.) In this instance

⁴⁰An ex post wealth tax (i.e., a tax on savings plus interest, available for consumption in period 2) or an ex ante wealth tax (i.e., a tax on period 1 savings, which equal $wl(1-t) - c_1$) could be set at the rate $t_r r/(1+r)$. In either case, the result would be the same as that from supplementing a labor income tax at rate t with a capital income tax at rate t_r .

⁴¹The result that no capital taxation is optimal also arises asymptotically in models with infinitely-lived individuals, see Judd (1985), Chamley (1986), and the survey in Auerbach and Hines (2002), although these analyses are in a Ramsey setting, on which see subsection 4.4.

⁴²Accordingly, the notion that consumption taxes are less redistributive than standard income taxes because the rich have more savings and thus more capital income is not emphasized here; adjusting the tax schedule to allow a distribution-neutral comparison clarifies the analysis of intrinsic differences between the two types of taxation. In practice, it is notable that the United States, which relies primarily on the income tax for redistribution, is generally viewed as engaging in less redistribution than many European countries, most of which rely heavily on a VAT, a form of consumption taxation.

⁴³As Feldstein (1978) emphasizes, the extent of intertemporal distortion is not indicated by the compensated elasticity of savings but instead by the effect of differential taxation on consumption across periods. For example, even if the compensated elasticity of savings is zero, it is still true that c_2 falls relative to c_1 as t_r increases.

⁴⁴On taxation and saving more generally, including behavioral theories, see Bernheim (2002). On myopia, capital taxation, and labor supply, see Kaplow (2006d).

and more broadly, when the government cannot directly control the capital stock through debt or other policies, taxation or subsidization of capital serves as a substitute instrument.⁴⁵ Separate arguments that favor consumption taxation over income taxation focus on administrative grounds, some related to issues explored in section 9.⁴⁶ See subsection 12.2.1.

5.1.3. *Corporate taxation*⁴⁷

The corporate income tax (in its classical, unintegrated variant) is levied on equity investment undertaken in the corporate form. Specifically, corporations subject to it pay an income tax on their earnings, and individual taxpayers pay a further round of tax under the personal income tax on dividend distributions. (Individuals also pay tax on interest receipts, but interest payments are deductible to the corporation.) By contrast, investments through sole proprietorships, partnerships, and certain types of corporations are not subject to an entity-level tax; instead, income is attributed to owners who are taxed accordingly.⁴⁸

The corporate tax adds a further layer to the foregoing analysis of capital taxation. Just as one can determine whether capital taxation is efficient by holding the distribution of income constant, so one can assess intrinsic features of the corporate tax most directly by considering changes in its level as part of a reform that keeps the level of capital taxation constant. Viewed in this light, the central feature of the corporate income tax is that capital invested in certain legal forms is subject to a higher level of tax than capital invested in other forms. Moreover, as noted, because interest is deductible, the corporate tax only applies to corporate equity. Such differential taxation tends to distort investment decisions, in the present context by discouraging operation in the corporate form, by encouraging the use of debt rather than equity, and perhaps also (see below) by discouraging dividend distributions, in each case relative to the levels that would be chosen for nontax reasons.⁴⁹

⁴⁵For further exploration using overlapping generation models, see, for example, Atkinson and Sandmo (1980), Atkinson and Stiglitz (1980), Ordoover and Phelps (1979), and Stiglitz (1985b). If individuals differ not only in earning ability but also in their ability to invest successfully – and if, moreover, capital markets are imperfect so those most productive at investment do not manage others’ savings – additional subtle adjustments may be optimal. See Stiglitz (1985b).

⁴⁶It is worth noting that the core difference between income and consumption taxation is less significant regarding existing income tax regimes than may appear to be the case. First, as suggested in portions of sections 9 and 12, actual income taxes exempt or tax at a lower rate much of capital income. (Notably, human capital is largely taxed as it would be under a pure consumption tax; likewise for retirement savings. Imputed income from owner-occupied housing is exempt, dividends and capital gains may benefit from preferential rates (including the exclusion of capital gains at death), and the realization requirement provides substantial deferral on much remaining capital income.) Second, as subsection 9.2.2 indicates, the tax on capital income falls primarily on the riskless return, well below the total return on equity.

⁴⁷See generally Atkinson and Stiglitz (1980), Auerbach (2002), Bradford (1980, 1986), Graham (2003), Gravelle (1994), King (1977), and McLure (1979).

⁴⁸Rules that vary across jurisdictions and over time determine which entities are subject to the corporate tax. In the United States, most large, widely-held entities (and many others) are covered.

⁴⁹Another effect of corporate taxation is that it induces avoidance behavior – including in recent times the increasingly creative use of financial instruments to issue equity-like securities that will be treated for tax purposes as debt – and governmental regulatory responses that themselves consume resources.

A natural question to consider is: Why tax corporations per se?⁵⁰ Most analysts, who emphasize that the burden of the corporate tax is ultimately borne by individuals, are skeptical that good reasons exist. One justification is that the corporate tax prevents avoidance of the individual income tax on capital, for in the absence of a corporate tax, individuals could invest in corporate form and defer taxes on capital income until they withdraw their funds, capturing the interest on tax that would otherwise be due in the interim. However, most proposed reforms involve methods of integration under which such deferral would not be possible.⁵¹ It is also suggested that corporations benefit from limited liability and thus should be taxed; however, the argument is a non sequitur (prices should equal marginal costs, which here may be near zero, not benefits), the corporate tax obligation is not directly related to any such benefits, and other limited liability entities are not subject to the tax. Various additional theories, based on different governmental benefits or other grounds, have been offered, but few relate closely to the form of the corporate income tax and most apply in principle to entities not subject to it.

Regarding distortion, the seminal contributions by Harberger (1962, 1966) present a general equilibrium model that, among other results, shows how the tax is likely to be borne by all capital, not just corporate equity. The basic point is that, in equilibrium, all forms of investment must offer the same after-tax rate of return; with differential taxation, this condition implies differences in before-tax returns, which are the source of distortion. Accordingly, the corporate tax imposes welfare costs if there are nontax reasons – perhaps relating to agency problems, asymmetric information, and costs of financial distress – that some firms would find it efficient to employ the corporate form, use of equity rather than debt, and distribute rather than retaining earnings.⁵² For estimates, see, for example, Goolsbee (1998, 2004), Gordon and MacKie-Mason (1994), Gravelle (1989), Gravelle and Kotlikoff (1989), MacKie-Mason and Gordon (1997), and U.S. Department of Treasury (1992).

An issue that has proved perplexing concerns dividend distributions. The new or tax capitalization view (contrasted with the so-called traditional view) holds that distortion is limited to contributions to new equity because the effect of the corporate tax on preexisting equity is capitalized into share prices in the first instance. See Auerbach (1979), Bradford (1981), and King (1974) developing the new view, and subsequent analysis and surveys in Auerbach (2002), Gravelle (1994), Poterba and Summers (1985), and Zodrow (1991). Under this view, repealing the corporate tax would confer a windfall on previously invested capital – although transition provisions might avoid this effect.⁵³ It is disputed whether the new view is empirically valid. Most analysis of the effects of the corporate income tax, particularly regarding firms' dividend

⁵⁰Justifications and problems that arise in an international setting are not considered here.

⁵¹Methods include treating the corporation as a pass-through entity, like other entities; giving corporations a deduction for dividends paid like their deduction for interest; and giving shareholders a credit for corporate taxes paid or an exclusion for dividend income. See, for example, American Law Institute (1989, 1993), McLure (1979), and U.S. Department of Treasury (1992). Most OECD countries provide some degree of integration, usually providing relief at the shareholder level. See, for example, Messere, de Kam, and Heady (2003).

⁵²Were it not for nontax costs or legal limitations, firms might, for example, use exclusively debt to finance incremental investments, thus avoiding the marginal distortion caused by the corporate tax. See Stiglitz (1973).

⁵³Viewing the benefit to old equity as a pure windfall is subject to doubt because anticipation of such relief from corporate tax would partially offset the existing distortion, especially given the long delay between contemplation of integration, which has been ongoing, and its ultimate enactment. See subsection 9.3.

policy, is confounded by the uncertainty about why corporations pay taxable dividends in the first instance, especially when share repurchases accomplish very similar results but do not subject shareholders to the tax on dividends (but only to taxes on capital gains that often would be lower).

5.2. *Transfer (estate and gift) taxation*

Many jurisdictions impose taxes on voluntary transfers, either nominally on the gifts and estates of donors or, through inheritance or accessions taxes, on the receipts of donees. Whether such taxation, usually limited to large transfers, is appropriate, should be expanded, or should be repealed has proved controversial. See, for example, Aaron and Munnell (1992) and Joint Economic Committee (1999). A closely related issue concerns the treatment of voluntary transfers in income tax systems: Generally, there is no deduction to the donor and no inclusion by the donee (though some, notably Simons (1938), advocate such inclusion). Ordinarily, all that matters will be the aggregate net tax or subsidy on transfers, so the analysis here will proceed accordingly, not distinguishing among these forms of transfer taxation.

Following Kaplow (2001), transfers (hereinafter, generically referred to as gifts) can be analyzed as a specific form of consumption. A donor's utility is given by $u(c, c_\gamma, l)$, where c refers to expenditures on own-consumption and c_γ to expenditures on gifts to others. The donor's budget constraint can be depicted as

$$(5.6) \quad wl - T(wl) = c + (1 + t_\gamma)c_\gamma,$$

where t_γ is a differential tax or subsidy on giving.⁵⁴ The question is the optimal sign and magnitude of t_γ . As with commodity taxation generally and capital taxation, the present analysis – unlike much policy debate – does not consider revenue-raising or redistribution to be central to understanding transfer taxation. The reason, as before, is that the income tax can be adjusted in a revenue- and distribution-neutral fashion, leaving only the efficiency effects that are intrinsic to the specific form of differential taxation. The question presented is whether, at a given level of income, a donor should be taxed relatively more or less on account of giving an additional dollar to a donee rather than spending it on own-consumption.

The answer might appear to be the same as that for the general differential commodity tax problem considered in section 4. With weak separability – if we can write the donor's utility function as $u(v(c, c_\gamma), l)$ – we know that $t_\gamma = 0$ is optimal. One might imagine that, instead, giving is a substitute for leisure (i.e., the less own-consumption, the less valuable is leisure because one has less funds to spend on leisure activities), justifying a subsidy. Or the relationship may be the opposite, for example, if giving more to grandchildren increases the value of time spent with them (though if it is in retirement, labor supply may be unaffected).

⁵⁴It is often imagined that much giving, including all bequests, is from savings; to the extent this is the case, gifts can be embedded in the multi-period model considered in subsection 5.1 on capital taxation.

Such an analysis of giving, however, is incomplete because it ignores the effects of gifts on donees. For each person who is a potential donor, suppose that there is a single potential recipient, whose budget constraint is

$$(5.7) \quad wl - T(wl) + \gamma = c,$$

where the γ in (5.7) equals c_γ in (5.6), the amount given by the donor, and c in (5.7) is total consumption by the donee. Giving by donors thus involves two sorts of externalities. First, there is a positive effect, that on the donee's utility. Even an altruistic donor (see subsection 10.4) considers only the effect of the donee's gain on the donor's own utility, whereas an SWF will also count the utility gain to the donee per se. This suggests a basis for subsidization. Second, gift receipts produce an income effect on donees, leading to a reduction in labor supply.⁵⁵ With a preexisting income tax, this involves a negative externality to the public fisc. (A contrary effect arises to the extent that gifts relax liquidity constraints, such as by enabling investments in human capital or entrepreneurship.⁵⁶) Depending on the relative magnitude of these effects, a subsidy or tax may be optimal.

Although individuals' motives are often irrelevant in economic analysis (for example, it usually will not matter why individuals prefer a particular mix of vacations and home-based leisure activity), motives are important in analyzing voluntary transfers. Whether a gift is motivated by altruism, various forms of warm-glow giving (see Andreoni (1990)), exchange (see Cox (1987) and Bernheim, Shleifer, and Summers (1985)), or accident (notably, accidental bequests due to imperfect annuity markets) may have important effects on how taxes or subsidies affect giving behavior and also on how any particular giving pattern affects donors' and donee's utility. See Kaplow (2001).

A natural extension to consider involves charitable giving.⁵⁷ Though often viewed as a subject in its own right, it clearly is a species of voluntary transfer, and the foregoing model and analysis is largely apt. Donors would be treated in the same fashion, and charitable organizations can be seen as conduits for individual donees (directly, such as when funds are dispersed to the poor, or indirectly, such as when medical research is produced that ultimately benefits victims of disease). The case for subsidy may be greater with many charities on account of the production of public goods; that is, though all pure giving produces a positive externality, the externality may on average be larger with certain charities than with others or than in the case of direct gifts to particular individuals. This may help to explain why subsidies to charitable giving, such as through an income tax deduction, are currently employed.

⁵⁵See, for example, Holtz-Eakin, Joulfaian, and Rosen (1993), Imbens, Rubin, and Sacerdote (2001), and Joulfaian and Wilhelm (1994).

⁵⁶See, for example, Blanchflower and Oswald (1998), Cox (1990), and Holtz-Eakin, Joulfaian, and Rosen (1994a, 1994b).

⁵⁷For a survey, see Andreoni (2005).

5.3. Social security taxation⁵⁸

In many countries, payroll (labor income) taxes are levied on individuals (or, equivalently, on their employers) to fund retirement insurance, referred to in the United States as social security.⁵⁹ At one extreme, if there was no linkage whatsoever between individuals' payroll tax payments and their own retirement benefits, the taxes could be analyzed precisely as before. At the other extreme, if an individual's tax payments funded the equivalent of an individual account, earning the market return – and, moreover, if individuals would have saved at least as much in any event – the system would have no effect at all.

In reality, tax-benefit linkages exist but are complex. In the United States, some individuals receive no marginal benefits for their tax payments (young workers, very low-income workers, some second earners), some pay a negative net tax (because own plus spousal benefits exceed in present value the marginal tax cost), and many individuals pay positive taxes net of benefits at widely differing rates that vary over their working lives. The divergence arises because, on average, many currently working cohorts will receive benefits less than taxes (whereas those first covered by the system received benefits significantly in excess of taxes) – see, for example, Leimer (1994) – and because there is substantial intracohort redistribution, including direct rich to poor redistribution through benefit formulas and supplemental assistance for the poor, offsetting redistribution because retirement annuities are more valuable to those with greater longevity (who tend to be higher-income individuals), and significant transfers among different family units (notably, to married couples having a spouse with no or low earnings). See, for example, Blinder, Gordon, and Wise (1980), Coronado, Fullerton, and Glass (1999), Feldstein and Samwick (1992), and Liebman (2002). Any net tax or subsidy at the margin operates, in principle, like a pure tax on labor income. Accordingly, redistribution through social security is not (as a first approximation) qualitatively different from redistribution through the tax and transfer system.⁶⁰

Two major qualifications are important. First, given the complexity of the formulas relating current taxes to future benefits, that benefits are far into the future and have contingent values, and that there is considerable uncertainty concerning future benefit levels (given that most systems are not in long-term fiscal balance), there is room for substantial heterogeneity in beliefs and outright misperception about tax-benefit linkages. See, for example, Dominitz, Manski, and Heinz (2003). It is suspected that many, especially younger workers, may underestimate the marginal benefits that accrue as they work, so that the labor supply effects of

⁵⁸See generally Diamond (2002, 2003, 2004), Feldstein (2005), and Feldstein and Liebman (2002a, 2002b). These and other overviews of social security address many important issues beyond the scope of this chapter (with its focus on taxation per se), notably including funding (various forms of pre-funding versus pay-as-you-go systems, particularly with regard to effects on national savings), investments (investment mix, such as in equities versus government bonds, and private versus public control), how benefit rules affect retirement decisions, annuitization of benefits at retirement, intergenerational redistribution and risk-sharing, political economy considerations relating to benefit levels, and how current social security surpluses affect overall government deficits.

⁵⁹This brief subsection focuses on income replacement, but many systems also fund medical care, disability insurance, and unemployment insurance.

⁶⁰One difference is that net transfers through social security depend on lifetime income, although the income tax and transfer system could, in principle, as well. See subsection 9.6.

payroll taxes are greater than they would be if benefits were fully appreciated.

Second, a major rationale for social security is that forced savings is beneficial on account of individuals' myopia.⁶¹ Many retire with few other assets, even though the social security replacement rate is significantly below plausible targets for optimizing life-cycle behavior. It may be that many individuals, even if they understood the benefits associated with the taxes they pay, would give such benefits little weight.⁶² This factor may also seem to indicate that the effect of payroll taxes on labor supply is more analogous to that of simple taxes on labor income than to that of voluntary personal retirement contributions. Myopic individuals' behavior may be different, however, when one takes into account the influence of their myopia on savings decisions as well as labor effort. See Kaplow (2006d).

5.4. *State and local taxation*⁶³

The central difference in analyzing taxes imposed by subnational jurisdictions is due to taxpayer mobility. In the perfect-competition version of Tiebout's (1956) model, individuals sort themselves into homogenous jurisdictions, each of which provides the desired public goods funded by benefit taxes, which, given the presumed homogeneity, would be uniform lump-sum (head or poll) taxes. In such a world, the payment of taxes to finance local public goods would be analogous to consumers' payments of prices to purchase private goods. There would be no distortion and, relatedly, no redistribution.⁶⁴

In fact, smaller jurisdictions rely on other forms of taxation. In the United States, for example, localities heavily use property taxes and states primarily employ sales and income taxes. Because there is significant, even if imperfect, mobility and because of local political forces, the distribution of benefits and of taxes still tends to be somewhat aligned. To the extent that the coincidence is incomplete, there may be redistribution and corresponding distortion. See section 7 (which implicitly refers to a national government's provision of public goods). However, redistribution may not occur because tax-benefit divergences may be capitalized into land prices, as suggested by Hamilton (1976), although under the new view of the property tax developed by Thompson (1965), Mieszkowski (1972), and Aaron (1975), the tax is borne by owners of capital and capitalization may not occur.

Additionally, even if benefits equal taxes, this equivalence will tend to hold on average rather than at the margin. Thus, a worker contemplating additional labor supply may not expect to benefit more from public goods, in which case labor income taxes (and, relatedly, sales taxes)

⁶¹Other rationales that do not have the same implications include asymmetric information and other shortcomings in the annuity market (see, for example, Brown, Mitchell, and Poterba (2002)), the Samaritan's dilemma (see Buchanan (1975)), and a desire to redistribute based on lifetime income.

⁶²If so, social security may not significantly displace private savings for such individuals.

⁶³See generally Inman and Rubinfeld (1996), Mieszkowski and Zodrow (1989), Musgrave and Musgrave (1989), Oates (1972, 1999), Rubinfeld (1987), Scotchmer (2002), Wildasin (1986) and Wilson (1999). An important set of issues ignored in this subsection concerns horizontal relationships across taxing jurisdictions, the issues being analogous to those considered in subsection 5.5 on international taxation.

⁶⁴An exception would arise to the extent that redistribution itself is a local public good. See Pauly (1973).

will tend to have effects like those analyzed previously. Similarly, property taxes will tend to distort investment in housing and other structures.

5.5. *International taxation*⁶⁵

Most international issues in taxation concern how the effects of capital taxation differ in an open economy. In the often-studied limiting case, capital is perfectly mobile and the taxing jurisdiction is small.⁶⁶ A fundamental distinction arises between taxation of capital supply (saving) by residents, which may be invested domestically or in foreign jurisdictions, and taxation of capital use (investment) by location, which may be from domestic or foreign investors. In a closed economy, there is ordinarily no difference between the two because the incidence of a tax is unaffected by the side of the market on which it is nominally imposed.

Taxes on investment in a home jurisdiction – so-called source-based taxation – lead to a reduction in investment until the point at which the after-tax return is as high as for investments elsewhere. Hence, the incidence of such a tax falls on domestic labor and other fixed factors, not on domestic capital. From the home country’s perspective, such taxation is inefficient: It distorts production without producing any unique benefit, such as taxing domestic capital (if that is desirable) or extracting any benefits from foreign investors.⁶⁷ Accordingly, although consistent with “capital import neutrality,” source taxation is not generally favored by economists writing on international taxation, although such taxation is typically employed by developed countries.

Contrariwise, a so-called residence-based tax, equally applicable to residents’ investments at home and elsewhere, reduces their return to saving but has no effect on domestic investment.⁶⁸ The analysis of such a tax is similar to that in subsection 5.1 on the taxation of capital generally (the earlier model suppresses production by implicitly assuming constant returns and competitive pricing, so the focus is on the utility of investors). Residence-based taxation, consistent with “capital export neutrality,” is consistent with global production efficiency because the location of investment is not distorted. Developed countries in fact levy taxes on residents’ capital income. In addition, they often provide a foreign tax credit or occasionally exemptions to avoid double taxation arising from source countries’ taxation of the same investments. As Richman (1963) explores, however, it would seem to be in a taxing jurisdiction’s interest to allow only a deduction for foreign source-based taxation, treating it as a cost of doing business. A credit or exemption leaves investors indifferent between investing at home or elsewhere, but the home

⁶⁵See generally Dixit (1985), Gordon and Hines (2002), and Slemrod (1988). Of necessity, this subsection omits many substantial topics, including avoidance and evasion issues that are prominent in an international setting, the corporate tax and its application to multinational enterprise, uncertainty and investor portfolio diversification, the interaction between tax policy and limits on capital mobility (including government actions that tend to offset capital flows), transition issues (accentuated by the fact that a capital levy would in part be borne by foreigners), and concerns about other countries’ retaliation and the scope for international agreements.

⁶⁶Similar analysis is applicable as well to capital taxation by subnational jurisdictions.

⁶⁷The inefficiency of such taxation is an implication of the production efficiency result described in note 34.

⁶⁸Allowing for both types of taxation, the result may well be specialization in simple models. All domestic saving may be invested locally or all local investment may be supplied by foreigners, depending on the relative levels of taxes on residents investing domestically, on residents investing in foreign jurisdictions, and on foreigners investing locally. See, for example, Slemrod (1988).

treasury is not indifferent because shifting the marginal dollar elsewhere costs the domestic fisc. Note, however, that the foregoing traditional analysis of international taxation treats capital as uniform, whereas capital taxation regimes may also distort ownership and thus the efficiency with which intangible capital (intellectual property) is transferred within multinational firms. See Desai and Hines (2003).

If a country has market power, notably if it supplies or demands a large share of the global capital stock, its nationally optimal policies tend to differ, by analogy to optimal tariff analysis. A large net capital importer will wish to tax the inflow and a large net exporter benefits by taxing the outflow.

6. Taxation and Transfer Payments

As subsection 2.1 indicates, two of the main purposes of taxation are redistribution and raising revenue to finance public goods and services. Accordingly, some analysis of expenditures – on transfers and on public goods – is essential to a full understanding of taxation. Furthermore, as subsection 2.2 emphasizes, the optimal design of one part of the fiscal system depends on what other instruments are available and how they are to be used, so any analysis that focuses exclusively on a subset of the system is incomplete and potentially misleading. Accordingly, this section and the next explore the two main categories of government expenditures, transfer payments (this section) and public goods and services (section 7).⁶⁹

6.1. Optimal transfers

A substantial and growing literature addresses the design of transfer programs.⁷⁰ One might, however, regard such treatments as unnecessary, at least at an abstract level; after all, section 3 on optimal income taxation presents the optimal tax *and transfer* schedule, $T(wl)$. Viewing transfers as part of the optimal tax problem is the approach adopted in a book review by Diamond (1968) that predates the leading modern contributions on optimal income taxation and advanced in Mirrlees's (1971) conclusion, but it has not been followed very directly in most subsequent work.

Drawing on the analysis in section 3, the most straightforward answer to the question of how best to design transfers, notably concerning the optimal level of transfer to individuals earning no income and the optimal phase-out rate, is that one should simply inspect the lower end of the $T(wl)$ schedule depicted in Figure 3.1. As noted, $-T(0)$ is the transfer g (which can be treated as the combined value of all transfer programs to those earning 0 income), and $T'(wl)$ is the net phase-out rate (combining the phase-out of all transfer programs with any positive or negative marginal income tax or other tax separately imposed) at any income level wl . In other words, each tax and each transfer program can be represented by its own schedule $T^i(wl)$, and we

⁶⁹For a more in-depth treatment of transfers, see Kaplow (2006e).

⁷⁰For surveys, see Atkinson (1987a) and Moffitt (2002).

can let $T(wl) = \sum T^i(wl)$.⁷¹ An immediate and obvious implication is that one cannot meaningfully ask what in principle is the optimal design of a particular transfer program (or of a particular aspect of the income tax schedule, such as the EITC in the United States), for all that matters is the aggregate schedule, not the shape of any particular component.

Simulations reported in section 3 suggest that optimal grants are fairly generous in a wide range of settings and that optimal marginal tax rates (phase-outs) are significant as well. For example, Stern's (1976) simulations for a linear income tax have a central-case grant equal to 34% of average income and an optimal tax rate of 54%, Slemrod et al.'s (1994) optimal two-bracket simulations for similar parameters have a similar grant and somewhat higher marginal rates at the low end (approximately 60%), and simulations for the nonlinear case generally feature marginal rates at the bottom that were at or near the highest and often fairly high in absolute terms. Recalling the intuition underlying these results for marginal tax rates (see the discussion of expression (3.9) in subsection 3.4), rates at the bottom collect revenue from most of the population but are inframarginal (and thus not distorting) with regard to them, they do not apply to an extremely high density of the population (which tends to be at a maximum closer to the middle of the income distribution), and they involve little productivity and thus revenue loss per unit of work effort that is sacrificed.

The existing system of transfer programs in the United States has high aggregate marginal rates (consisting mostly of welfare phase-outs) near the bottom of the income distribution, indeed, even higher than seems likely to be optimal. Before the welfare reforms in the mid-1990's, Giannarelli and Steuerle's (1995) microsimulations found aggregate marginal rates averaging 75% or more near the bottom and that many faced rates of 100% or more. Post-reform, Sammartino et al. (2002) find average marginal rates of roughly 60%-70% near the poverty line and over 100% in a modest range just above the poverty line. Other studies report similar results.⁷²

⁷¹A complication is that some transfer programs have a so-called cliff or notch effect, such that when income reaches a certain point, a particular benefit is lost altogether; that is, some $T^i(wl)$ may be discontinuous, so $T'(wl)$ may not be defined at particular points. Another complication is that some transfer programs are subject to asset tests, which is to say, for example, that an individual must first consume all assets before becoming eligible for transfers. This formulation can act as a 100% tax on the principal of one's savings in low-income states of the world which, as Diamond (1968) explains, can be a substantial deterrent to savings. Some evidence suggests that asset tests indeed discourage savings. See Gruber and Yelowitz (1999) and Powers (1998); but see Hurst and Ziliak (2004).

⁷²See, for example, Dickert, Houser, and Scholz (1994) and Wilson and Cline (1994) before welfare reform, and the post-reform studies by Acs et al. (1998), Gokhale, Kotlikoff, and Sluchynsky (2002), and Reed and Hepner (2004). These studies take into account the existence of the EITC: In the credit phase-in range, the EITC mitigates aggregate marginal rates for very low-income individuals, but in its phase-out range, aggregate marginal rates are pushed higher. Although the EITC has received substantial attention and is viewed by nonspecialists as an alternative to traditional welfare, it should be kept in mind that in fact it is roughly equivalent (for the relevant population) to stretching out the phase-out of welfare. (The marginal subsidy in the phase-in range has the same effect as reducing the phase-out rate of other programs to the same extent, and the EITC phase-out is equivalent to extending welfare phase-outs by raising their level and applying them to higher-income individuals, on account of the need to complete the phase-out that is prolonged by the EITC subsidy.)

6.2. Categorical assistance

Transfer programs often are targeted at or are more generous to particular groups, usually individuals deemed less able to work on account of age, family configuration (single parent with young children), or disability. In this respect, transfer programs serve as ability-based taxation, as discussed in subsection 3.5.1. It is useful to extend that analysis by considering some special cases. First, suppose that it is possible to observe perfectly which individuals' abilities are below some low level, w° . Then that group can be given a high transfer g that would not be very costly to finance; g could be fairly low for everyone else without fear that such individuals would be destitute because, by assumption, they all can earn at least a minimal income. Relatedly, it would be optimal not to tax low levels of earnings in the group for whom $w \geq w^\circ$, thereby avoiding any labor supply distortion at the bottom of the group.⁷³

More realistically, signals about ability will be noisy. Even though some features, such as age or certain disabilities, can be observed nearly perfectly at low cost, there will usually be differences in ability associated with these characteristics. And other traits, including many other disabilities, cannot be observed perfectly. Accordingly, suppose that a low-cost signal makes it possible to divide the population into two groups, group L consisting mostly of individuals with very low ability and group H containing few such individuals. That is, by reference to the population density function $f(w)$ from the optimal income taxation model in section 3, the density $f^L(w)$ is heavily concentrated at low levels of w and the density $f^H(w)$ is very thin at the bottom.⁷⁴

The analysis of the optimal nonlinear income tax provides the basis for making conjectures about the optimal tax and transfer schedule for each group. To begin, it seems plausible that $g^L > g^* > g^H$. To consider the shape of the optimal tax schedule for each group, consider the first-order condition (3.9), reinterpreted for the present case involving two groups in the manner suggested in subsection 3.5.1. For the more able group, focus on low levels of income. The first term will be notably higher than in the single-group version of the problem. The $1-F$ component will be somewhat greater because almost everyone in the group will have higher incomes; more significantly, the f component in the denominator will be smaller, indeed, very small if the categorization is even moderately accurate. This suggests that the optimal marginal tax rate at low levels of income should be substantially higher than in the standard problem.⁷⁵ For the less able group, the opposite result seems plausible. The $1-F$ component will,

⁷³The usual argument for high marginal rates near the bottom of the income distribution is inapplicable when all earn above some minimum level because then it is more efficient to reduce the grant g than to apply a positive marginal tax at the bottom. This is the result in the optimal income tax literature, discussed in note 20, that a zero rate at the bottom is optimal, which as mentioned is inapplicable in the ordinary (noncategorical) case in which the lowest-ability individuals do not work.

⁷⁴The analysis assumes that the traits determining the categorization are exogenous. However, providing more generous benefits to certain family units or to the disabled may affect incentives to marry, procreate, or avoid injuries, which in turn will influence the optimal degree of differentiation of treatment between categories.

⁷⁵Some offset will be provided through the second term because $g^H < g^*$ and the existence of higher marginal tax rates at low income levels each implies that individuals at higher income levels will have somewhat higher marginal utilities of income and (for strictly concave SWF's) higher welfare weights. On this account, it may not be optimal to have g^H much below g^* . After all, with a steep phase-out, few individuals will benefit much from the grant in the higher-ability group; those who do will be individuals who are misclassified.

after extremely low levels of income, be substantially smaller than in the combined problem, and f will be much larger, favoring low marginal rates in this income range.⁷⁶

Interestingly, existing welfare phase-outs tend to have the opposite character: When benefits are high, as they are for low-ability groups, aggregate phase-out rates are correspondingly high because there are more benefits being phased out. But it was just suggested that optimal aggregate (phase-out inclusive) marginal tax rates for such individuals may be low, even if that means that the substantial grant is not fully phased out until income reaches higher levels. For high-ability groups, benefits are low so there is little to phase out and, accordingly, phase-out rates are low. Yet the foregoing analysis explains that high marginal tax rates may nevertheless be optimal. This apparent deviation from optimality seems to be a product of focusing on transfer programs in a vacuum and as if they are subject to their own special requirements. Specifically, it tends to be assumed that, when transfers are granted, they must be phased out, and that the phase-out must be complete at reasonably modest levels of income, lest welfare become too expensive and available to non-needy individuals.⁷⁷ And when there is little welfare to be phased out, there correspondingly is thought to be no need for high marginal tax rates. A virtue of incorporating the analysis of transfer programs into the optimal income tax framework is that potential errors that result from unintegrated thinking can be avoided.

6.3. *Work inducements*

There has been ongoing concern with getting welfare recipients to work. Optimal income taxation analysis, however, does not attribute significance to work per se.⁷⁸ Inefficient work disincentives are a byproduct of positive marginal tax rates, and this cost is factored into the analysis. Additionally, it was noted that a feature of the optimum in a unified system is that the lowest-ability individuals do not work. In a perfect categorical system, this would continue to be true of those with the least ability, for it is optimal to give them a generous grant despite its work disincentive effect. If those above a minimum level of ability can be identified perfectly, they will be induced to work because their grant, g^H , will be set very low. When categorization is imprecise, these results will be approximated imperfectly.

Though the analysis thus appears to be complete, it is interesting to examine schemes that might induce additional work effort. One might reduce transfers by the extent to which earnings fall below some target level, perhaps the income produced in a full-time minimum-wage job. The marginal return to work in the relevant range for one who could earn only the minimum wage would be double the wage (the earnings per se, plus a one-for-one reduction in the shortfall penalty) minus taxes and benefit phase-outs. Supposing that the latter aggregated to under 100%,

⁷⁶As the previous note indicates with regard to the higher-ability group, some offset will be provided by the second term: Because of the more generous grant and low initial marginal rates, the welfare cost of higher payments by those with greater income will be less than otherwise.

⁷⁷This assumption about transfers and phase-outs often characterizes not only political debate but also formal analyses, as reflected for example in Moffitt's (2002) survey.

⁷⁸If there were positive externalities to work by the poor (setting a good example for one's children that has the effect of reducing future dependency and crime) or negative externalities (such as may flow from reduced supervision of children), the analysis would differ.

the effective marginal tax rate would be negative, a net subsidy to earnings. If everyone subject to such a regime has the requisite ability such that, in an optimal scheme, they all would work at least at the target level, then it is unproblematic. However, if there are classification errors – notably, if some subject to the work requirement have a lower ability – then the foregoing analysis suggests that this scheme is not optimal. The possibly extremely low implicit grant level may well be too low, and marginal rates should be greater, possibly quite high rather than negative near the target. In any event, it is unlikely to be optimal for the marginal tax rate to jump on the order of 100 percentage points at the target income level.

Some work incentive schemes assume that hours as well as earnings are observable. As noted in subsection 3.5.1, earning ability might then be inferred (earning ability, the wage, is simply earnings divided by hours). When ability can be observed, the first-best can be achieved (individualized lump-sum taxes with zero marginal tax rates for everyone), and there is no role for work requirements. When hours are observed, however, ability is only conditionally observable; individuals who do not work at all do not reveal their type. The second-best optimum for this case similarly involves individualized lump-sum taxes (for those who do work) and zero marginal tax rates, although the extraction from higher-ability types is incomplete. See Dasgupta and Hammond (1980).⁷⁹ Existing programs premised on the observability of hours differ qualitatively.⁸⁰ Furthermore, as mentioned in subsection 3.5.1, hours are manipulable, so it is not obvious that the use of hours is feasible. See Moffitt (2002). With imperfect observability, the analysis of categorization in subsection 6.2 becomes applicable.⁸¹

6.4. Cash versus in-kind transfers

It is ordinarily supposed that cash transfers are superior to transfers in kind because individuals have different preferences and they tend to have better information than does the government about their own situations. Nevertheless, many transfers are given in kind, a practice that may sometimes be optimal for a number of reasons.⁸² The poor may be myopic or otherwise unable to make wise spending decisions, a possibility strengthened by the fact that such infirmities may have contributed to their low earning ability. There may be externalities due to certain forms of consumption, such as if housing reduces crime or immunization prevents the spread of disease. There may be psychic externalities when taxpayers feel better knowing that

⁷⁹See also related models by, for example, Diamond (1980) and Saez (2002) that focus on the participation decision.

⁸⁰See, for example, Michalopoulos, Robins, and Card (2005) on an experimental program in Canada that provides a large bonus to those working at least thirty hours. A more moderate work inducement, corresponding to that previously described in the text for the case in which only earnings are observed, takes the following form when hours are also observable. Let w^o and l^o denote the target wage and required labor supply and t the (flat) preexisting aggregate (inclusive of phase-outs) marginal tax rate below the target income level. Then, for $l < l^o$, disposable income available for consumption, c , is

$$c = g + wl(1 - t) - w^o(l^o - l), \text{ or}$$

$$= [g - w^o l^o] + wl(1 - \tau),$$

where $\tau = t - w^o/w$. Note that wage subsidies are similar.

⁸¹There is also literature on the possible optimality of conditioning welfare on public employment. See, for example, Besley and Coate (1995) and Brett (1998).

⁸²Many of the arguments are noted, for example, by Nichols and Zeckhauser (1982).

the assistance they provide must be spent on food, shelter, medical care, or education. In addition, taxpayers may be subject to the Samaritan's dilemma, concerned about strategic imprudence by potential beneficiaries, a possibility that makes compulsory health and social insurance particularly appealing.⁸³ In-kind assistance can also direct aid to children in particular, such as by providing medical care, education, or meals served at school. Furthermore, it may be possible to use in-kind assistance to help mitigate labor supply distortion in subtle ways by improving selection.⁸⁴

7. Taxation and Public Goods

As noted previously, the revenue-raising objective of taxation makes analysis of the relationship between taxation and public goods central to a comprehensive understanding of taxation. Furthermore, because a substantial fraction of GDP consists of governmentally provided goods and services and because such provision itself has significant distributive implications, analysis of taxation and public goods is also important in understanding the redistributive function of taxation.⁸⁵ As one might expect, there are important interactions between the two subjects: For example, how much redistribution is optimally undertaken through the income tax will depend on the extent to which the public goods funded by income tax revenue benefit the poor. Thus, as in the case of other forms of taxation and of expenditures on transfers, it is necessary to examine income taxation and public goods together to know how each should be determined so as to maximize social welfare.

7.1. *Distributive incidence and optimal redistribution*

The distributive incidence of public goods is relevant to the optimal income tax problem because the optimal redistributive tax depends on individuals' utilities, which in turn depend on public goods. Specifically, when the SWF is strictly concave in individuals' utilities, the marginal social benefit of redistribution depends on the extent of differences in individuals' utility levels. Additionally, public goods may affect individuals' marginal utilities of consumption, which likewise affects this marginal social benefit.

Consider, for example, the case in which public goods are a perfect substitute for disposable income. That is, utility can be written as $u(c+b(G), l)$, where G denotes expenditures on public goods and b indicates the dollar-equivalent benefit. In this situation, public goods provide equal benefits measured in dollars (rather than utility) to everyone. Accordingly, the benefit of the public good is equivalent to a higher g , the uniform grant. Ignoring this effect of

⁸³See, for example, Bruce and Waldman (1991) and Coate (1995).

⁸⁴It is sometimes suggested that giving low-quality in-kind goods has this benefit. However, high-ability individuals generally mimic low-ability individuals by earning less, and given their lower earnings they may have similar preferences among goods to those of lower-ability individuals who earn the same amount. Hence, using in-kind provision of low-quality goods tends to be an inefficient means of improving screening. Compare Munro (1989). In contrast, in-kind provision, notably, of medical care, may helpfully select individuals of high need. See, for example, Blackorby and Donaldson (1988).

⁸⁵The analysis in this section is applicable to any government expenditures on goods and services, regardless of whether they are public goods in the technical sense.

public goods would lead one to overstate (perhaps greatly) the marginal social benefit of redistribution.

Now suppose that utility is additively separable in consumption, public goods, and labor: $u = v(c) + b(G) - z(l)$. Public goods provide equal benefits measured in utility (rather than dollars) to everyone. Measured in dollars, the value of public goods is given by the inverse of individuals' marginal utility of consumption, which depends on the curvature of v . For example, if $v(c) = \ln c$, then marginal utility is $1/c$, so the public good has a dollar value proportional to consumption. In this case, because of separability, the benefit of the public good has no effect on individuals' marginal utility of consumption and thus no effect on the optimal extent of redistribution through this channel, although raising everyone's welfare level by a constant amount (measured in utility) may affect the marginal social benefit of redistribution when the SWF is strictly concave.

In sum, knowing the distributive incidence of public goods as well as how public goods enter into individuals' utility functions (the two questions are closely related) is necessary to determine the optimal extent of redistributive taxation. Unfortunately, ascertaining distributive incidence empirically, especially for public goods like police protection and national defense, is notoriously difficult.⁸⁶

Another question concerns how increasing government expenditures on some public good or service at the margin affects the desirability of income redistribution and, in particular, how this effect depends on the distributive incidence of the particular good or service. Suppose, following Kaplow (2006b), that the income tax was set optimally and that it became efficient (perhaps due to technological change) to supply more of some public good. Once that was done, what if any adjustment to the extent of redistribution would be appropriate? Clearly, the answer to this question will depend on how the public good is financed in the first instance. For example, if it were financed by taxing the poor (rich), more (less) redistribution is likely to be in order, but that would tell us little about how changing the public good per se affected the desirability of redistribution. Accordingly, it is useful to contemplate finance of the public good by a distribution-neutral (offsetting) income tax adjustment (see section 4), so the change in public good combined with its finance preserves the preexisting distribution. Under these circumstances, if additional redistribution then becomes desirable, it would be meaningful to say that changing the provision of a public good affects the desirability of redistribution.

One might conjecture that with distribution-neutral finance there is no further need to adjust the extent of redistribution. Indeed, when a public good is a perfect substitute for cash, such as in the first example above and therefore is worth the same (dollar) amount to everyone, this conjecture can be shown to be valid. In the more general case, however, redistribution may become more or less desirable, through two channels. First, the reform package may affect the relative marginal utilities of the rich and the poor. (With a strictly concave social welfare function, changing relative utility levels would also matter, but the distribution-neutral tax

⁸⁶See, for example, Aaron and McGuire (1970), Musgrave et al. (1974), Reynolds and Smolensky (1977), and Ruggles and O'Higgins (1981) for the United States.

adjustment keeps these constant.) Second, the reform package may affect the revenue impact of adjustments to redistributive taxation. After the hypothesized reform, raising marginal tax rates, for instance, may have different labor supply effects and, for a given labor supply effect, have different effects on revenue than before. Analysis of both channels is somewhat subtle, and no simple characterization has been obtained.

7.2. *Distribution and distortion*

The preceding subsection considers the implications of public goods provision for redistributive taxation. This subsection considers the reverse: how the second-best nature of redistributive taxation bears on optimal public goods provision. The first-best rule – the Samuelson (1954) rule – is that public goods should be provided until the point at which the sum of individuals' marginal benefits equals the marginal cost of provision. Two second-best caveats are standard.

First, Weisbrod (1968), Feldstein (1974), Drèze and Stern (1987), and others suggest that distributive weights be incorporated in cost-benefit analysis.⁸⁷ Second, a large literature following Pigou (1928) argues that the distortionary cost of finance should be accounted for in determining the optimal level of public goods.⁸⁸

It turns out, however, that both qualifications arise from entangling choices of the extent of redistribution and of the level of public goods, decisions which can be separated in principle and in practice. Once the problems are unscrambled, the basic Samuelson test provides an appropriate benchmark for public goods provision. The reasoning closely parallels that used to analyze the inefficiency of differential commodity taxation in section 4. Indeed, some analysts have noted the analogy between the public goods and commodity tax problems.⁸⁹ Specifically, providing more (less) of a public good than is otherwise efficient is analogous to subsidizing (taxing) a particular commodity relative to other commodities. The analogy is even closer if one imagines a hypothetical public goods economy that employs Lindahl (1919) pricing, where a subsidy (tax) on the public good would entail lowering (raising) the “prices” consumers face for the public good just as commodity subsidies (taxes) on private goods entail lowering (raising) the prices consumers pay for them. Because the analysis is so similar to that of commodity taxation, it will only be sketched briefly.

Suppose that individuals' utility as a function of consumption c , public goods G , and labor effort l can be written as $u(v(c, G), l)$, which uses the assumption of weak separability of labor, just as in the analysis of commodity taxation.⁹⁰ (When this and other assumptions are

⁸⁷One way of viewing this suggestion is that it responds to the objection to the Kaldor-Hicks hypothetical compensation test, see, for example, Little (1957), that standard cost-benefit analysis ignores distributive concerns.

⁸⁸Pigou's argument was subsequently explored by Diamond and Mirrlees (1971), Stiglitz and Dasgupta (1971), and Atkinson and Stern (1974) in models of optimal taxation (in the Ramsey tradition; see subsection 4.4); and further developed in additional work, much of which is surveyed in Mayshar (1990), Fullerton (1991), and Ballard and Fullerton (1992).

⁸⁹See, for example, Mirrlees (1976), Konishi (1995), and Kaplow (1996a, 2004).

⁹⁰Both c and G could be interpreted as vectors, but the scalar representation is used to simplify exposition.

relaxed, qualifications parallel to those in subsection 4.3 are applicable.⁹¹) Again, the approach will be to identify the distribution-neutral (offsetting) adjustment to the income tax and transfer system, show that it does not affect labor supply, and determine when it generates a budget surplus or deficit.

The offsetting income tax adjustment for a marginal change in G is given by the marginal rate of substitution, v_G/v_c . To verify this, we need to consider whether this shift in the schedule T will be such that $\partial U/\partial G = 0$ for all types w and at every level of l that each type might supply. (This is a partial derivative because labor supply is being held constant; in the next step, it is shown that individuals indeed do not change labor effort when this tax adjustment is employed.) Thus, we consider

$$(7.1) \frac{\partial U}{\partial G} = \frac{\partial U}{\partial v} (v_c c_G + v_G),$$

where c_G denotes the (here partial) derivative of c with respect to G . From the budget constraint (3.1),

$$(7.2) c_G = - \frac{\partial T(wl, G)}{\partial G},$$

where the notation $T(wl, G)$ is used to indicate how the tax schedule will be adjusted as G changes. If the tax adjustment is set equal to v_G/v_c , as suggested, then $c_G = -v_G/v_c$. Using this result and substituting (7.2) into (7.1) yields the conclusion that $\partial U/\partial G = 0$ for any given w and l .

Consider next whether individuals in fact would change their labor supply in response to a change in G financed by the specified adjustment to the tax schedule T . Just as in the analysis of commodity taxation in subsection 4.2, it should be apparent that, indeed, individuals of all types (w) would not change their labor supply. The reason is that expression (7.1) equals zero for any given l and hence for all l . Therefore (for each type w), if l^* was superior to all $l \neq l^*$ before G was changed, this will continue to be so afterwards because the utility at each and every l is unaltered by the change in G , when combined with the offsetting adjustment to T .⁹²

Hence, government provision of a good or service when financed by a distribution-neutral (offsetting) income tax adjustment keeps everyone's utility (and hence the distribution of utility) constant and everyone's labor supply unchanged. It remains to determine how the government's budget is affected. But this is straightforward because the tax adjustment equals (at the margin)

⁹¹For example, improvements to public beaches and libraries, plausible leisure complements, should be undertaken to a lesser extent than that indicated by the Samuelson rule, whereas enhancing mass transit, a plausible labor complement, should be done to a greater extent.

⁹²For a more formal derivation along these lines as well as one that differentiates the first-order condition for l with respect to G and uses the result to demonstrate that $dll/dG = 0$, see Kaplow (1996a, 2006b) and also Auerbach and Hines (2002).

individuals' marginal rates of substitution. Total revenue due to the tax adjustment, therefore, is given by the integral of individuals' marginal rates of substitution, so there will be a surplus (deficit) if the Samuelson rule is satisfied (fails). When the project passes the cost-benefit test, it is possible to rebate the surplus to make everyone better off (and when the project fails the test, a movement in the opposite direction will make possible a Pareto improvement).

It is immediately apparent why the two standard caveats are inapposite: One needs no special adjustment for distributive or labor supply effects because, on account of the use of a distribution-neutral income tax adjustment, there are none. Relatedly, if a public good were not to be financed by a distribution-neutral tax adjustment, the present approach is still warranted by the analysis of subsection 2.2, in particular the discussion of the virtues of using a two-step decomposition to separate the intrinsic effects of public good provision (hypothetically financed in a distribution-neutral manner to remove the pure effects of redistribution) from those of redistribution per se.

This view of public provision, which contrasts sharply with that in the literatures noted previously, is associated with an emerging body of work.⁹³ Hylland and Zeckhauser (1979) were the first to use offsetting tax adjustments to show that distributive incidence should be ignored. Christiansen (1981) and Boadway and Keen (1993) show that the simple cost-benefit test for public goods provision is correct if one assumes that the income tax is set optimally; they take advantage of the fact that, when at the optimum, the marginal benefit of additional redistribution equals the marginal cost of additional labor supply distortion, so marginal adjustments to the tax system have no net effect on social welfare. Kaplow (1996a, 2004, 2006b) builds on Hylland and Zeckhauser's approach to advance the view that both distribution and labor supply distortion can be ignored with regard to a wide domain of government policy, notably including public goods.⁹⁴ As should be apparent from the present analysis (and the analogous argument in section 4 on commodity taxation), when a distribution-neutral (offsetting) tax adjustment is employed, features of the initial income tax and transfer system – notably, whether it is set optimally – are irrelevant.

⁹³The reconciliation between previous work finding that distortion is associated with public goods provision and the present result is that the other work tends to find distortion when the combination of public good and tax adjustment in the policy experiment under consideration result in an increase in redistribution – yet the distributive benefit is disregarded (in a manner that may nominally be justified by the use of representative-agent models, which ignores that the motivation for employing distortionary taxes like the income tax rather than a uniform lump-sum tax is precisely that individuals are heterogeneous, so distribution matters). See the discussion of Ramsey taxation in subsection 4.4 and also Kaplow (2004). See also Allgood and Snow (1998), who show that much of the difference in leading empirical estimates of the marginal cost of funds and of redistribution can be attributed to subtle ways in which different authors' simulations implicitly change the level of effective lump-sum transfers and thus the extent of redistribution assumed to take place.

⁹⁴See also Ng (2000) and Slemrod and Yitzhaki (2001). Slemrod and Yitzhaki's formulation for the optimal provision of public goods allows for adjustments to the cost (taxation) and benefit (public good) side of a standard cost-benefit equation to take into account (on each side) effects on labor supply and on distribution. As the analysis in the text indicates, in the basic case with distribution-neutral finance, all of these adjustments cancel. Moreover, with non-distribution-neutral finance, the two-step decomposition suggests that all effects that do not cancel will be associated with a pure change in redistribution. In this setting, it aids in analysis and interpretation (see subsection 2.2 and Kaplow 2004) to think of the distributive effects from the public good and from the method of finance as being netted (and the resulting labor supply effects will similarly offset in part), so one is left simply with a single cost and benefit associated with the change in the extent of redistribution.

7.3. *Benefit taxation*

The foregoing discussion of the use of distribution-neutral (offsetting) income tax adjustments to finance public goods may be used to illuminate the long-discussed concept of benefit taxation. See, for example, Musgrave (1959). The first observation is that this particular mode of tax adjustment is indeed a sort of benefit taxation, as the magnitude of a marginal adjustment equals marginal benefits. (Recall that, at each income level, the marginal tax adjustment equals individuals' marginal rates of substitution.) For discrete changes, the offsetting tax adjustment equals individuals' total benefits for the project. Surplus is included, as the total tax adjustment at any level of income equals the area under the implicit demand curve for the public good.

This tax adjustment, however, differs from prior understandings of benefit taxation in important ways. First, as just explained, the posited tax adjustment is equivalent to Lindahl (1919) pricing at the margin, but it is not equivalent for a discrete change. Thus, if marginal benefits are declining, the average rate of the offsetting tax adjustment would exceed the Lindahl price, which equals the marginal benefit at the final point of the increase in G . Second, the stated tax adjustment differs from many notions of benefit taxation because it is based entirely on the benefits of a public project without regard to its cost.

Various authors have proposed a number of candidates for benefit taxation, most of which differ from the present formulation in other ways as well. See, for example, Hines's (2000) proposal and his review of Lindahl pricing and related alternatives. Such work usually presents as its objective the derivation of a benefit measure that has certain properties in common with the market's pricing of private goods or that meets other a priori criteria.⁹⁵ However, the purpose of providing such a measure is not explained. By contrast, the distribution-neutral (offsetting) income tax adjustment is chosen here because of its usefulness in policy analysis. This benefit measure also has descriptive functions. For example, whether the median voter will favor a project depends on whether that voter's actual new tax obligation exceeds this hypothetical offsetting tax adjustment.⁹⁶

Yet another reason for formulating a principle of benefit taxation is to determine the proper manner of financing government expenditures on goods and services. Yet when there is also a system of redistributive taxation in place, that itself may be freely adjusted, the purpose of isolating the benefit tax component is unclear. From some normative perspectives, such as a libertarian one, benefit taxation may be required and any redistribution may be deemed impermissible. Such an approach does require selection of a particular definition of benefit

⁹⁵See, for example, Hines (2000) and the debate between Aaron and McGuire (1970, 1976) and Brennan (1976a, 1976b).

⁹⁶Another feature of the distribution-neutral approach is that it renders moot concerns about the progressivity of benefit taxation, a subject that has received much attention. See, for example, Hines (2000) and Snow and Warren (1983). Whatever is the degree of progressivity (or regressivity) of a tax that is set equal to actual benefits, its distributive incidence is, by definition, precisely offset by that of the public good itself. Hence, changing the level of public goods, financed by such benefit taxation, has no distributive effect regardless of the shape of the tax adjustment viewed in isolation.

taxation, and it is also necessary to confront the difficult (some would say insurmountable) baseline question regarding the benchmark against which one measures the distributive incidence of the entire public sector (is the hypothetical alternative anarchy?).

8. Corrective Taxation

Correcting externalities is a third major function of taxation. Subsections 8.1 and 8.2 review the analysis of corrective taxation when externalities are the only concern. Subsection 8.3 integrates the analysis of corrective taxation with that of income and commodity taxes to determine social welfare-maximizing corrective taxation when revenue-raising and distributive concerns are also relevant.

8.1. Pigouvian taxes and subsidies

Among the contributions of Pigou (1920) was his diagnosis of externalities in terms of divergences between private and social costs or benefits and his suggestion of taxes and subsidies as a possible cure.⁹⁷ To analyze Pigouvian taxation, we can extend the model of commodity taxation from section 4, following Kaplow (2006c). As before, there are n commodities, x_1, \dots, x_n . Corresponding variables e_1, \dots, e_n denote the total consumption of each commodity: $e_i = \int x_i(w) f(w) dw$, for all i . Individuals choose levels of consumption and labor effort l to maximize their utility functions $u(x_1, \dots, x_n, e_1, \dots, e_n, l)$. Utility may have any relationship to the level of the e_i 's; that is, the external effect due to each of the commodities may be positive, negative, or nonexistent.

The monetary equivalent of the marginal external harm associated with any commodity x_i is

$$(8.1) \quad h_i = - \int \frac{\partial U(w) / \partial e_i}{\mu(w)} f(w) dw,$$

where $\mu(w)$ is the Lagrange multiplier on individuals' budget constraints (4.1) for individuals of type w , signifying the marginal utility of income. (U is also expressed as a function of w because the partial derivative may differ by type due to differences in consumption and labor effort.) The first term in the integrand, therefore, is the marginal effect of the externality on utility divided by the marginal utility of disposable income, which gives the marginal externality for a given type w , measured in dollars. Note that for positive externalities, $h_i < 0$.

Using this expression for marginal external harm, we can define first-best Pigouvian taxes and subsidies as a commodity tax vector $\{\tau_1, \dots, \tau_n\}$ having the property that

⁹⁷Although it is conventional to focus on externalities alone, similar analysis is applicable to some informational and self-control problems. That is, if there is no externality but individuals underestimate the private benefit of some activity, a subsidy may be used to offset the divergence, or if private harm is underestimated, a tax may be helpful. See, for example, Gruber and Mullainathan (2005) on the possibility that cigarette taxes may improve the welfare of myopic smokers.

$(p_i + \tau_i)/(p_j + \tau_j) = (p_i + h_i)/(p_j + h_j)$, for all i, j . Notice that the definition does not require that $\tau_i = h_i$, for all i . The reason has to do with normalization, discussed in subsection 4.1: If all commodity taxes are raised or lowered in such a manner as to leave all price ratios unchanged, individuals' behavior will be unaffected – if the level of the income tax is also adjusted to produce the same effective disposable income. However, it is useful to think of a case in which the only commodity taxes are Pigouvian, in which event it is true that $\tau_i = h_i$, for all i .

8.2. Choice of instruments

Pigouvian taxes and subsidies not only constitute an important instrument for the control of externalities, but our understanding of them also helps to illuminate other government interventions that address externalities. For example, free immunizations against communicable diseases are akin to a Pigouvian subsidy that brings the price to zero, which would be optimal if the external benefit happened to equal the cost. However, if the external benefit is even larger and if the private benefit is less than other private costs (which may include inconvenience, modest pain, and the risk of adverse side-effects), one could employ a subsidy in excess of 100% of the direct cost or, as is commonly done, impose a regulation that requires immunization.⁹⁸ More broadly, in examining the choice among regulatory instruments, it is helpful to keep such connections in mind.

In many settings, particularly involving negative externalities, the Pigouvian tax prescription is not employed. Two alternatives with important similarities to Pigouvian taxation are legal liability and tradeable permits. A rule of strict liability requires the injurer to pay the victim for all harm imposed, which from the injurer's point of view is similar to a Pigouvian tax.⁹⁹ A Pigouvian tax has the advantage that, because victims do not receive compensation, they retain incentives to mitigate harm – although this is a disadvantage to the extent that the activities of the injurer and victim combined bear excessive costs, creating insufficient incentives to undertake the combined activities and excessive incentives to integrate if that would eliminate tax liability.

Tradeable permits have the familiar virtue that, like Pigouvian taxes, they result in cost-minimization because each purchaser equates the marginal cost of harm reduction to the (common) market price of permits. Permits importantly differ from Pigouvian taxation because the overall quantity of the externality is not optimized – by polluters equating marginal cost to the tax rate, itself set equal to marginal harm – but rather is determined by fiat. Note, however, that in principle the government could adjust the number of permits until the point at which the market-clearing price equalled marginal harm at the given quantity.

A greater contrast is provided by command and control regulation, whether imposed directly (such as with technological requirements) or indirectly (such as through liability

⁹⁸If vaccinations are always completely effective, compulsory immunization of everyone is not only suboptimal, but dominated by the laissez-faire solution. See Brito, Sheshinski, and Intriligator (1991).

⁹⁹When harm is uncertain, one can think of a Pigouvian tax imposed probabilistically – which is how the tort system typically operates – or that a tax equal to expected harm is imposed with certainty.

involving injunctions or negligence rules under which damages are only owed if standards are violated). The common objection is that the government decision-maker has limited information, for optimal regulation of this sort requires not only information about harm (which is also required to set a Pigouvian tax) but also about the costs of various technologies.¹⁰⁰

An important qualification to the inefficiency of some forms of regulation, particularly when implemented through liability rules rather than government edict, is that injurers and victims may bargain to more efficient results. This important point of Coase (1960) is true even when no liability is imposed for externalities, for a victim could pay an injurer to abstain from harm-causing activity if the cost of the harm exceeded the injurer's benefit from the activity. This solution, of course, tends to be infeasible in large-numbers cases – such as with industrial pollution and externalities associated with automobiles. Furthermore, even when bargaining may be feasible, asymmetric information interferes with efficiency, and accordingly there may be benefits of legal rules that more closely mimic Pigouvian taxes.

The choice of instruments problem is a good deal more complex than the foregoing suggests, involving comparisons between the government's and private parties' (including victims') information, concerns about the ability of injurers to pay for harm (especially large harms that may occur with low probability), considerations of administrative costs, and other factors. See, for example, the *Handbook* surveys on environmental regulation by Bovenberg and Goulder (2002) and Revesz and Stavins (2006) and that on tort liability by Shavell (2006). Nevertheless, it is worth emphasizing that much analysis of various forms of regulation is illuminated by the comparison with the straightforward principles of Pigouvian taxation. Likewise, it is useful to take advantage of this relationship when considering how the problem of controlling externalities interacts with other second-best considerations related to the other functions of taxation, the topic of the next subsection.

8.3. *Distribution and distortion*

The standard Pigouvian prescription that taxes should be set equal to the marginal external harm applies in a world that is first best, other than for the externalities being corrected. Just as section 7.2 considered whether and how one should deviate from the Samuelson rule for public goods when there is a concern for distribution and labor supply distortion in world that is second-best with regard to redistributive taxation, so we can ask whether these two considerations call for modification of the Pigouvian prescription. Distributive concerns are often expressed, such as in the argument that a gasoline tax, which may be used to internalize pollution and congestion externalities from driving, may be regressive and thus less desirable on this account.¹⁰¹ Labor supply distortion has received substantial attention in recent literature.¹⁰²

¹⁰⁰Weitzman (1974) argues that setting quantities (regulation) may be superior to setting prices (taxes) when there is uncertainty, but his result arises largely because he rules out feasible instruments, notably a nonlinear Pigouvian tax schedule under which the marginal tax rate equals the marginal expected harm, and because he assumes that the linear instruments could not be adjusted over time, even when observable behavior revealed errors. See Shavell (2006).

¹⁰¹See, for example, Casler and Rafiqui (1993) and West (2004).

¹⁰²For a survey and a collection of literature, see respectively Bovenberg and Goulder (2002) and Goulder (2002).

Initially, some thought environmental taxation might produce a “double dividend” – both correcting an externality and also raising revenue without distortion, permitting reductions in distortionary income taxation – and a substantial subsequent literature has suggested that the problem is more complicated and, as it turns out, environmental policies may exacerbate the preexisting labor supply distortion due to income taxation.

It would seem, however, that in light of the previous analysis addressing these same two concerns in the contexts of differential commodity taxation (section 4) and public goods (subsection 7.2), one would expect, under similar simplifying assumptions, that first-best Pigouvian principles provide an appropriate benchmark for analysis – and that the qualifications to this conclusion (section 4.3) would be largely the same as in the previous settings. This indeed is the case, as developed in Kaplow (1996a, 2004, 2006c).¹⁰³

One way to view the intuition is to return to the model of differential commodity taxation, wherein (with weak labor separability) uniformity was optimal. The intuition was that differential commodity taxation distorted consumption choices without reducing the distortion caused by redistributive taxation; hence, differential taxation is inefficient. Specifically, eliminating (or reducing) differentiation, with a distributively offsetting adjustment to the income tax schedule, results in a Pareto improvement. Extending that logic to the present case with externalities, the relative prices that result in no distortion are no longer ones with no differential commodity taxation but instead are consumer prices that reflect the full extent of any externalities, as in the definition of first-best Pigouvian taxes and subsidies in subsection 8.1. Hence, making this formulation of commodity taxes the benchmark rather than no differentiation, any deviation from the benchmark will, as before, be inefficient. Specifically, if one removes any deviations – that is, reforms commodity taxes to equal first-best Pigouvian taxes – and adjusts income taxes to offset distributive effects, a Pareto improvement will result. See Kaplow (2006c). The proof essentially tracks that presented in subsection 4.2 for commodity taxes. The main difference is that, as individuals adjust their consumption, this now changes the level of externalities and also changes the revenue from commodity taxes and subsidies (which are not moved to zero, but instead to first-best Pigouvian levels). Note, however, that the net revenue produced by the latter effect precisely equals the revenue necessary to compensate individuals for the former effect, through the income tax adjustment that holds everyone’s utility constant. Therefore, just as in the case without externalities, optimal commodity taxes are those that otherwise would be efficient on first-best grounds.

As explored in subsection 8.2, the analysis of Pigouvian taxes and subsidies illuminates regulation much more broadly; hence, it would seem, as a benchmark, that regulations should be set with regard to the efficiency with which they mitigate externalities, independent of

¹⁰³See also Pirttilä and Tuomala (1997) and Cremer, Gahvari, and Ladoux (1998). The reconciliation between this conclusion and that in much of the literature that does find additional distortion associated with greater environmental regulation or particular environmental policies is, just as in the case of public goods (see note 93), due to the literature’s employing combinations of regulation and income tax adjustments under which greater redistribution occurs. See Kaplow (2004, 2006c).

distributive effects and labor supply distortion.¹⁰⁴ One particular regulatory instrument is the use of legal rules, such as rules of tort liability. Indeed, as explored in subsection 8.2, a legal rule of strict liability is much like a Pigouvian tax (at least with regard to the injurer). In the analysis of legal rules, it has long been controversial whether adjustments should be made on account of distributive effects. Shavell (1981), in one of the first papers using the method of offsetting tax adjustments, shows that it is inefficient to deviate from otherwise efficient legal rules on account of distribution (which is held constant by the offsetting income tax adjustment). See also Kaplow and Shavell (1994).

9. Additional Dynamic Issues

Dynamic considerations were first introduced in extending the basic optimal income and commodity tax model to capital taxation in subsection 5.1. In this section, a number of further dimensions and complications that arise in a dynamic setting are examined.

9.1. Inflation¹⁰⁵

Inflation complicates measurement of the tax base under a standard income tax because changes in wealth over time are subject to tax and the most readily available measures of such changes are denominated in nominal prices at different points in time. Note that an implication of the source of the inflation problem is that a labor income tax and, likewise, a cash-flow consumption tax do not require significant modifications to adjust for inflation because the tax bases are appropriately measured in terms of current prices. (In nonlinear systems, just as under a nonlinear standard income tax, one would still need to index the bracket levels to avoid “bracket creep,” wherein the real level of unindexed bracket boundaries declines over time as a consequence of inflation.)

One sort of inflation adjustment necessary in a standard income tax is indexation of basis. For example, if an asset was purchased in period 1 for \$100 and is sold in period 2 for \$125, the nominal gain of \$25 will overstate the real gain if there is, say, 10% inflation. Basis adjustment involves restating the period-1 purchase price of \$100 as \$110 in period 2, so that the resulting taxable gain of \$15 properly measures the real gain. Similar (ongoing) basis adjustments are necessary to preserve the real value of depreciation and to properly measure changes in inventories.

Another type of adjustment involves interest and related returns (which can alternatively be accomplished in an accrual system through basis adjustments to debt and related instruments). Suppose, for example, that inflation is 10%, the real interest rate is 2%, and the nominal interest rate is 12%. A 50% income tax applied to nominal interest would produce an after-tax nominal return of 6%, which would be a real after-tax return of -4%. Failure to index, therefore, results in an effective tax rate of 300% on the real return of 2%. Relatedly, borrowers, who deduct

¹⁰⁴The claim regarding distributive effects is first advanced by Zeckhauser (1981). Distribution and labor supply distortion are addressed more fully in Kaplow (1996a, 2004, 2006c).

¹⁰⁵See generally Aaron (1976), Feldstein (1983), and Halperin and Steuerle (1988).

nominal interest payments, receive tax bonuses to a similar extent.¹⁰⁶

Most standard income tax systems fail to index basis or account for the inflationary component of interest and related returns. They may do so indirectly, such as by providing a capital gains preference and more rapid depreciation, although such means often are not adjusted as inflation changes over time, they do not cover all pertinent dimensions, notably, the problem of interest, and they inevitably are more complete for some assets than for others.¹⁰⁷ As a consequence, when inflation is nontrivial, standard income taxes in practice deviate substantially from their idealized form and significant distortions can arise.

Indexing is more commonly employed by societies experiencing hyperinflation. In such settings, additional dimensions, in principle relevant even with low inflation, become significant, such as the difference in time between the withholding of taxes and payment to the tax authority and the fact that earnings and expenditures occur at different times within the standard accounting period, which is typically one year in length.

9.2. *Risk-bearing*¹⁰⁸

9.2.1. *Uncertain labor income*

Uncertainty in labor income provides a supplemental, efficiency-based justification for some redistributive income taxation.¹⁰⁹ Even if everyone is identical *ex ante*, individuals would prefer to have income transferred from high- to low-earning states, which a redistributive income tax does.¹¹⁰ Given that existing income taxes and optimal schemes examined in the literature involve high tax rates even without uncertainty, the optimal adjustment for uncertainty may not be that large, both because the preexisting distortion is significant and because quite substantial implicit insurance would already be made available.¹¹¹

The general problem of optimal income taxation in the presence of uncertainty has not been the subject of extensive study. Mirrlees's (1990) preliminary analysis (examining a linear

¹⁰⁶Symmetry in theory can lead to asymmetric effects in practice because of incentives for high marginal tax rate actors to borrow from tax-exempt entities.

¹⁰⁷LIFO accounting approximates the result of inflation adjustment as long as firms' inventories are not declining. Observe further that, as outlined in note 46, much capital income is effectively exempt under the existing income tax, so the inflation problem is limited to the remainder. However, this suggests that there may be even greater differentials in the taxation of capital than seems apparent, with some capital exempt and some of the rest effectively taxed at higher than stated rates.

¹⁰⁸Technically, one can analyze risk as resolved instantaneously, although as a practical matter the issues examined herein typically arise in a dynamic setting.

¹⁰⁹See, for example, Eaton and Rosen (1980a, 1980b, 1980c), Tuomala (1990), and Varian (1980). Subsequent work includes Strawczynski (1998) and Low and Maldoom (2004).

¹¹⁰Varian's (1980) simulations suggest that, in light of moral hazard (i.e., the labor-leisure distortion), the optimal level of insurance may be only a few percent, whereas Strawczynski's (1998) and Low and Maldoom's (2004) simulations suggest that high marginal tax rates may be optimal.

¹¹¹An important special case of income uncertainty involves the possibility that one will become disabled and thus unable to earn income in the future. See, for example, Diamond and Mirrlees (1986). Unemployment insurance is also pertinent.

income tax where the degree of variation in skill and the extent of uncertainty are assumed to be small) suggests that, taking as given the total variation in observed income, greater income uncertainty most plausibly favors a lower tax rate. For given aggregate variation, higher income uncertainty implies less variation in skill, and it turns out that skill variation is more powerful than income uncertainty in leading to a higher optimal tax rate.¹¹²

There are two caveats regarding the use of the income tax as insurance against uncertain labor income. First, to the extent that income uncertainty involves systematic risk, the government is not able to solve the problem: Its resulting budget uncertainty must be addressed, for example, by raising taxes or reducing spending if the resolution of uncertainty is adverse.¹¹³ Second, the standard analysis ignores private insurance, the possibility of which renders government insurance through taxation not only unnecessary but also inefficient. Specifically, if the main inhibitor of private income insurance is moral hazard, as much of the literature asserts, the government cannot combat it either; indeed, that is why there is a labor-leisure distortion from income taxation. However, if adverse selection or other imperfections impede private insurance, then government insurance such as through taxation may be optimal. It should be kept in mind, however, that private and direct government insurance does exist for some important sources of uncertainty in labor income, notably for disability and temporary unemployment, and various other means allow individuals to mitigate income uncertainty to some extent.¹¹⁴

9.2.2. *Uncertain capital income*¹¹⁵

Uncertainty is central to the understanding of capital income taxation because a substantial portion of the return to capital, notably regarding equity investments, consists of a risk premium. Domar and Musgrave's (1944) seminal paper offers a partial equilibrium analysis in a model with two assets, one riskless and the other risky. Their basic insight is that taxes on the risky component of returns have no effect on individuals, who will simply gross up their investments in the risky asset to offset the effect of the tax.

To verify this result, suppose that, in a world in which only the riskless return, r , is taxed at the rate t_r , an investor would invest X in a risky asset that pays R_i (possibly less than X) in state of the world i . (For simplicity, ignore the rest of the investor's portfolio, which is held constant and which is unaffected by the reform to be considered.) Then, after risk is realized and tax is paid, the investor will have $R_i - t_r rX$, the gross return minus the tax on the riskless return to the initial investment.

¹¹²Tuomala (1990, section 9.3) finds that uncertainty in wages at the time effort is chosen (capturing such decisions as investment in human capital and occupational choice) favors rising marginal tax rates, the intuition being that high realizations are substantially attributable to luck, so the disincentive effect of taxing them more heavily is modest. His results are surprising in that the extent to which this is true in his simulations actually increases as uncertainty falls, which seems to contradict both the given intuition and the results of his simulations elsewhere in his book, which generally display falling marginal rates when there is no uncertainty.

¹¹³Compare Bulow and Summers (1984) and Gordon (1985).

¹¹⁴See Cochrane (1991) and Mace (1991).

¹¹⁵On taxation, risk, and household portfolio behavior more generally, see Poterba (2002).

Now assume instead that all investment returns, including the risky component, are to be taxed at the rate t_r (in a fully symmetrical manner, allowing for complete deductibility of losses). The investor can offset the effect of this supplemental tax on risk by increasing his investment in the risky asset from X to $X/(1-t_r)$, borrowing the additional funds, $t_r X/(1-t_r)$, at the riskless rate r . After risk is realized, the loan (with interest) is repaid, and tax is paid, the investor will have

$$\begin{aligned}
 (9.1) \quad & \frac{R_i}{1-t_r} - \frac{t_r X}{1-t_r} (1+r) - t_r \left[\frac{R_i - X}{1-t_r} - \frac{t_r X}{1-t_r} r \right] \\
 & = (1-t_r) \frac{R_i}{1-t_r} - \frac{t_r X}{1-t_r} (1+r-1-t_r r) \\
 & = R_i - \frac{t_r X}{1-t_r} r(1-t_r) = R_i - t_r r X.
 \end{aligned}$$

In the first line of expression (9.1), the first term is the gross return on the investment of $X/(1-t_r)$, the second term is the repayment of the loan, $t_r X/(1-t_r)$, with interest, and the third term is the tax owed, the tax at rate t_r being levied now on the gross return net of the investment, with a deduction allowed for the interest payment on the loan. As can be seen, in every state (for any i), the investor's net return under this regime – having adjusted the initial level of investment – is $R_i - t_r r X$, which is identical to the net return under the initial regime that taxes only the riskless return to investment.

This basic model has been extended in various ways that, among other things, take account of general equilibrium effects in asset markets and whether the government's budget is in balance in different states of the world. See Bulow and Summers (1984), Gordon (1985), and Kaplow (1994). An important implication of this model is that capital taxation (see subsection 5.1) is less important than it may appear to be because a tax on all returns is, accounting for portfolio adjustments, equivalent to a tax on only the riskless return, which is but a portion of the total return to capital. In addition, permutations of the foregoing analysis imply that various equivalences among taxes (for example, between a labor income tax and a consumption tax) that hold in a static model and in a dynamic world with certainty extend to the case of uncertain capital income. See Kaplow (1994).

9.2.3. *Other losses*

Aside from uncertainty that may affect the return to labor effort and investment, individuals may suffer losses directly, notably in cases of illness, requiring possibly significant medical expenditures, and casualties, such as if one's home is destroyed by fire. A common view, reflected to an extent in some income tax systems through deductions, is that individuals' effective income is lower on account of such losses and hence their taxable income should be reduced accordingly.

There are two shortcomings in this logic. First, the point has not been developed properly in an optimal income tax model. Even if the marginal utility of consumption of an individual

who, say, earns \$50,000 and suffers a loss of \$10,000 is the same as that of someone who earns \$40,000 and suffers no loss, their ability level and thus various aspects of the optimization are different, so further analysis of the optimal treatment is required. Second, a complete analysis must take account of the possibility that individuals could insure or take various precautions *ex ante*. See Kaplow (1992). Providing a deduction for losses is tantamount to providing free insurance for a fraction of losses equal to an individual's marginal tax rate. Such implicit insurance produces moral hazard, which distorts private insurance decisions. If moral hazard is the only market imperfection (or, even more so, if private insurance can combat moral hazard, such as where some precautions are observable), insurance through the tax system is inefficient. Furthermore, if the tax deduction is limited to uninsured losses, as in the United States income tax, private insurance is inefficiently discouraged.

9.3. *Transitions and capital levies*¹¹⁶

Many contemplated fundamental tax reforms involve transitions that entail what is tantamount to a one-time capital levy (or grant). One-time capital levies are traditionally viewed as an ideal sort of tax. Such a levy is imposed only on preexisting capital and, being one-time (with a presumed credible commitment never to be repeated), is nondistortionary.

There are two major problems with arguments in favor of a capital levy. First is the familiar point that the future promise may not be credible. The prospect of capital levies is a serious fear in many developing economies, which discourages foreign investment and induces residents to send capital outside the country. Any government that actually imposes a capital levy would not expect to be trusted anytime soon. That most countries refrain from such policies reflects some mix of constitutional limitations, strong norms, and the fear that future capital flight would be more costly than any short-run, even if substantial, gain.¹¹⁷

Second, there is a conceptual problem with the purported idyllic nature of a capital levy in developed economies that have an income tax.¹¹⁸ Specifically, one could in principle raise sums distortion-free by reducing the grant component g of the income tax, even making it negative – i.e., a uniform lump-sum levy. The primary deterrent to using this approach is not inefficiency but dislike of the distributive consequences. If a capital levy is a mere substitute for lowering g , and if g is already set optimally, then there is no benefit to a capital levy.

Further reflection suggests that a capital levy may nevertheless be welfare-increasing (if the one-time feature were realistic) because, at any given point in time, it is likely that ownership of the existing capital stock is distributed in a way that positively correlates with income and underlying earning ability, for it constitutes the result of prior accumulations that ultimately derive from labor income. (The correlation will be highly imperfect due to differences in lifecycle stage, preferences, and other factors.) Thus, a capital levy may be distributively

¹¹⁶See Kaplow (2003) on these and other transition issues; see also Shaviro (2000).

¹¹⁷For the classic statement of the dynamic commitment problem, which mentions capital levies as an illustration, see Kydland and Prescott (1977).

¹¹⁸Compare the discussion of Ramsey taxation in subsection 4.4.

appealing whereas reducing g would not be. Observe that this version of the argument is closely analogous to the notion that it would be ideal to impose future individualized lump-sum taxes based on ability as inferred from prior earnings or investments in human capital: The taxes would be nondistortionary in the future, and as long as this regime was not anticipated *ex ante*, society would not have suffered from prior distortions either.¹¹⁹ If such a one-time imposition were possible, it would be optimal to fashion the redistributive tax as a function of revealed labor effort rather than imposing a uniform capital levy.

In sum, one-time capital levies may seem attractive, depending on the available alternatives, but are generally regarded as infeasible, if not dangerous even to contemplate actively. It is interesting, therefore, that many fundamental tax reforms can involve what is tantamount to a capital levy. Most analyzed is the transition from an income tax to a consumption tax (or simply the introduction of or raising the rates in a consumption tax): Unless there is transition relief for pre-enactment accumulations, the effect is to reduce the purchasing power of preexisting capital.¹²⁰ Thus, although a wage tax and a consumption tax may be equivalent in steady-state, simulations of the transition to a consumption tax show greater efficiency gains than result from transition to a wage tax because the former contains a significant capital levy whereas the latter does not.¹²¹ Of course, if the transition were anticipated, say during years or decades of preceding debate, the implicit levy would not be unanticipated and distortion would result.

Similar questions arise in other settings. For example, analyses of the efficiency of capital taxation more generally often envision a world in which there is a preexisting capital stock without inquiring as to its origin – notably, as a consequence of prior earnings or of inheritance, which itself is the product of a donor’s prior earnings, on which see subsection 5.2. In such a model, the intertemporal inefficiency of taxing capital in a simple setting (see subsection 5.1) will be counterbalanced by the advantage of the capital levy, and a dynamic analysis will accordingly suggest the seeming optimality of high capital taxes initially but no capital taxation in the long-run steady state.¹²² All of this, of course, assumes that the enactment of the initially high capital tax is unanticipated and that the subsequent promise to eliminate capital taxation is credible.

Likewise, negative capital levies – windfalls – can arise if, for example, corporate taxation is reduced or eliminated. Thus, a key point concerning the desirability and appropriate form of integration of the corporate income tax (see subsection 5.1.3) concerns the fact that existing corporate equity would thereby be freed of future tax liability. This revenue loss is ordinarily seen as unaccompanied by any corresponding efficiency gain, although in a setting in which the possibility of integration may long be anticipated, an understanding that old equity

¹¹⁹For a theoretical exploration of taxation based upon prior economic choices, see Roberts (1984).

¹²⁰See, for example, Bradford (1996a, 1996b), Kaplow (2003), Sarkar and Zodrow (1993), and Shaviro (2000).

¹²¹See, for example, Auerbach and Kotlikoff (1987) and Sarkar and Zodrow (1993).

¹²²See, for example, the results reported in note 41.

would benefit would tend to have the effect of reducing pre-enactment distortion.¹²³

9.4. *Capital gains*

The attempt to employ an accrual income tax (taxing returns to both labor and capital) is plagued by the problem of capital gains. Proper taxation requires that gains be taxed as they accrue or, in the alternative, following Vickrey (1939), that interest be charged on taxes that are deferred until realization (ordinarily, the sale of the asset). Ongoing accrual taxation (referred to as “mark to market”) is feasible for many publicly traded securities but not for some other assets, and selective application of accrual taxation would be distortionary.¹²⁴ As a consequence, most assets are taxed on a realization basis, resulting in mismeasurement of income (which may cause interasset distortion since the benefits of deferral vary across types of assets) and distortion of investors’ portfolios on account of the lock-in effect, wherein taxpayers with accrued gains have an incentive to defer sale in order to further defer taxation.¹²⁵ Additionally, the realization requirement induces a variety of financial manipulations designed to take advantage of its benefits.¹²⁶

An ingenious scheme, initially due to Auerbach (1991) and subsequently extended by Bradford (1995) and Auerbach and Bradford (2004), solves the problem using a sort of realization-based taxation that, in its most basic form, taxes investors as if the value of the asset at the time of sale was produced by a hypothetical investment at the time of purchase that grew at the riskless rate of interest. Two desirable features of this approach are that relative risk-adjusted asset returns are unaffected, just as under an idealized accrual tax, and lock-in is avoided. An apparent shortcoming is that actual tax payments diverge from what one would think should be due in particular states of the world. For example, if there is a huge gain, the investor’s tax based on the imputed riskless return is far less than what would be due under an actual accrual tax, and if there is a loss, the investor still pays positive tax based on the imputed riskless return. However, the central virtues of the tax scheme are unaffected by these apparent anomalies. Moreover, when one takes into account individuals’ portfolio adjustments (compare subsection 9.2.2), investors’ actual net positions in each state of the world are the same as they would be under an ideal accrual tax. See Kaplow (1994).

¹²³Expansions and contractions of social security benefits can be analyzed in an analogous manner: If taxpayers perceive a significant tax-benefit linkage and if (but only if) benefit changes are anticipated, this prospect should affect pre-enactment labor supply.

¹²⁴Possible lack of liquidity is another reason sometimes given for disfavoring accrual taxation, although the problem is unlikely to be significant for publicly traded assets for which mark to market is feasible.

¹²⁵That the United States also provides a tax-free step-up of basis at death adds to the lock-in problem. Note that there is an important exception to the realization approach for business assets, namely, the provision of depreciation, amortization, and other deductions for business expenditures on capital assets that predictably decline in value over time. (In the absence of such provision, taxpayers would have ongoing incentives to sell used plant and equipment, to realize losses.) To the extent allowed deductions depart from economic depreciation (on which see Samuelson (1964)), interasset distortions result. One case involves intangibles, such as investments in advertising and R&D, which are permitted to be expensed.

¹²⁶One of the simplest is the selective sale of assets with losses so that they can be deducted against other income, while continuing to hold assets with unrealized gains. See Stiglitz (1985a). Capital loss limitations are employed to counter this tactic.

9.5. Human capital

Human capital constitutes a substantial majority of all capital. See, for example, Davies and Whalley (1991) and Jorgenson and Fraumeni (1989). Furthermore, the returns to human capital – wages – are the direct or indirect source of most tax revenue. Accordingly, the relationship between human capital and taxation deserves significant study. Nevertheless, the subject has received far less attention than has the taxation of physical and financial capital. To illuminate the matter, it is useful to compare the tax treatment of human capital under an accrual income tax, which purports to tax capital income, with standard treatments of physical and financial capital, following Kaplow (1996c).¹²⁷

An accrual income tax, which taxes both labor income and returns to capital, treats human capital essentially on a realization basis by taxing wages while ignoring changes in the value of an individual's stock of human capital. This is most apparent in an individual's last year of work: The year's wages are taxed, but the individual's stock of human capital will have fallen during the year by approximately the full amount of these wages (the present value at the outset equaling the year's wages with a slight time value discount) while no offsetting depreciation deduction is allowed, such as would be the case under pure accrual income taxation. Under an idealized accrual system, the receipt of human capital (at birth) would be subject to tax, and each year's earnings would be partially offset by depreciation deductions that would be growing over time. Further taxation (including negative taxation for falls in human capital) would arise as uncertainty was resolved, just as with a physical or financial asset that produced a similar (yet equally uncertain) pattern of future cash flows.

To highlight the difference between accrual taxation of human capital and the realization-based approach implicit in taxing wages instead, with no adjustments for changes in the value of human capital, one can ask, just as in subsection 9.4's discussion of capital gains, what taxation at realization would serve as a proxy for accrual taxation. As a crude approximation, by analogy to Auerbach's (1991) scheme, any wage earnings would be subject to greater tax the longer the holding period, i.e., the older the individual earning the wages. Thus, pure accrual taxation would be similar to applying to wage earnings a multiplier that grew over individuals' lifetimes.

Given that actual taxation of human capital is realization based (with no multiplier) and thus closer to the treatment appropriate under a consumption tax, we can ask what are the efficiency implications of this attribute. First, to the extent that consumption taxation is more efficient by reducing intertemporal distortion (see subsection 5.1), this form of wage taxation may seem desirable. The discrepancy with the treatment of other capital suggests that individuals would prefer to fund future consumption by deferring labor supply to later years rather than by earning more now and engaging in conventional savings. Because later years' wages are not taxed at a higher rate reflecting the implicit deferral whereas conventional savings are subject to tax on appreciation under an accrual income tax (and to a lesser extent under existing, standard income tax systems), there does exist a preference for saving through deferral of labor supply.

¹²⁷For a complementary treatment of some of these issues, see Andrews and Bradford (1988, appendix).

This secondary distortion of labor supply, in the timing of earnings, serves to partially offset the distortion of intertemporal consumption choices under an accrual income tax.

Under standard forms of capital taxation, such as in an accrual income tax, investment in human capital would appear to be favored over investment in other capital because human capital is only taxed upon realization. As noted, however, there are no depreciation deductions for human capital and thus for incremental investments therein. Some investments in human capital, notably forgone earnings, are implicitly expensed since the forgone imputed income is never taxed, which is more favorable than depreciation. See Boskin (1977) and Heckman (1976). However, if such implicit deductions are taken in years in which marginal rates are low (due to rate graduation), the result could be less generous. See Nerlove, Razin, Sadka, and von Weizsäcker (1993). Many direct investment expenditures, such as on education, are never deductible (although there are also substantial public subsidies). Additionally, to the extent that the uncompensated labor supply elasticity is positive (negative), the reduction (increase) in labor effort due to labor income taxation will reduce (increase) the value of investments in human capital. Further influences on the return to human capital investment may arise on account of general equilibrium effects on wages of the sort noted in subsection 3.5.2. The net effect of these (and other) factors is not entirely clear. Nevertheless, Trostel (1993) estimates that income taxes do significantly discourage investment in human capital, the primary channels being a consequence of the taxation of labor income, implying that a consumption tax would have a similar effect. It does not follow, however, that all such effects involve inefficiencies: Taking as given that individuals, say, will work less on account of labor income taxation, it is efficient for them to invest less in their human capital to that extent.¹²⁸

Human capital is also treated qualitatively differently from other capital under transfer tax systems. See Kaplow (2001). Many countries subject sizeable gifts and estates, usually transfers to the next generation, to high marginal tax rates. However, transfers of human capital are largely exempt. The primary constituents – genetic endowment, environment (parental involvement and schooling), opportunities, and contacts (see Taubman (1996)) – are not ordinarily considered as conceivable components of a transfer tax base. Direct expenditures, such as on private education or on more expensive housing that gives access to superior public schools, are typically exempt as well. As noted in subsection 5.2, however, the negative externality of gifts due to the income effect may be reversed in the case of gifts of human capital (and the standard positive externality to the donee remains), so preferential treatment of transfers that contribute to human capital may be optimal. Of course, there may be some inefficient discrimination against other transfers having similar effects, such as those that relax liquidity constraints and thereby facilitate entrepreneurship.

9.6. *Lifetime horizon*

An important simplification implicit in standard, static optimal income tax analysis is that

¹²⁸There may be externalities to investment in human capital, and general equilibrium effects also influence welfare, so such effects of taxation on human capital may still be of social consequence. See, for example, Hamilton (1987), Heckman, Lochner, and Taber (1999), and Jacobs (2005).

individuals' lives, both their labor effort and consumption, are collapsed into a single period. However, because individuals' earnings vary over the lifecycle both systematically and on account of uncertainty and because individuals borrow and save to allocate (generally, to smooth) consumption over the lifecycle, much of relevance is omitted as a consequence. In particular, with income taxes that are assessed on an annual basis, the mismatch between current and lifetime distributive effects is significant. Many of the current "poor" consist of young or old individuals with low current but high lifetime income or individuals of any age who may be having a bad year, whereas some of the "rich" may be moderate-lifetime-income individuals having a good year. With hump-shaped earnings profiles, even middle-lifetime-income individuals with a certain wage stream will have below-average incomes when young and when old and above-average incomes when in their peak earning years.¹²⁹ See generally Fullerton and Rogers (1993).

If individuals engaged in no borrowing and lending (and there were no consumer durables and no other sources of utility interdependence across periods), the optimal income tax problem would be largely unaffected: In each period, individuals would have a given wage and the social welfare optimization could proceed period by period. If, however, there is significant borrowing and lending (directly or indirectly), as clearly occurs, the problem changes. The optimum would involve age-dependent tax schedules, and the optimization would need to take into account individuals' consumption-smoothing behavior, including possible limits to theoretically ideal smoothing due to liquidity constraints and myopia.¹³⁰

Short of a complete analysis, it is widely suggested, following Vickrey (1939), that some sort of averaging scheme would be appropriate. Lifetime averaging may seem ideal, and following Vickrey's proposal is less complex than it might seem, although changes in family unit membership over the lifecycle do make the problem significantly more challenging. See Liebman (2003) for estimates of the effects of averaging over various periods under the current United States tax and transfer system. Liebman also emphasizes the need to relate income averaging explicitly to social welfare, noting that averaging can produce not only distributive benefits but also efficiency gains, on account of equalizing marginal tax rates across individuals and over time.

Two caveats regarding the importance of averaging should be noted. First, if the redistributive tax is based on consumption rather than labor income or total income, the potential mischief caused by focusing on annual information is greatly mitigated on account of consumption smoothing. In the simplest case (including a world with complete earnings

¹²⁹For similar reasons, the incidence of many forms of taxation is more nearly proportional (rather than progressive or regressive) if the basis of comparison is lifetime rather than annual income (or if it is consumption, which over the lifetime is smoother than income). See Fullerton and Rogers (1993). There are also more subtle effects. For example, median-lifetime-income individuals have a later earnings peak than high- or low-income individuals and hence save less when smoothing their consumption. As a consequence, Fullerton and Rogers find that the lifetime incidence of taxes on capital tends to be U-shaped, falling more heavily on the rich and the poor than on the middle class.

¹³⁰The social security system (see subsection 5.3) is age-dependent, but primarily as a means of forced savings. It is unclear the extent to which its features, when combined with the annual income tax, are in accord with what would be optimal. On lifetime income, income taxation, and social security, see Diamond (2003).

certainty and perfect annuity markets), individuals would consume evenly over their lifetimes, so no adjustments would be required. Second, even under an income tax, variable earnings over the lifecycle would not have the ordinarily posited effects if the tax schedule were linear.¹³¹ Only with graduated rates are tax burdens higher as a consequence of uneven earnings. As explored in section 3, however, it is not apparent the extent to which highly nonlinear marginal tax rates are optimal.

9.7. Budget deficits and intergenerational redistribution

Another common assumption in much analysis of taxation is that budget balance is required. In a dynamic setting, this requirement need not be met in any particular accounting period but must hold in the long run; deficits today must ultimately be financed, even if by paying interest in perpetuity. The time pattern of deficits is not, however, a matter of indifference, even abstracting from macroeconomic effects.

First, Barro (1979) shows that it is advantageous to adjust short-run deficits so as to maintain constant tax rates (in expectation). Because the marginal distortionary cost of taxation rises with marginal tax rates, it is better to raise revenue over time with tax rates that are as nearly constant as possible rather than with more highly variable tax rates, just as in certain basic static settings it is best to tax different activities uniformly. Accordingly, whether a deficit makes sense today depends on whether expenditures are temporarily high (for example, on account of a war), on projections for future growth of the tax base, and on other factors bearing on whether paying off the deficit will require higher tax rates in the future.

Second, different timing of deficits has distributive effects and, in particular, is one potential source of intergenerational redistribution. For this reason, Auerbach, Gokhale, and Kotlikoff (1991) and others have proposed to track such effects using generational accounting, wherein the aggregate effect of government tax and transfer policy (and, in some work, certain government expenditures, such as on education) over time is imputed to different generations, making the assumption that deficits or surpluses of the past and present will ultimately be borne by future generations. See Kotlikoff (2002). Social security (see subsection 5.3), when funded largely on a pay-as-you-go basis, obviously has important intergenerational effects. Furthermore, uncompensated transitions that may involve large capital levies (see subsection 9.3) can likewise have distributive effects, such as by heavily taxing existing capital, owned disproportionately by older living generations, which allows reduction of the national debt that otherwise would ultimately be paid off by younger or future generations. An important complication, related to debates about Ricardian equivalence, see Barro (1974), concerns the extent to which private intergenerational transfers (variations in the level of gifts and bequests) will adjust to offset changes in public intergenerational transfers.

¹³¹There still is an important effect in an income tax that includes both labor and capital income because, as noted in subsection 9.5, earnings in earlier years of equal present value are disfavored by the tax on the return to savings.

10. Unit of Taxation

10.1. Framework

Treatment under income taxes and transfer programs depends on the type of family unit, notably, whether there is a married couple or a single adult and whether and how many children are present. What treatment is proper has proved quite controversial, with actual practice varying substantially among programs, across jurisdictions, and over time. This section considers work that seeks to relate issues involving the unit of taxation to the explicit welfare-maximizing approach that serves as the basis for optimal income tax analysis when there is only one type of taxable unit.

The framework and analysis outlined here and developed in subsections 10.2 to 10.5 follows Kaplow (1996b). It simplifies the problem by holding labor supply and family composition fixed (on which see subsection 10.6), thereby focusing on the question of how the relative treatment of different types of family units affects social welfare on account of distributive effects.¹³² It is helpful to consider a simple model with two family units, a single individual and a two-member family: For some applications, the two members may be thought of as two adults, and for others as a representative parent and a representative child. With labor supply and thus total income fixed, it is assumed that the sole policy choice is an allocation between the two units. Allocations within the two-person family are assumed to be determined in some internal fashion that the government is unable to observe or control.¹³³

To complete the description of the model, it is necessary to state the pertinent utility functions, the mechanism by which sharing within the two-person unit is determined (see, for example, Becker (1991)), and the SWF.¹³⁴ For the latter, analysis will consider the utilitarian case; the implication of a strictly concave SWF will be apparent below because most results depend on the concavity of individuals' utility and a more concave SWF will usually have implications similar to those of more concave utility functions.

As a benchmark, consider the case in which all individuals – the single individual and both family members – have the same utility functions, there is equal sharing in the (two-person) family, there are no economies of scale, and there are no interdependencies in utility functions. As with Edgeworth's (1897) egalitarian result, the optimum here obviously involves giving the single individual half the consumption as the family because this allocation equalizes everyone's

¹³²A further aspect of non-fixed family composition is that individuals spend different parts of their lives in different types of family units, so optimization over the lifecycle raises additional complications in determining optimal taxation of different family units.

¹³³Allocations can be influenced by differential commodity taxation (assuming that spouses or children have different demands) and by providing transfers in-kind.

¹³⁴Two features are noteworthy. First, each individual is the unit of analysis in the SWF, rather than referring to a family utility function (though one could define the latter as the sum of the utilities of the family members). Second, this method does not involve defining an equivalence scale and considering, say, how to equalize equivalent income. See, for example, Deaton and Muellbauer (1986) and Gronau (1988). As will become clear, this alternative approach would not be tantamount to maximizing any standard SWF, except by coincidence. For criticism of the use of equivalence scales for welfare analysis, see, for example, Pollak and Wales (1979).

marginal utility of consumption. Note that everyone's total utility is the same as well.

10.2. Intrafamily sharing

The optimal treatment of different family units may well depend on how sharing operates within multi-person families.¹³⁵ Indeed, in debates about whether married couples should be taxed as a unit (as in the United States) or as if they were two single individuals (as in many other countries), it is often suggested that the former treatment is more appropriate to the extent that sharing is equal. (A primary reason the difference matters is due to graduated rates, which make separate treatment less advantageous;¹³⁶ note, however, that the analysis in subsection 3.4 hardly indicates that graduated rates are optimal.) Such commonly held views, however, consider neither how the resulting differences in tax burdens will actually be shared nor how the results relate to maximization of a standard SWF.

Insight into the issue can be gleaned by beginning with the above-described benchmark case and assuming now that the two-person family shares resources unequally in some stipulated ratio, with ϕ being member 1's share and $1 - \phi$ being member 2's. Without loss of generality, consider the case in which $\phi > 1/2$. Furthermore, because we are abstracting from labor supply and considering identical utility functions, we can let u denote each of the individual's utilities as a function of post-redistribution consumption. It is also convenient to let c denote the total consumption of the two-person family and ωc that of the single individual.¹³⁷ This allows the simple interpretation that, when ω equals (or is greater or less than) $1/2$, the single individual receives precisely (or more or less than) a pro rata share of total resources.

Social welfare is equal to $u(\phi c) + u((1 - \phi)c) + u(\omega c)$. Differentiating with respect to c (keeping in mind that ω is implicitly a function of c) yields the following condition for the utilitarian optimum:

$$(10.1) \quad \phi u'(\phi c) + (1 - \phi)u'((1 - \phi)c) = u'(\omega c).$$

This first-order condition, as one would expect, sets the sum of the two family members' marginal utilities from an additional dollar allocated to the two-member family (taking account of how much of the dollar each member actually will consume) equal to the marginal utility of an additional dollar allocated to the single individual. The first term on the left indicates the benefit from the fraction ϕ of a dollar allocated to the family going to the first member, whose marginal

¹³⁵See Apps and Rees (1988). Note also that when family members' earnings differ from their consumption allocations, gifts or exchange are implicitly involved. Hence, the question of taxation of different family units must, in principle, be related to the question of transfer (gift and estate) taxation, see subsection 5.2, especially in light of the fact that a substantial portion of all voluntary transfers are to other family members. This relationship is illustrated in subsection 10.4 on altruism.

¹³⁶To illustrate, suppose that for single individuals there is a 20% marginal tax rate on income below \$50,000 and a 40% rate above, and that married couples face the same rates with the upper tax bracket beginning at \$100,000. If one individual earns more than \$50,000 and another earns less than \$50,000, marriage will reduce their combined tax payments because part of the former's income that would have been taxed at 40% will now be taxed at 20%.

¹³⁷That is, letting C denote total resources, $\omega = (C - c)/c$.

utility reflects the consumption share ϕ . The second term likewise indicates the benefit from $1-\phi$ of a dollar going to the second member. The right side is the single individual's marginal utility of a dollar.

It is indeterminate whether ω exceeds, equals, or is less than $1/2$. The first term on the left side of (10.1) is the effect of allocating additional funds to the family through its effect on the individual who takes the greater share. Since that person receives more than a pro rata share ($\phi > 1/2$), this term receives more weight; however, for the same reason, that person's marginal utility will be lower, on account of the diminishing marginal utility of consumption, giving the term less weight. For the second person, these effects reverse. Which effect is larger depends on the curvature of the utility function. Taking the constant-relative-risk-aversion case, if the coefficient of risk aversion exceeds (is less than) 1, it can be shown that the allocation should be more (less) favorable to the family – ω should be less (greater) than $1/2$. The intuition is that, when the curvature is greater, it matters more that some of the additional resources to the family are enjoyed by the less advantaged member because that member's higher marginal utility of consumption more than counterbalances the fact that a majority of the added resources go to the more advantaged member.

This result assumes that, whatever is each family member's share, it is constant rather than a function of consumption. If the share of the more-advantaged member rises (falls) with consumption, treatment of the (two-member) family should be less (more) generous than implied by expression (10.1). This is because the marginal dollar more (less) favors the advantaged member than does the average dollar, and the average dollar – really the total – determines individuals' marginal utilities of consumption. In sum, to determine what treatment is optimal on account of unequal sharing requires specifying (and justifying) a particular model of how intrafamily sharing operates. See, for example, subsection 10.4 and the surveys by Behrman (1997) and Bergstrom (1997).

10.3. Economies of scale

Economies of scale are thought to be the main justification for applying a higher tax schedule to married couples than to (two) single individuals, such as is done in the United States. To assess this conventional wisdom, return to the benchmark case (with equal sharing) and suppose that a dollar of consumption is worth more to the two-member family. Specifically, assume that each of the two family members' utility is given by $u(\beta(c)/2)$, where $\beta(c) > c$. For concreteness, consider the linear case: $\beta(c) = \beta c$, with $\beta > 1$.

The first-order condition for welfare maximization is now

$$(10.2) \quad \beta u'(\beta c / 2) = u'(\omega c).$$

Again, there are two competing effects. On the left side, the leading β indicates that the two-member family gets more per dollar than the single individual, which favors more generosity toward the family ($\omega < 1/2$). But the argument of u' on the left side is $\beta c/2$ rather than $c/2$, a higher value, which reduces the marginal utility of consumption, favoring less generosity

($\omega > 1/2$). (This latter effect corresponds to the conventional wisdom on the subject.) Which effect is greater depends again on the curvature of the utility functions, although the results are opposite to those with unequal sharing. With constant-relative-risk-aversion utility functions and a risk-aversion coefficient above (below) 1, the latter (former) effect dominates, making less (more) generous treatment of the family optimal. The intuition is that, when curvature is high, the higher standard of living due to scale economies greatly diminishes the marginal payoff to additional consumption relative to the multiplier accounting for the family's greater efficiency of converting tangible resources into effective consumption.

10.4. Altruism

One specific case of interest is that in which each family member is altruistic toward the other. Specifically, suppose that the utility of each member of the two-person family is given by $u_i + \psi_i u_j$. Then the total utility entering into the SWF from the two-member family will be $(1+\psi_2)u(\phi c) + (1+\psi_1)u((1-\phi)c)$. For preliminary insight into the effect of altruism, assume equal sharing ($\phi = 1/2$). Then, the first-order condition is

$$(10.3) \left(1 + \frac{\psi_1 + \psi_2}{2} \right) u'(c/2) = u'(\omega c).$$

Clearly, the allocation should be more favorable to the two-member family ($\omega < 1/2$) to an extent that increases with the level of altruism. Here, the two-member family, like in the case of scale economies, more efficiently converts tangible resources into utility. However, given the stipulated manner of the conversion, there is no offsetting effect from a diminished marginal utility of consumption.

One suspects that stipulated equal sharing may be inconsistent with altruism, especially when altruism is asymmetric. Another simple possibility is that the shares are chosen to maximize family welfare. Compare Samuelson (1956). Making use of the first-order condition for the family's optimization problem, one of the equivalent ways to express the first-order condition for welfare maximization is

$$(10.4) (1 + \psi_2) u'(\phi c) = u'(\omega c).$$

(The parameter ψ_1 implicitly enters, symmetrically, through the determination of ϕ in the family's first-order condition.) It can be shown, as one would expect, that greater altruism favors more generosity to the family.

Another interesting case is that in which only one member (member 1) is altruistic and that member chooses ϕ to maximize personal welfare, as in Becker (1974). In this case, the optimal treatment will depend on the strength of altruism. For example, if $\psi_1 = 1$, which corresponds to giving equal weight to the other member's utility, equal sharing will result and the outcome of the preliminary case in this subsection, involving more generous treatment to the family, will govern. When $\psi_1 < 1$ but is still sufficiently large that some sharing occurs, the

result is more complex. As in subsection 10.2, although few incremental resources may go to the less advantaged member, the marginal utility from those additional resources will be relatively high.

10.5. Children

If children were like adults (in terms of the model, meaning the same utility functions and so forth), then no additional analysis would be required. In the benchmark case of subsection 10.1, families' allotments would optimally involve each member getting the same resources as a single individual. Such treatment is substantially more generous than that provided by tax systems, which usually make relatively modest adjustments for children, especially for individuals above fairly moderate levels of income. (Indeed, in the United States, some adjustments are phased out at higher levels of income.) Existing treatment would be optimal if, for some reason, the welfare of children simply did not count as constituents of social welfare, a rather implausible view.

Suppose that children differ because they require fewer resources to achieve a given level of utility. Specifically, assume that member 2's utility is given by $u((1-\phi)c/\zeta)$, where $\zeta < 1$. Member 1, taken as a representative adult, continues to have the same utility function and thus to achieve the same level of utility for a given level of consumption as does the single individual. First, consider the case in which the family's sharing equalizes the utility levels of the two family members. This requirement implies that $\phi = 1/(1+\zeta)$. The first-order condition for welfare maximization is

$$(10.5) \quad \frac{2}{1+\zeta} u'\left(\frac{c}{1+\zeta}\right) = u'(\omega c).$$

Because $\zeta < 1$, the leading component on the left side of expression (10.5) exceeds 1. Thus, it must be that $1/(1+\zeta) > \omega$. Furthermore, because $\phi = 1/(1+\zeta)$, we have $\phi > \omega$. This means that the optimal allocation is more generous to families than one that would equalize the total utility of each person – or, equivalently in this case, equalize the utility of member 1 and that of the single individual, each of whom has the same utility function. This result is due to the fact that member 2 is a more efficient generator of utility, and the only way to channel additional resources to member 2 (given the stipulated intrafamily sharing rule) is to benefit member 1 as well. (Again, the curvature of the utility function will also affect the optimum: The greater the curvature, the less is the efficiency effect relative to the diminishing marginal utility effect, so the less is the aforementioned preference for the family.)

Second, consider the case in which the family's allocation maximizes the sum of their utilities rather than equalizing the levels of their utilities. This allocation would be relatively more advantageous to member 2, the more efficient utility generator, and the share would be set at the level where the efficiency effect just equalled the diminishing marginal utility effect. The result is that the socially optimal allocation entails $\phi = \omega$, an allocation under which member 1 has the same resources and utility as the single individual. (The family equates the marginal

utility of resources between the two members, and the social authority equates the marginal utility of the family, which equals the marginal utility of either member – and we can take member 1 – to the marginal utility of the single individual. Since member 1 and the single individual have the same utility function, they receive the same allocation.) As in the prior case, however, the family's allocation is sufficient to allow member 2 to achieve a higher utility than that of the single individual (so average utility in the two-member family remains higher).

It would seem that optimal allocations to families with children are more generous than is typically provided. Whether and to what extent this is true would depend on the actual form of the utility function. For example, if children are such efficient utility generators that they achieve high utilities with virtually no resources and are subject to rapidly diminishing marginal utility at that point, little adjustment for family size may be required.¹³⁸

Furthermore, the above results suggest that family size adjustments should not be limited to lower-income families. It is often thought that extending or expanding adjustments to higher-income individuals (perhaps making them proportional to income) would be highly regressive. Such reasoning, however, is misleading in two respects. First, it ignores that the overall tax schedule can be adjusted simultaneously to avoid such an effect; thus, the relevant question is, as between families of a given level of income, what should be their relative tax payments (or transfer receipts) as a function of the number of children. Second, any characterization of this sort presumes that one has already determined who is rich and poor and to what extent, but in setting adjustments for different family units, the point of the enterprise can be understood (loosely) as an implicit process of defining how rich or poor various family units are in the first instance.

10.6. Incentives

The foregoing analysis of optimal taxation of different family units takes labor supply and family composition as given. However, there are likely to be interactions between how different family units are taxed and each of these incentive margins.

First, consider work incentives. One way to view the optimal income tax problem when there are different family units (taken to be exogenous for the moment) makes use of the analysis in subsection 3.5.1 in which a different $T(wl)$ schedule is applied to each group (θ would now index family composition). The analysis in the preceding subsections can be understood as bearing on the form of individuals' utility functions for each group. In other respects, analysis would proceed as before.¹³⁹

One issue that has received special attention is the treatment of second earners, typically

¹³⁸Another complication is that all government policy, including for example free public education, must be taken into account in determining the extent of generosity in an existing system.

¹³⁹Cremer, Dellis, and Pestieau (2003) examine a model with exogenous differences in family size and find that marginal rates should be lower (or, for the highest type in a nonlinear scheme, the same) for families with more children. An explanation for this result can be found in the analysis of subsection 10.5, assuming that the absolute amount of adjustments required to equalize effective marginal utilities across family types is rising with income, as seems plausible.

women in two-parent families (often with children), who some suggest to have a higher elasticity of labor supply than primary earners or single individuals. It is argued that, accordingly, they should face lower marginal tax rates. See, for example, Boskin and Sheshinski (1983), Feldstein and Feenberg (1996), and Rosen (1976), and also Schroyen (2003) who considers intrahousehold behavior.

Second, incentives to marry are arguably affected by the tax system. In the United States, for example, married couples face a higher overall schedule than would be faced by two single individuals each earning half the income, which creates a marriage penalty. On the other hand, if two individuals with highly unequal income marry, they face lower taxes on account of rate graduation, and this effect may exceed the first, creating marriage subsidies. Other provisions, especially those in transfer programs, can create relatively significant tax differentials as a consequence of the decision to marry.¹⁴⁰ See, for example, Alm and Whittington (1996) on the extent of marriage taxes and subsidies in the United States. Interestingly, the penalty effect is caused by a higher schedule often motivated by a desire to account for economies of scale in a manner that the analysis of subsection 10.3 indicates may not be optimal, and the subsidy effect is due to rate graduation that the analysis in subsection 3.4 indicates may not be optimal.

A common view is that the tax system should be marriage neutral to avoid distortion of the marriage decision. However, there may be positive externalities to marriage, especially when children are involved, in which case a subsidy may be optimal. It is often feared that eliminating marriage penalties or increasing subsidies, such as by making the schedules for married couples more generous, would be expensive and regressive (since the highest absolute penalties are borne by higher-income individuals), but just as in the case of adjustments for family size (see subsection 10.5), this view is misleading: It is possible to adjust the level of other schedules (here, raising that on single individuals) and the shape of all schedules (preserving the average amount paid at any level of income), and, regarding regressivity, one cannot define distributive goals meaningfully without first specifying the relative positions of various family units.

Third, the treatment of children in tax and transfer programs may influence procreation decisions, a possibility that is usually raised with respect to transfer programs.¹⁴¹ Nearly all systems (except in countries that specially penalize or forbid additional births) make the net treatment at least somewhat more generous as the number of children increases, and the analysis in subsection 10.5 suggests the possibility that significant adjustments may be optimal. Whether any effect of such treatment on child-bearing is desirable depends on the net external effects of having children. This problem is particularly vexing when one of the externalities (under at least some views) pertains to the births per se, i.e., the positive externality to the child thus created. See, for example, Mirrlees (1972b) and Nerlove, Razin, and Sadka (1986).

¹⁴⁰For a survey of evidence on the effects of welfare on family structure, see Moffitt (1992).

¹⁴¹Regarding the effect of welfare on fertility, see Schultz (1994). Whittington, Alm, and Peters (1990) offer evidence that income tax exemptions affect the birth rate.

11. Tax Administration and Enforcement

Much analysis of taxation, as reflected in the foregoing sections, abstracts from concerns about administration and enforcement, implicitly assuming that tax liability is ascertained accurately and collected costlessly, without any resistance by taxpayers. This view, of course, is unrealistic. For example, in the United States, public and private collection costs for the income tax are approximately 10% of revenues, and it is estimated that over 15% of tax liability is unpaid.¹⁴²

As outlined by Stiglitz (1985a), tax avoidance – generally understood as constituting reduction in tax obligations through manipulations permitted by law – comes in a number of basic forms: deferral (moving a nominal tax liability to a later date, thereby capturing the interest in the interim), tax arbitrage between individuals or entities with different marginal tax rates (including the case of the same taxpayer, facing different rates in different periods), and arbitrage across earnings flows facing different tax treatment (for example, dividends versus interest for firms, ordinary income versus capital gains for individuals). If unconstrained by capital market imperfections or legal limits (such as on the ability to deduct capital losses), Stiglitz suggests that individuals could eliminate their tax liability altogether without changing their underlying real behavior. Gordon and Slemrod (1988) calculated that the United States tax system in 1983 collected, roughly, no revenue from the taxation of capital income. As a result of subsequent events, Gordon, Kalambokidis, and Slemrod (2004) find that substantial revenue was raised from the taxation of capital in 1995, but Gordon, Kalambokidis, Rohaly, and Slemrod's (2004) update to account for 2003 legislation concludes that, closer to the previous situation, little such revenue is collected as of 2004.

Tax evasion – illegal nonpayment – is also significant, as reflected in the aforementioned estimate of unpaid income tax liability. Although nearly 100% voluntary compliance is achieved on wages and salaries (which are subject to information reporting requirements), voluntary reporting is barely over 40% for self-employment income, due in large part to the difficulty of identifying evasion in the cash sector. It is suspected that evasion in many countries, especially developing economies, is much worse than in the United States, in significant part because so much more economic activity is in the latter category. It is worth noting that, on average, evasion tends to be worse as a percentage of income at the bottom of the income distribution whereas avoidance tends to be more significant at the upper end, in both cases on account of differential opportunities for tax reduction. (There is some important overlap; notably, the self-employed tend to avoid and evade more than average.)

The substantial literatures that measure avoidance and evasion, examine the effects of different policies on the extent of revenue loss, and analyze what policies are optimal in light of these problems are largely beyond the scope of this chapter but are surveyed elsewhere.¹⁴³ This

¹⁴²See, for example, Guyton, O'Hare, Stavrianos, and Toder (2003), Internal Revenue Service (1996, 2005), and Slemrod (1996b).

¹⁴³See, for example, Andreoni, Erard, and Feinstein (1998), Cowell (1990), Roth, Scholz, and Witte (1989), and Slemrod and Yitzhaki (2002).

section will focus on conceptual and normative issues that pertain most directly to the topics addressed in previous sections.

11.1. Choice of tax systems

Most analyses simply assume that some tax instruments are available and others are not (just commodity taxes, commodity taxes and income taxes, only linear income taxes, no ability taxes).¹⁴⁴ However, as emphasized by Mirrlees (1971), Atkinson and Stiglitz (1980), and Slemrod (1990), among others, it is important that the presumed set of available instruments be motivated by administrative and enforcement concerns that indicate what actually is feasible. Ideally, these concerns would not be stipulated but rather would be made endogenous, which is the point of much of the literature examined in subsection 11.2. Often, feasibility is a matter of degree, and one must choose among various imperfect systems, the quality of each being determined by policy choices regarding administration and enforcement and also by how the instrument is used (e.g., the extent of evasion may depend on rates and on what other taxes are in place).

It is useful to consider a few examples of how administrative considerations may affect the choice among tax systems. As noted in subsection 3.5.1, Stern (1982) compared an imperfect ability tax (combined with a linear income tax) to a perfect (that is, error-free) nonlinear income tax. More broadly, the analysis in that section considered, for any signals that may correlate with ability, how one might optimally design a nonlinear income tax system that could be made a function of the signal. Further analysis would make endogenous both the government's categorization (how accurately to observe the signal, how to set burdens of proof) and private efforts to manipulate such signals.

In comparing a linear and a nonlinear income tax (subsections 3.2 and 3.4), it is obvious that the latter dominates the former in a world without administration costs and avoidance activity. However, when all income is taxed at the same rate, substitute taxation – notably, collection at the source – becomes feasible and may have compliance advantages. Furthermore, incentives to engage in transactions to shift income between taxpayers subject to different marginal rates are eliminated. Hence, if the welfare gain from nonlinear taxation is modest, linear income taxation may be preferable.

As a further illustration, consider the choice between income taxation and broad commodity taxes, like sales taxes or a VAT. Setting aside cases in which differential commodity taxation would be optimal, it would seem that commodity taxes are redundant and, if they have any additional administrative cost, undesirable. However, some propose that such taxes may be useful if there is significant income tax evasion in some sectors. Due to its method of collection, many believe that a VAT is overall harder to evade, so shifting significant collections away from the income tax may be advantageous. Moreover, even if commodity taxes are subject to

¹⁴⁴Similar assumptions are invoked concerning key elements of the tax base, such as whether nonpecuniary income (e.g., imputed rent from owner-occupied housing) may be taxed (see subsection 12.1.1) or whether capital gains can only be taxed on a realization basis (see subsection 9.4).

significant evasion (perhaps in the same areas as income taxation, such as those involving informal activity conducted largely in cash), it has been further suggested that a combination of the two systems may be optimal. The intuition is that individuals who evade the income tax would still pay taxes on their consumption (in most sectors). Yet as Kesselman (1993) shows, when general equilibrium effects on prices and wages are taken into account, this idea is incorrect in the case in which commodity taxes are fully evaded in the same sectors as those in which the income tax is evaded – an approximately plausible scenario since commodity tax evasion typically will be both possible in such cases and also necessary to avoid detection of the income tax evasion. The reason is that the ultimate incidence is the same regardless of whether a tax is levied on a producer's inputs (in particular, labor) or sales.¹⁴⁵

These few examples and the limited research to date suggest that greater attention to the choice among tax systems is warranted. Whether or not to have a 20% VAT, relying far less on income taxes, is probably a more important decision than how to set commodity tax differentials in subtle ways in light of the qualifications to the uniformity result noted in subsection 4.3. Such system choices are likely to be particularly important for developing countries, where fewer options are feasible and the available instruments are changing over time (and in ways that are influenced by other government policies).¹⁴⁶

11.2. Optimal administration and enforcement

The determination of optimal administration and enforcement of a given tax system is itself complex. First, there are many dimensions, ranging from the design of tax rules to the intensity of audits, extent of information reporting requirements, accuracy of adjudication of disputes, setting of penalties, and allocation of resources across types of taxes and taxpayers. Second, problems of avoidance and evasion and the responses thereto have important feedback effects, notably, on what tax rates are optimal (should the optimal rate on a commodity subject to evasion be higher or lower?) and on the initial choice of which forms of taxation to employ.¹⁴⁷

The problem is also challenging because of the subtlety of the harm due to avoidance and evasion, which involves a transfer to taxpayers (or, one might say, a lack of a transfer to the government) rather than a destruction of resources.¹⁴⁸ To see this, suppose that there exists only a tax on a single commodity and that taxpayers are costlessly able to avoid taxation on half of their purchases. Here, it would not make sense to expend governmental resources to reduce avoidance, for instead the government could simply double the tax rate. Though this example is artificial, it illustrates that the costs of nonpayment are less obvious than they may first appear.

¹⁴⁵Kesselman does find some benefit to shifting toward commodity taxation when evasion of the latter (unlike evasion of the income tax) is incomplete, but he argues that for plausible parameter values this benefit is small. Boadway, Marchand, and Pestieau (1994) find supplementation with commodity taxation to be desirable in a model in which it, unlike income taxation, is not subject to evasion.

¹⁴⁶See Gordon and Li (2005).

¹⁴⁷Although private compliance and avoidance activity is considered here, no attention will be given to the possibility that it may be optimal to regulate such activity directly, for example, by taxing professional tax advice because its use may be socially excessive. See Kaplow (1998).

¹⁴⁸Compare Shavell (1991) on theft.

To further complicate matters, consider the fact that, while raising rates tends to increase distortion, so does increased enforcement since, if it works, it raises effective rates, which are the source of distortion. In addition, increasing enforcement entails direct resource costs.

To appreciate the benefits of enforcement and to determine optimal policy, it is necessary to return explicitly to the SWF; indeed, the problem of administration was one of the motivations offered in subsection 2.3 for making direct use of the SWF. The central idea is that, whatever are the criteria used to determine whether one or another tax system or level of tax rates is optimal in the first instance, the same criteria should be employed to assess deviations and efforts to correct them.

This approach has been followed increasingly in recent work, including Kaplow (1990, 1998), Mayshar (1991), Slemrod (2001), and Slemrod and Yitzhaki (1987, 1996). The models employed vary in abstraction (whether they consider generally instruments available to the government or particular means of enforcement) and in the private behavior addressed. For example, Kaplow (1990) considers optimal government expenditure on enforcement that increases the fraction of taxpayers observed by the taxing authority and how the optimum depends on private evasion reactions; Mayshar (1991) examines a tax authority that chooses a range of policy instruments where taxpayers choose the amount of labor effort to devote to sheltering; and Slemrod (2001) models private avoidance when increasing labor income increases avoidance opportunity. In this literature, social costs and benefits depend on how avoidance, evasion, and enforcement affect the equitable allocation of tax burdens across individuals, the extent of distortion caused by taxes, the amount of resources devoted to private compliance and tax reduction activity, government expenditures on administration, and risk-bearing.¹⁴⁹ It is useful to elaborate on some of these effects.

Tax equity is implicated because the achievable level of social welfare depends on whether individuals pay the correct amount of tax. After all, were this not a concern, society could rely on uniform lump-sum taxes and not have to worry about distortion. In reality, imperfections in defining the tax base and in administering the law combined with taxpayers' efforts to minimize tax obligations result in a system where mismeasurement often occurs. The welfare effect can be determined directly from the SWF. Standard first-order conditions – see expressions (3.8) for the linear income tax and (3.9) for the nonlinear income tax – have a $W'u_c$ term, indicating the marginal social value of a dollar to each taxpayer (the marginal utility to the taxpayer times the marginal social welfare weight). Holding constant the revenue to be raised from a particular group of taxpayers, greater error is associated with a greater dispersion in treatment.¹⁵⁰ Because u_c is strictly concave and, if the SWF is not utilitarian, W' is as well, mismeasurement, however produced, tends to be welfare-reducing. As developed in Kaplow (1998), the welfare cost is roughly given by a risk premium (determined, in the utilitarian case,

¹⁴⁹Earlier work on evasion and avoidance was largely positive. Allingham and Sandmo (1972) considered a setting like that in Becker's (1968) model of law enforcement; the taxpayer's only decision was the choice of how much to underreport income, and this choice depended on risk preferences. Optimal enforcement thus addressed risk-bearing concerns, as in Polinsky and Shavell (1979). Extensions to Allingham and Sandmo include Yitzhaki (1974, 1987). On models of law enforcement, see generally Polinsky and Shavell (2006).

¹⁵⁰Compare Kaplow's (1989) analysis of horizontal inequity.

by taxpayers' risk preferences, reflected by the curvature of their utility functions). One implication is that, for a given absolute error, mismeasurement is more costly to social welfare when it affects lower-income taxpayers on account of decreasing absolute risk aversion (and to a greater extent the more concave are their utility functions and the SWF).

A further point about potential inequity also bears on distortion. Specifically, as Bittker (1979) and Bradford (1980, 1986) argue, inequities often turn into inefficiencies. For example, if flight attendants are tax exempt on the value of free air travel or if sellers in the underground economy are effectively exempt from tax (see Kesselman (1989)), equilibrium wages and prices will adjust so that, for the marginal taxpayer, there is no gain, the benefit being passed on to consumers (or others). Accordingly, many imperfections in the tax system involve little inequity but do cause inefficiency. The same point holds regarding so-called tax shelters. For example, low-income housing tax shelters or tax-advantaged shopping center or office building developments are likely to result in greater investment and lower rents in the targeted areas of activity rather than windfalls to those who invest in the shelters.

As the foregoing point suggests, much avoidance and evasion can be analyzed by analogy to changes in marginal tax rates, such as for particular commodities. This approach is followed in Kaplow (1990, 1998). In some instances, one might be able to offset the distortion by changing explicit rates. But if the sector is underground or if evasion is selective, this will not be feasible. Instead, resources may need to be spent to reduce noncompliance, such as by expanding information-reporting, increasing auditing, and so forth. To the extent that such enforcement succeeds, effective tax rates will be driven higher. As noted previously, however, this may appear to increase distortion. There are two main reasons why such efforts may nevertheless be efficient. First, in some instances distortion may fall directly. For example, if most activity is taxed, exempting only some activity increases distortion through inefficient substitution. Second, one must make appropriate comparisons. Consider the prior hypothetical examples, in which the choice was between raising nominal rates or increasing enforcement. If, more realistically, some pay the full nominal rate and others pay less, then raising enforcement tends to be less distortionary. The reason relates to the familiar point that marginal distortion rises with the effective tax rate. Accordingly, subjecting some individuals to high effective tax rates and others to low (or zero) effective tax rates, as occurs when there is selective evasion, results in greater distortion than when everyone is subject to an intermediate tax rate, with which there is perfect compliance.

The analysis of the potential equity and efficiency effects of evasion indicates how the social costs can, in principle, properly be measured. Then it is possible to assess whether increased expenditures on one or another enforcement instrument are optimal. However, the analysis is further complicated by the fact that, in addition to the government's expenditures, private costs must also be considered. Note that, in general, it is possible for these costs – which unlike nonpayment of taxes are real resource costs – to fall or rise as enforcement increases. On one hand, some individuals may be induced to reduce avoidance and evasion activities because they are rendered unprofitable. On the other hand, some individuals may spend more, in order to continue to keep their income out of the government's hands.

Finally, it is useful to revisit briefly the question of how these issues bear on the setting of tax rates and the choice of tax systems. Regarding the former, the results are ambiguous. Higher nominal rates – such as in the extreme, initial example when evasion could be costlessly offset – may be optimal. However, if some individuals face the full nominal rate and others face, say, a zero rate, and little can be done to combat this, then lower rates may be optimal than otherwise (or a zero rate, when there are fixed costs and little tax can be collected), with greater reliance on taxes that have a more uniform effect on different taxpayers. Regarding tax systems, obviously those that are very costly to administer and highly imperfect even after enforcement is optimized are less attractive. Of course, all tax systems suffer in varying degrees, so the question is a comparative one.

11.3. Elasticity of taxable income

Important recent work motivated by problems of administration and enforcement examines what has come to be referred to as the elasticity of taxable income. The first-order conditions for the optimal tax problem – such as expressions (3.8) and (3.9) – depend on the elasticity of labor supply. It has been emphasized, however, that taxpayers respond to income taxes in many ways: reducing labor supply, shifting compensation to tax-preferred fringe benefits, making use of tax shelters, and evading outright. Furthermore, these responses all have a qualitatively similar effect on distortion. See, for example, Feldstein (1999) and Slemrod (1998).¹⁵¹ One implication of this literature has been an upward revision in assessments of the distortionary cost of labor income taxation because estimates of the elasticity of taxable income are greater than estimates of the elasticity of labor supply.¹⁵² Interestingly, one reason labor supply responses to tax reforms may be low is that taxpayers are able to respond on these other margins.

Another implication of the literature is to reinforce the importance of examining the choice of tax systems, tax rates, and tax enforcement parameters as part of a unified optimization. As Slemrod and Kopczuk (2002) argue, the pertinent elasticity, of taxable income, unlike the elasticity of labor supply, is in significant part determined by policy rather than a manifestation of individuals' exogenous preferences. For example, greater problems of avoidance and evasion – implying a higher elasticity of taxable income – may favor lower tax rates. But it is also true that higher optimal tax rates warrant greater expenditures to reduce avoidance and evasion. Slemrod and Kopczuk examine a model in which administrative cost considerations are the impediment to a comprehensive income tax base, and they find that a social desire for a more redistributive tax should be accompanied by greater administrative expenditures to broaden the base; conversely, the more costly it is to expand the base, the less redistribution is optimal. Kopczuk (2005) analyzes the base broadening of the 1986 Tax Reform Act in this light.¹⁵³

¹⁵¹There are qualifications, such as when taxpayers increase charitable contributions or invest in low-income housing tax shelters, activities that may be preferred because of the positive externalities that they produce.

¹⁵²See, for example, Auten and Carroll (1994, 1999), Feldstein (1995), Giertz (2004), Goolsbee (2000), Gruber and Saez (2002), Moffitt and Wilhelm (2000), and Slemrod (1996a).

¹⁵³See also Wilson (1989) and Yitzhaki (1979) who consider the optimal base of a commodity tax where base broadening reduces distortion but adding more commodities to the base is costly, and Weisbach (2000) who considers, by analogy to the commodity tax base problem, where to draw lines between taxable and exempt activities or transactions,

12. Additional Features of Tax Systems

Numerous particular features of tax systems have been studied in varying degrees of depth – far too many to mention much less summarize in a single, conceptual survey on taxation. Some elements, however, are particularly significant and have a close relationship to themes pursued in previous sections (especially section 11 on administration and enforcement), so they will be examined briefly here.

12.1. Tax base

12.1.1. Exclusion of nonpecuniary income

Idealized income and consumption tax systems envision a comprehensive base because it is thought to provide a better measure for purposes of distributive equity and because omissions generally are distortionary. There are, however, certain systematic exclusions that are often justified on account of the infeasibility – or significant administrative difficulty – of measurement. One of the most important sets of exclusions involves nonpecuniary sources of income.

The most fundamental such exclusion is the value of leisure, sometimes referred to as imputed income due to household services.¹⁵⁴ Indeed, the central distortion caused by income taxation (and consumption taxation, where the pertinent exclusion pertains to the value of nonmarket time) – the labor-leisure distortion – is directly attributable to this exclusion. See subsection 3.5.1 on ability taxation.

Another important exclusion, related to the topic of the next subsection, involves nonpecuniary features of market employment. These include both positive features – air-conditioning or artwork – and negative attributes – unpleasantness and danger associated, for example, with mining, harvesting, and work on assembly lines. Standard labor market theory suggests that nonpecuniary features of employment will, in equilibrium, be offset by compensating wage differentials. See Rosen (1986). However, the compensating differentials are subject to taxation – higher wages are taxed and wage reductions are implicitly excluded because never earned – whereas the offsetting amenities for which they compensate are not recognized by the tax system. Hence, omitting nonpecuniary job characteristics when measuring labor income or consumption distorts workplace attributes and the allocation of labor across jobs.

An additional significant exclusion, one particularly relevant to an income tax (that reaches capital as well as labor income), is of the imputed rent from consumer durables, most

recognizing that expanding the base may or may not be efficient depending on whether the newly included activity is a closer substitute for taxed or tax-exempt activities.

¹⁵⁴This latter characterization is potentially misleading because one might mistakenly assume that only labor used in direct household production (meal preparation, cleaning, home repair, child care) is relevant whereas mismeasurement and distortion are involved on account of the omission of any non-market time from the tax base.

importantly, housing. Rental services, a form of consumption, are not deductible. But if one owns durables rather than renting them, there is no tax on the imputed rent. Put another way, the return to capital is, in principle, subject to tax, but if the return is in the form of services to oneself, for which no explicit rent is paid, the return is effectively exempt.¹⁵⁵ Because housing alone is such a large fraction of the capital stock, this exclusion is hardly innocuous.

12.1.2. Business versus personal expenditures

Related to the preceding subsection's discussion of nonpecuniary features of employment, there is a more general problem of distinguishing business (or, more broadly, income-producing) and personal expenditures. Pure costs of doing business (a sole proprietor's cost of goods sold, rent, utility bills, and so forth) must be deducted or otherwise excluded in properly measuring net income, whereas items of consumption, which may be heavily present in many fringe benefits, need to be kept within the tax base of an income or consumption tax.

Some measurement problems concern pure subterfuge, such as when an individual attempts to deduct a large fraction of housing costs as a "home office" though little work is performed in the home or when employers pay for what are tantamount to employee vacations. Others involve myriad situations of genuinely mixed use: Free meals for restaurant employees helps monitor quality and makes servers more informative to customers, entertainment may improve comradery or client relationships, and improved working conditions may simultaneously raise productivity and utility. One problem is distinguishing the former and latter cases. A second is determining optimal treatment in cases in which consumption and production are intermingled, on which see Katz and Mankiw (1985). Observe that, in either situation, to the extent that there are utility benefits to workers, we would expect wages to adjust, so ultimately the problem is one of distortion, here involving forms of expenditure at the workplace and the choice of occupations.

12.1.3. Retirement savings¹⁵⁶

Under an accrual income tax (in contrast to a labor income tax or a consumption tax), the return to savings is included in the tax base. See subsection 5.1.1. A common feature of income tax systems, such as in the United States, is to provide tax preferences for retirement savings through employers (pension plans) and individual retirement accounts of various sorts. Such schemes typically provide consumption tax treatment by allowing an exclusion or deduction from current income for contributions, permitting tax-free build-up, and subjecting withdrawals to tax.

Retirement savings provisions are variously rationalized on the ground that they move in the direction of a consumption tax, deemed to be preferable; that they increase national savings

¹⁵⁵Observe that this exclusion is not directly attributable to the home mortgage interest deduction. Under an ideal income tax, all interest payments are in principle deductible. (They are negative interest receipts, which are taxable.) The benefit of untaxed imputed rent is fully available to an owner-occupier who has no debt. The primary relevance of the mortgage interest deduction is to make the benefit available to individuals with insufficient net worth to own outright.

¹⁵⁶See generally Bernheim (2002) on taxation and saving.

(which depends on the empirical question of whether the income or substitution effect dominates), believed by some to be desirable; or that they offset individuals' tendency to provide inadequately for their retirement (see subsection 5.3 on social security). The actual implementation of such schemes – particularly employer pension plans, which are heavily regulated – is complex. Furthermore, it is uncertain the extent to which the latter objectives are achieved. Notably, much of what is contributed to retirement savings plans may not be additional savings but shifts of funds that would have been saved in any event, and, regarding paternalism, myopic individuals may well be those least likely to respond to savings incentives.

12.1.4. Tax expenditures

Departures from a tax base that involve exclusions, deductions, or other preferences are sometimes generically referred to as tax expenditures, a view championed by Surrey (1973). The notion is that granting special tax treatment – e.g., for expenditures on energy conservation – is tantamount to a direct budget outlay for the activity. Surrey further proposed that an annual tax expenditure budget be compiled (as it now is), to provide accountability for such expenditures that, as a whole, constitute a sizeable fraction of government spending. Additionally, he generally opposed tax expenditures' existence on grounds of accountability and their “upside-down” effect, being worth more to taxpayers in higher brackets.

Although there clearly is some virtue to this viewpoint, there are some difficulties as well.¹⁵⁷ One concerns what constitutes a tax expenditure, the argument often going to the merits of the choice of tax base. For example, favorable treatment of retirement savings is a tax expenditure under an income tax, but not under a consumption tax, where subjecting ordinary savings to tax is seen as tax penalized. Concerns about regressivity can, in principle, be met by tax rate adjustments, as exemplified in the 1986 Tax Reform Act in the United States, where the repeal of many tax expenditures was accompanied by a purportedly distribution-neutral adjustment of tax rates. Whether it is efficient to deliver subsidies through the tax system or otherwise and other arguments going to the desirability of various tax expenditures depends on analysis of pertinent specifics. Nevertheless, the basic point that there is no clear distinction between spending and selective tax reduction is important both for tax policy and a broader range of fiscal matters.

12.2. Forms of consumption taxation

The discussion of commodity taxation in section 4 and the comparison of income and consumption taxation in subsection 5.1.1 provide some insight into the nature of consumption taxation. It is useful, however, to explore variations in the form of consumption taxation, some of which are equivalent to others in principle but may differ with regard to administrability and evasion.

¹⁵⁷Much of the leading commentary on the tax expenditure concept is by legal academics. See, for example, Bittker (1969), Griffith (1989), Shaviro (2004), Surrey and McDaniel (1985), and Weisbach and Nussim (2004).

12.2.1. Cash-flow consumption taxation

If a uniform tax on all forms of consumption is desired – and possibility at different marginal rates depending on individuals' aggregate consumption – it is not necessary to measure each individual's expenditures on each and every commodity. Instead, one may employ cash-flow taxation, as developed by Andrews (1974). Because total consumption in an accounting period equals income minus net savings (i.e., minus deposits and plus withdrawals), a consumption tax base may be defined just as an income tax base (that includes labor and capital income), making an adjustment for net savings.

Indeed, implementing such a consumption tax is likely to be significantly easier than defining the income tax base, even though the former on its face requires an additional set of adjustments. The central reason is that many of the most difficult measurement problems in defining income involve capital income – especially accruals, such as with capital gains and depreciation (see subsection 9.4). But the consumption tax's adjustment for net savings makes many of these problems moot. For example, when an individual purchases an asset, a deduction would be allowed. Any intervening changes in value can be ignored under a consumption tax; all that is necessary is to include the proceeds upon ultimate disposition. Even that final step is unnecessary if there is reinvestment. Thus, for assets held in an account (say, a brokerage account or a closely-held firm), one need only track flows in and out; all changes in value within the account are irrelevant. For this reason, Andrews (1974), Bradford (1986), and others find a consumption tax superior to an income tax on administrative grounds. For further aspects of the comparison, see subsection 5.1.2.

As noted in subsections 4.2 and 5.1.1, a uniform consumption tax is equivalent to a labor income tax (in a basic setting with linear taxes), so another way to implement a consumption tax is to tax all labor income while exempting capital income. (Following the analysis of subsection 9.2.2, these systems are also equivalent in a world with uncertainty, taking into account individuals' portfolio adjustments.) In some respects, a labor income tax seems particularly easy to administer, for only wages need be taxed. However, disentangling income from wages and from capital is sometimes difficult, notably for the self-employed, whereas consumption taxation, which only needs to track the outflow of funds to the owner, may be easier to implement. Hybrid schemes have also been proposed, both regarding sources of labor income and the treatment of other issues, such as purchases of consumer durables. See Bradford and U.S. Department of Treasury (1984).

12.2.2. VAT and sales taxation

The other main forms of consumption taxation – which generally must be linear, unlike a cash-flow consumption tax – are value-added taxes (VATs) and sales taxes. These can be imposed uniformly, or subject to rate variations and exemptions (such as preferences for expenditures on food), thereby implementing the full range of commodity tax schemes analyzed in section 4.

A VAT is applied to the value added at each stage of production. By contrast, a sales tax

applies only to final sales to ultimate consumers. In either case, the same amount, in principle, is subject to tax, and the equilibrium incidence is the same.¹⁵⁸ The main differences are administrative.

A sales tax requires policing only the final stage, but this stage is often difficult to monitor where there are large numbers of small retailers. A VAT covers all stages, but production and wholesale distribution are often more concentrated, making enforcement easier for much of the tax base. Additionally, certain forms of the VAT have a self-enforcing feature: Under the credit-invoice method, a seller at any stage pays tax on gross receipts and, in order to receive an offset for taxes previously paid by others on purchased inputs, the seller must produce invoices that confirm payment of tax at the prior stages.

13. Tax Equity

Sections 3 through 12 consider how to employ various tax instruments to maximize a standard SWF. This section considers issues bearing on whether social welfare, conventionally understood, should be the sole social objective and on the form of the SWF.

13.1. Welfarism

Welfarism is the principle that social decisions should be based exclusively on how they affect individuals' utilities (welfare or well-being). Put another way, data on the levels of utility achieved by each individual under a policy are deemed to be sufficient information to ground social choice. It is common in optimal income tax analysis to employ a function of the additive form, displayed in expression (2.1), but that is not essential to the concept.

The motivation for the welfarist approach is not only that each individual's well-being should matter, but that anything independent of anyone's well-being should not. The appeal of welfarism is bolstered by the fact that any nonwelfarist approach conflicts with the Pareto principle; that is, following any nonwelfarist approach will sometimes favor a regime under which everyone would be worse off. See Kaplow and Shavell (2001).

An important clarification is that much of relevance under welfarism may be important because of its indirect, ultimate effects on individuals' utilities, but this does not make something a social value in its own right. Some considerations may serve as proxies for well-being; for example, a simplified tax system may be desirable because it is less costly to administer, which in turn saves resources, allowing a higher level of welfare to be achieved. Furthermore, certain factors may be components of well-being for some individuals; in this spirit, subsection 3.5.2 noted the possibility that individuals may have preferences regarding redistribution itself.

¹⁵⁸See generally Bradford (1996a). Employing a sales tax can be administratively problematic when some goods are intermediate for some purchases and final for others. Additionally, some sales tax schemes are not legally defined in terms of the underlying principle of ultimate sales to consumers but instead purport to cover a broad range of sales subject to numerous specific exemptions covering most intermediate uses; however, this latter approach sometimes results in multiple taxation (referred to as "cascading") when there are gaps in the exemptions.

Welfarism entails the view that once all such effects on well-being are taken into account, the relevance of any given consideration is exhausted.

Although welfarism has not been highly controversial among economists, the discussion in subsection 13.3 will indicate that a number of familiar normative criteria that have been used to assess tax policy do appear to be nonwelfarist, unless they are understood purely as proxies rather than as independent principles.¹⁵⁹ In more direct apparent confrontation, Sen (1985, 1997) has suggested that individuals' situations should be assessed based on their capabilities and functionings – a sort of list of means of fulfillment – rather than solely their well-being. Rawls (1971, 1982) notion of primary goods has been seen by many in a similar light. A number of issues have been raised concerning these nonwelfarist approaches. First, what is on the privileged list and how is this determined, if capabilities, functionings, and primary goods are to be viewed not purely instrumentally but rather as constituents of the good itself? Second and related is the problem of relative weightings, which are necessary if there is more than one item on the list. See, for example, Blair (1988) and Gibbard (1979). Indeed, it is straightforward to demonstrate that these alternative approaches conflict with the Pareto principle, unless by chance the lists and weightings correspond precisely to those implicit in all individuals' utility functions (in which case there is no disagreement with the dictates of welfarism).¹⁶⁰ Underlying these problems is the question of why society should deviate from welfarism. Perhaps the appeal of these theories lies not in a genuine rejection of welfarism but, to the contrary, in a concern that well-being is often assessed too narrowly. Indeed, the appendices to Sen (1985) and some of his other work on development emphasize that frequently used measures like per capita GDP do not adequately capture well-being, whereas supplementation with additional factors provides a more accurate indicator.

As a practical matter, this debate about welfarism has had little impact on the economic analysis of tax policy. Independent of the merits of the dispute, most tax instruments are based on income, consumption, and related observable flows. Different views on the proper social objective matter primarily when individual differences are observable, such as when some individuals are disabled. In this realm, actual policy seems to reflect a mixed position. On one hand, accommodation requirements may be prompted by a desire to equalize capability rather than utility. On the other hand, this approach may be motivated by concerns for welfare, and there seems to be little enthusiasm for policies that consciously seek to enhance capabilities at the expense of beneficiaries' well-being – although this may occur implicitly if non-cost-justified accommodations are required in lieu of alternative forms of assistance that recipients would, all things considered, value more highly.

¹⁵⁹Welfarism is highly controversial outside of economics. Notably, much of twentieth-century moral philosophy is critical of the approach. See, for example, Sen and Williams (1982), for competing views. For a survey, analysis, and response to nonwelfarist writings, see Kaplow and Shavell (2002).

¹⁶⁰Suppose, for example, that all individuals have the same utility function, there are two goods, production is centralized, the marginal rate of transformation between the goods is 1, and the nonwelfarist theory deems the two goods to be of equal importance. The planner (taken here to be egalitarian) would produce equal amounts of each good and distribute them pro rata. If, however, individuals' utility functions are optimized at any other combination of the two goods, everyone would be worse off than if the planner selected utility-maximizing proportions of the two goods instead.

13.2. Choice of social welfare function

As noted in subsection 2.3, when an explicit SWF is required, notably, in optimal income tax simulations, an additive, often iso-elastic form is used. See expression (2.2). As discussed, the inequality parameter, e , may range from 0 (corresponding to a utilitarian summation) to ∞ , the limiting case that corresponds to maximization of the utility of the least-well-off individual, inspired by Rawls (1971).

Although most work is formally agnostic about the concavity of the SWF, important arguments have been offered. Harsanyi (1953), predating Rawls's use of a "veil of ignorance" or "original position," postulated that the n individuals in a society had to choose regimes not knowing their actual identity, with each believing that there was a $1/n$ chance that he or she would be any of the n individuals in society. Harsanyi showed how each individual's expected utility in this setting corresponded to the utilitarian maximand. See also Vickrey (1945). Independently, Harsanyi (1955) developed an argument that assumed that each individual's utility followed the rationality axioms of decision (and expected utility) theory, likewise for the SWF, and that the SWF depended solely on individuals' utilities in a positive and symmetric fashion. From this, he deduced that the SWF had to be utilitarian.¹⁶¹

Additional, related arguments for a utilitarian SWF have been offered. Hammond (1983) demonstrated that no other SWF was time consistent. One way to express the idea is to note that, from an initial point, a reform involving uncertainty may be favored because it raises expected social welfare; however, after enactment, with a nonlinear SWF it is possible that repeal would be deemed optimal. Kaplow (1995) showed that, for any strictly concave SWF, one can construct examples in which a reform would be unanimously preferred *ex ante* by all individuals but rejected under the SWF; that is, there is a conflict with the Pareto principle.

Sen (1997) and others view utilitarianism as insufficiently egalitarian. The meaning of such an objection is not entirely clear. A utilitarian SWF is formally egalitarian (everyone counts equally, that is symmetrically or anonymously), and in simple cases without incentive concerns it favors complete equalization. In realistic settings, none of the standard SWF's favor complete equality; then, more concave SWF's favor greater equality. However, the degree of equality favored by any given SWF is a matter of subtlety and controversy, for it depends on individuals' utility functions (both the degree of concavity, which itself affects the optimal extent of redistribution, and the labor supply elasticity), the distribution of abilities, and in more complex models on many additional factors. Hence, it seems difficult to have an *a priori* view on the extent of inequality that should be tolerated, from which one might deduce the appropriate concavity of the SWF.

Rawls's (1971) maximin claim, translated into the present framework, is one of the few other specific SWF's that has been advocated. However, it has not commanded wide acceptance because of its extreme implication – that social welfare is raised by making nearly everyone in

¹⁶¹For a discussion of objections and responses, see, for example, Broome (1984), Diamond (1967), Harsanyi (1975), Myerson (1981), and Strotz (1958).

society miserable as long as there exists one slightly more miserable person who gains infinitesimally – and because it purports to be grounded in the original position and rationality assumptions that, per Harsanyi, imply utilitarianism. See, for example, Arrow (1973) and Hare (1973).

An additional set of issues surrounding the choice of SWF concerns whose welfare is to be included. Key dimensions include geographic scope (national versus international), the weighting of future generations, whether average or total welfare should be maximized (which is highly pertinent to issues bearing on population size), and whether the welfare of other sentient beings should count.

13.3. Other normative criteria

13.3.1. Traditional principles

Prior to the advent of modern welfare economics and its embodiment in optimal tax theory – and continuing to a lesser extent to the present – tax equity was judged by a range of criteria, including vertical and horizontal equity, ability to pay, the benefit principle, and principles of equal sacrifice. See Musgrave (1959, 1985). Additionally, certain definitions were sometimes treated as if they were normative criteria; notably, the Haig-Simons income definition was used as the foundation for articulating a comprehensive tax base that was portrayed as a normative ideal.¹⁶²

Many of these principles can be understood as intuitive notions of distributive justice, or certain aspects thereof. Nevertheless, some appear to be limited to the funding of public goods – most obviously the benefit principle but also principles of equal sacrifice (with redistribution, it cannot be that everyone is sacrificing equally) and, under some interpretations, ability to pay. As noted in subsection 7.3 on benefit taxation, it is not apparent whether such notions have bite to the extent that redistributive taxation is also permitted. And if it is not, there is an arbitrariness (except under the benefit principle) due to the fact that the extent of permissible redistribution depends on the extent of public goods provision and on the distributive incidence of the public goods provided, which is a happenstance of technology and preferences. Likewise, the underlying basis for most of these principles is unclear.¹⁶³ (Exceptions are the benefit principle, which might be defended on libertarian, anti-redistributive grounds and the equal marginal sacrifice version of the sacrifice principle, advanced by Edgeworth (1897) and Pigou (1928) as a corollary of utilitarianism.)

¹⁶²Debates about the comprehensive tax base ideal and about the tax expenditure concept, see subsection 12.1.4, overlap.

¹⁶³Blum and Kalven (1953) in a well-known essay employ a traditional approach and conclude that taxes should be proportional. As an indication of the difficulty of reasoning to particular conclusions in this fashion, Bankman and Griffith (1987) and Groves (1974), among others, have explained how Blum and Kalven rely largely on a presumption in favor of proportionality combined with broad skepticism toward many arguments concerning redistribution.

13.3.2. *Horizontal equity*

As stated by Musgrave (1959), horizontal equity is the principle that equals should be treated (specifically, taxed) equally. A number of approaches have been advanced for making this seemingly uncontroversial concept operational. See, for example, Aronson and Lambert (1994), Auerbach and Hassett (2002), Atkinson (1980), Feldstein (1976), King (1983), Musgrave (1990), and Plotnick (1981).

Two sets of difficulties have been identified. The first – recognized in much of the aforementioned literature developing indexes of horizontal inequity – concerns definitional problems. What if no two individuals are precisely equal? Relatedly, does it make a qualitative difference if individuals begin exactly equal or slightly unequal? Once measures are extended to unequals, as they have been, are they still measures of horizontal equity?

Second and more fundamental, just why is horizontal equity valued and why should society be willing to sacrifice social welfare, conventionally measured, in pursuit of horizontal equity? The measurement literature has said little on this question, which seems logically prior to deriving indexes since it is difficult to assess measurement instruments when the purpose of measurement is unclear. See Kaplow (1989). Kaplow (1995) shows that if any weight is given to horizontal equity, policies that make everyone better off may be rejected. This result is a special case of the more general subsequent demonstration of Kaplow and Shavell (2001), previously noted, that all nonwelfarist principles conflict with the Pareto principle. A plausible explanation for the strong concern about horizontal equity is that, although not itself a constituent of social welfare, violations serves as a proxy for factors associated with welfare reductions, such as greater inequality, risk-bearing, mistaken regulations, and abuse of power. See Kaplow (1989). After all, if individuals are truly equal in relevant respects, welfare maximization usually requires that they be treated equally.¹⁶⁴

13.3.3. *Inequality, poverty, progressivity, and redistribution*

Related to the redistributive function of taxation, there have been developed various indexes of the extent of inequality and poverty existing in a society (whether before or after taking into account the effects of taxation) and of the degree of progressivity and redistribution attributed to all or part of the fiscal system.¹⁶⁵ These measures are sometimes employed to offer a normative assessment of taxation, the standard implication being that systems resulting in less inequality and poverty and, correspondingly, involving more progressivity and redistribution are superior.¹⁶⁶

There are two related difficulties with this approach. See Kaplow (2005). First, the

¹⁶⁴Not always because, for example, there may be nonconvexities, as Stiglitz (1982b) demonstrates.

¹⁶⁵On inequality, see Atkinson and Bourguignon (2000), Cowell (1995), Lambert (2001), and Silber (1999). On poverty, see Atkinson (1987b), Clark, Hemming, and Ulph (1981), Lambert (2001), Ravallion (1994), Ruggles (1990), Sen (1976), and Silber (1999). On progressivity and redistribution, see Jakobsson (1976), Kakwani (1977), Lambert (2001), Musgrave and Thin (1948), and Suits (1977).

¹⁶⁶The indexes also have descriptive uses, which raise different issues. See Kaplow (2005).

implicit assumption that more is better is incorrect, for – as with much in economic policy – it is the optimal extent of redistribution rather than the maximal extent that is desired. Second, for a normative measure to be well-grounded, it must be derived from an SWF, as originally suggested by Dalton (1920) and undertaken by Atkinson (1970) with regard to the measurement of inequality. However, in thus deriving a measure, it is necessary as a prerequisite both to choose an SWF and to employ it to measure the level of social welfare under the regime in question. Because it is possible to derive the indexes in question only after a complete welfare assessment has already been obtained, it is difficult to see how the measure – of inequality, poverty, progressivity, or redistribution – can be of further normative use. In sum, indexes of inequality and poverty seem aimed at a component of social welfare, and measures of progressivity and redistribution at traits of policies that affect social welfare; hence, all are best seen, as many of the other normative criteria surveyed here, as proxies for welfare rather than as ultimate bases for social evaluation.

14. Conclusion

This essay has offered a conceptual survey of taxation. It illustrates how many forms of taxation and widely varied issues of tax policy are illuminated by relating the analysis to a central, unifying framework. Specifically, the model of optimal income taxation, extended to incorporate commodity taxes, serves as the foundation for understanding most of the subjects considered, including government expenditures on transfers and public goods and the use of taxes and other instruments to control externalities. Furthermore, grounding normative assessment explicitly in the welfare economic framework – where necessary making reference to a social welfare function or, by holding distribution constant, judging comparisons through use of the Pareto principle – renders policy evaluation more consistent and cogent.

Future research could advance the mission of providing a more integrated view of various elements of taxation. Specifically, the existing body of tax research, far too vast to examine here, could be better appreciated and its development more precisely guided if its relationship to core principles and structures was more often made explicit. In addition, the central building blocks, including the income tax itself, would benefit from further study because, despite the difficulty of optimal income tax analysis and what may appear to be the near-exhaustion of basic extensions, even slight advances have potentially great payoffs. Empirical research on taxation, which is beyond the scope of this survey, also could profit from the sharper definition of pertinent issues that would flow from the foregoing research program.

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