Mirrlees Report Chapter on the Base for Direct Taxation[1]

Introduction

Chapter 2 of the Meade Report,[2] 'The Characteristics of a Good Tax Structure', is divided into six sections: Incentives and economic efficiency, Distributional effects, International aspects, Simplicity and costs of administration and compliance, Flexibility and stability, and Transitional problems. To consider direct taxation in the UK, the Committee considered each of these issues separately and then combined the insights into a policy recommendation. It seems to us, as it seemed to Alfred Marshall, that this is an appropriate way to proceed.[3] While the capacity of computers to find equilibrium in complex models has grown apace since the Meade Report, the models available for analysis, like much of the underlying theory, are still quite limited and still too far from reality to proceed in any other fashion than that followed by the Meade committee. Whilst this should not exclude learning from complex simulations, this essay focuses solely on theoretical findings with regard to the tax base. [4]

Traditionally, the conceptual starting place of a study of tax reform, such as the Meade Report, is a concept of an ideal tax base, one that reflects both horizontal equity (treating equals equally) and vertical equity (those with larger ideal tax bases pay larger taxes). This conceptual starting place is then adjusted in light of the issues raised by the other five areas of concern identified in Chapter 2 of the Meade Report.

Since the mid-1960's, there has been a great deal of analysis of models that consider both equity and efficiency in an integrated modeling effort, based on maximizing a social welfare function defined in terms of individual utilities with a

---

[2] The Structure and Reform of Direct Taxation, Report of a Committee chaired by Professor J. E. Meade, London: George Allen & Unwin, 1978.
[3] it [is] necessary for man with his limited powers to go step by step; breaking up a complex question, studying one bit at a time, and at last combining his partial solutions into a more or less complete solution of the whole riddle. ... The more the issue is thus narrowed, the more exactly can it be handled: but also the less closely does it correspond to real life. Each exact and firm handling of a narrow issue, however, helps towards treating broader issues, in which that narrow issue is contained, more exactly than would otherwise have been possible. With each step ... exact discussions can be made less abstract, realistic discussions can be made less inexact than was possible at an earlier stage. [Alfred Marshall, *Principles of Economics*, eighth edition. New York: The Macmillan Company. 1948, page 366.]
[4] For a recent optimal tax calculation and discussion of accomplishments and difficulties, see Judd and Su, 2005.

heterogeneous population.[5] The primary purpose of this essay is to review that literature and draw inferences for policy that sets the tax base.[6]

We begin by considering lessons from the recent optimal tax literature with specific regard to the taxation of income from capital and the related issue of the tax treatment of savings.[7] We show that a succession of papers, for a number of different reasons, have argued that under certain conditions the optimal tax schedule should not include taxes on capital. Our analysis discusses both single cohort versions of these models (such as the Atkinson-Stiglitz model and its successors) as well as the infinite horizon equivalents studied originally by Chamley and Judd. The required conditions for the optimality of zero taxation, however, – typically relating to separability between consumption and leisure, limited heterogeneity in preferences and the extent to which this is correlated with other outcomes, an absence of age-varying patterns of preferences and uncertainty over the life cycle, or systematic links between socioeconomic outcomes and expected length of life - are argued to be too restrictive and the finding of no role for capital taxation is therefore considered not robust enough for policy purposes. Hence there should be some role for including capital as a part of the tax base.

In the second part of this chapter we discuss broader issues in the optimal tax setup that matter for how these theoretical considerations ought to influence tax policy. After reviewing the structure of a social welfare function, we begin by considering how (and whether) to combine an underlying concept of fairness with the models of utility-only social welfare optimization. A similar issue arises in assessing the equity dimension of a transition to a new tax system, considered later in the chapter. Finally, we consider the time frame for thinking about annual taxation and also the limits on tax structure coming from limits on allowable complexity.

---

[5] The standard basic model treats administrative costs of different taxes as zero or infinite and ignores tax evasion. See, for example, the textbooks by Myles, 1995, Salanié, 2003, Tresch, 2002, Tuomala, 1990, although there are articles that address administrative costs and evasion. There has not been integration with macro issues incorporating, for example, built-in stabilizers (Auerbach and Feenberg, 2000, Diamond, 1994) nor has the incorporation of international issues (trade, investment, migration) included the macro dimensions of those issues.

[6] Other chapters contain discussions of issues not considered here, including tax rates, the presence of families, and corporate taxation.

[7] In terms of the Chapter 2 topics of the Meade report, we will not consider international aspects, analyzing closed-economy models, nor the use of taxes as part of discretionary fiscal policy for macroeconomic stabilization. Oddly, the Meade report ignores built-in stabilizers, which seem to us to matter.

Our focus is on the relative taxation of labor and capital incomes, not a horse race between total (Haig-Simons) income and consumption.[8] In the end, the Meade Report effectively did the same – the Report closes with a section entitled "ULTIMATE OBJECTIVES:"

> We believe that the combination of a new Beveridge scheme (to set an acceptable floor to the standard of living of all citizens), of a progressive expenditure tax regime (to combine encouragement to enterprise with the taxation of high levels of personal consumption), and of a system of progressive taxation on wealth with some discrimination against inherited wealth, presents a set of final objectives for the structure of direct taxation in the United Kingdom that might command a wide consensus of political approval and which could be approached by a series of piecemeal tax changes over the coming decade." (Page 518.)

We leave to other chapters discussion of the provision for the very poor and concern about inheritances. And we assume that annual measurement of wealth is not available and so consider annual capital income taxation instead.[9] While the Meade Report was part of a long tradition contrasting taxation of income with taxation of expenditures, its inclusion of annual taxation of wealth in its conclusion places that discussion in a different context than if they were to choose only income or expenditure taxation. We share their framing of the potential simultaneous use of several tax bases and focus the chapter on a set of questions.

- If there is annual non-linear taxation of earnings, is it worth having a more complex tax structure, particularly age-varying tax rates? Would greater age-varying rules in capital income taxation be worthwhile?

- If there is annual non-linear taxation of earnings, how should annual capital income be taxed – not at all, linearly (as in the Nordic dual income

---

[8] Haig-Simons income is labor income plus accrued capital income – Haig (1921), Simons (1938).
[9] While the values of some types of wealth are readily measurable, others are not. Of course the same is true for accruing capital income. In practice, this is addressed by taxing realized incomes. Such taxation could be, but is not, adjusted to offset the difference between accrual and realization taxation. We are not aware of a literature exploring the relative advantages of wealth and capital income taxation (with the latter supplemented by wealth taxation at death) as part of optimal taxation. Our conjecture is that capital income taxation could do better, but that is just a conjecture awaiting analysis.

tax), by relating the marginal tax rates of capital and labor incomes, or by taxing all income the same?

- If there is annual non-linear taxation of earnings, should there be a deduction for savings?

Part I. The optimal taxation of capital and labour income

There are many papers that analyze optimal taxes; and they differ in many ways. This essay is not meant to be a survey of methods and model results, but a selective drawing of policy inferences from the literature. Before turning to particular papers and the lessons to be drawn from them, we say a little about the modeling strategies we do and do not draw on.

The optimal tax literature analyzes real taxes dependent on real labor and capital incomes (apart from analysis of money growth). We do not think there is any significant disagreement among economists that to the extent feasible, the relevant basis for taxation is real capital income, not nominal capital income. While such taxation is feasible without excessive additional administrative costs for capital gains, it is harder to do for flow capital income since the asset valuation needed to convert nominal into real is not readily available for many assets. This could be addressed by incorporating the inflation adjustment in the eventual capital gain taxation. This would add to the case for adjusting capital gains taxation to remove much of the advantages of deferral. Other than pointing out that taxing nominal interest and dividends results in taxes on real interest and dividends at rates higher than the stated marginal tax rate, we do not explore the real-nominal distinction. We also do not explore issues related to the realization of income, but note that taxation of deferred realization of incomes, as with capital gains, calls for heavier taxation than non-deferred capital income, not lighter taxation as is common practice (Helliwell, 1969, Auerbach, 1991).

Intertemporal optimal tax models can have a single (present discounted value) budget constraint for the government, reflecting the ability of government to save and to borrow. Some models require period-by-period budget balance (together with

restrictions on allowable taxes that make this constraint binding).[10] The budget constraint assumption can have a strong influence on results. The political economy of how much borrowing a government does is important and controversial, making it unlikely that some specific model of political outcomes implicit in a budget balance constraint will match actual behavior. Moreover, policy conclusions are likely to be sensitive to the particular political constraints chosen, making it difficult to draw conclusions for a different political constraint. For countries like the UK, the ability to borrow, to reduce the public debt, and to save is real. Examining policy with a single budget constraint is in keeping with looking for what governments ought to do. And it is a baseline from which it may be easier to draw inferences if one wants to adapt policies from such a model to reflect a perceived political bias. Thus we ignore papers with period-by-period budget balance.

Overwhelmingly, optimal tax models assume competitive behavior by firms. While this is not a genuinely satisfactory assumption, we have not explored the limited literature that considers other market structures.

Typically, the labor market is modeled as if workers can choose the number of hours to work at the wage available to them. Such a simple linear before-tax budget constraint is not realistic for many people, given rules on overtime pay and possibly different earnings per hour on primary and secondary jobs. Also many jobs come with a standard number of hours, although it should be recognized that the standard number of hours at an employer is a choice variable that plausibly reflects to some degree the hours that workers would like to work. Some of the literature recognizes the discontinuity in disutility of work at zero hours (e. g., from commuting) that makes withdrawal from the labor force a possible next-best alternative to work with a significant number of hours. The distinction between extensive and intensive labor supply margins is very important for considerations of tax rates and acknowledging both can lead to a greater role for the average tax rate in policy analysis. Moreover, since the relative importance of intensive and extensive margins varies widely by age, this is highly relevant for the case for age-

---

[10] In models with standard fully rational agents, the government can balance period-by-period budgets by using taxes and transfers over time on the same individuals. This converts a constraint of period-by-period budgets into a single intertemporal budget constraint without explicit government borrowing or saving.

varying taxes. Since it is most common in the literature, we focus on models with adjustable hours, although the retirement literature often makes use of a zero-one model of employment opportunities.

Most of the literature assumes that the relative wages of workers with different skills is exogenous and we review primarily inferences from these papers. A few papers allow the undoubtedly important issue of endogeneity. Some of these papers have just two types of labor and no capital. With constant returns, strict concavity of the production function and only two factors an increase in the supply of one raises the return to the other. Such modeling calls for encouraging more skilled labor supply to lower the skill premium. For our purposes, three factor models are needed, so that capital can affect relative wages (e. g., Naito, 1999). Empirical work supports the finding that increased capital raises unskilled relative to skilled wages (Krusell et al., 2000).

To a large extent we work with the assumption that capital income and labor income are both perfectly observable. This omits issues of tax evasion and also omits difficulties in distinguishing between the two types of incomes. This is obviously an issue for the self employed – an issue that the Nordic dual-income tax structures have had to face.[11] It is also an issue in the conversion of labor income into corporate income, which has received attention in the literature on the corporate tax (e. g., Gordon and MacKie-Mason, 1995) and when recognizing that labor effort can affect returns on capital investments - by seeking better investments or working harder at evaluating them.

The use of labor for home production is relevant in some contexts, particularly when considering differential commodity taxation of goods. But this distinction does not seem important for the intertemporal issues considered here, although it does matter for evaluating the impact of withdrawal from the labor market on the utility achievable from consumer spending.

More central to consideration of the taxation of capital income, however, is the impact of such taxation on individual savings. Overwhelmingly, intertemporal optimal tax analyses have assumed a life-cycle model (and frequently one with an implausible assumption of intertemporal additive separability in the life-time utility function). Yet

---

[11] Zzz DESCRIBE RULES

analysts examining the wide distribution of individual consumption, savings and wealth holdings over the life-cycle have not found this model adequate. Uncertainties are important, as reflected in the precautionary savings literature. Non-time-consistent behavior has been deemed important for some issues in the quasi-hyperbolic discounting literature and even within the standard discounting framework there appears to be a considerable heterogeneity in underlying discounting of the future in the population (e.g., see Hausman on different discount rates for air conditioner purchasers, or Samwick on the distribution of discount rates that can rationalize the distribution of retirement saving wealth). And the behavior of those with very large wealths appears to require utility directly from wealth holding, not indirectly from later consumption (Carroll). These issues must be taken seriously before one can evaluate policy implications that may rely too heavily on a savings model with some real connection with the data, but very incomplete connection. Below we will briefly speculate how different models of savings behavior might alter some of the optimal tax inferences.

For the most part we focus on models that do not have a bequest motive and we do not consider inter vivos transfers between generations within families.[12] This is wrong for some people and again the life-cycle consumption literature argues that the role of saving for bequests is diverse in the population and unclear (Hurd).[13] But to incorporate bequests we would need to consider taxes on bequests or inheritances and to explore the appropriate social evaluation in the context of such externalities (Diamond, 2006). We can only hope that our analysis would carry over to models that realistically reflected the diversity in bequest behaviors (and savings for bequests) and also incorporated taxes on such transfers.

---

[12] The empirical evidence on the consumption patterns of parents and adult children alive at the same time is strongly contradictory of the idea that overwhelmingly people behave as if there were a single dynastic utility function being jointly maximized. Moreover, taking this literally and recognizing marriage (which links dynasties to each other) leads to absurdities (Bagwell and Bernheim).

[13] As an example of the importance of motivation, if all bequests are accidental from incomplete annuitization and also unobservable, then there is a case for capital income taxation when assumed preferences and technology would have a zero tax rate be optimal without the bequests (Boadway, Marchand, and Pestieau. 2000). On the other hand, with the same assumptions, if bequests are given from a utility motivation and if the utility motivation is fully respected in the government objective function, then the optimal tax on capital may be positive or negative (Cremer, Pestieau, and Rochet. 2003). On the issue of whether such motivation should be fully respected in the government objective function, see Diamond, 2006.

Tax tools

The models examined take as given different packages of government tax tools, contrasting the use of tools in models with different or additional tools available. They differ greatly in both the choice of the tax base and the degree of allowed complexity in tax rates. When a model matches a tax structure that is employed, then drawing inferences has all the difficulties implicit in the incompleteness of a standard social welfare function to capture all the concerns about policy, as discussed in Part II. Drawing inferences becomes even more complicated when a model allows a degree of complexity well beyond what is done in practice. The prime example of this issue is the use of mechanism design to derive some of the conditions satisfied by an optimum. For example, in the two-period model with two consumption variables and two earnings variables studied below, the usual mechanism design approach has each person choosing all four variables out of the set of allowed four-variable options. With uncertainty about second-period skills or preferences, there are two separate incentive compatibility constraints. While first period choices are over available pairs of first-period consumption and earnings, the available set of second-period consumption-earnings pairs depends on the choice that was made in the first period. This is complex in both tax structure and first-period individual optimization. While one can argue that all four variables are reasonably observable, the complexity implicit in the tax structure goes well beyond what is observed in practice, although there are special cases that simplify. This is not to suggest that there is nothing to learn from these models – quite the contrary is true, but that one must draw policy inferences carefully, not literally.

Complexity in tax policy is a difficult issue to consider. We are lacking in analyses that take us very far in considering when additional complexity is a bad idea. Additional complexity can affect individual choices (and the perceived fairness of outcomes that are strongly influenced by the ability to handle complexity) and can affect the quality of the legislative process as ex ante restrictions (formal or informal) in the range of legislation to be considered can influence the outcome. In the absence of extended analyses on which to draw, using complexity concerns to influence policy inferences from formal models is subjective, but seems important. We make use of such concerns, for example, in favoring more variation of taxation with age while not favoring

variation of taxation with height, despite the apparent improvement in the equity-efficiency tradeoff that would come with using height as an additional dimension in tax design. This is discussed further in Part II.

A second issue with these models is the small dimensionality of the population usually assumed. We think that the dimensionality of actual populations (given measurement on an annual basis) is not small enough for the typical analysis to automatically transfer even if complexity were not an issue. The issue is then the kinds of inferences one should be drawing. For example, in the one-period model with earnings and a single consumption good, the mechanism design optimum with a single type of worker can be implemented by a tax on earnings. As Saez (2001) has shown, provided that the optimum has individuals making small responses to small tax changes, the standard first-order conditions can be used with a higher dimension population, using averages of characteristics at each earnings level. However, once we move into intertemporal models with uncertainty, we are skeptical of the ability to have such a simple carryover when the required optimal structure has sufficiently complex allowable interactions.

2-period models with 1 labor supply

Atkinson-Stiglitz (1976) explored a model that had a single labor supply and multiple consumer goods. These consumer goods can be interpreted as including goods consumed in the first period and goods consumed in the second period. Thus the model can be viewed as shedding light on the taxation of savings for retirement. For taxation of savings for later consumption during working life, we turn below to models with two separate labor supplies, representing labor supply in different periods. By examining the relationship between the MRS and MRT between consumer goods in different periods, one can examine the taxation of savings from first-period labor to finance second-period consumption. Thus, if the MRS should equal the MRT between each pair of consumer goods, then the optimum is not consistent with taxing consumer goods other than proportionally (i. e., without relative consumption distortions), and thus inconsistent with taxing savings at the margin. Indeed, Atkinson and Stiglitz showed that when the

available tools include optimal nonlinear earnings taxes, optimal taxation is not consistent with differentially taxing consumer goods when two key assumptions are satisfied. The two key assumptions are that all consumers have preferences that are separable between goods and labor and that all consumers have the same sub-utility function of consumption. Like the Fundamental Welfare Theorem, this theorem plays two roles – one is to show that limited government action is optimal in an interesting setting, and the second is to provide, through the assumptions that play a key role in the theorem, a route toward understanding the circumstances where more government action (in this case distorting taxation of savings) is called for.

Moreover, the underlying logic of the theorem extends to additional settings beyond the full optimization of social welfare. Laroque (2005) and Kaplow (2006) show that with the same preference assumptions, and any income tax function that gives rise to an equilibrium, if there are distorting consumer taxes, then a move to non-distorting consumer taxes can be done along with a permutation of the income tax that leaves every consumer with the same utility and the same labor supply, while the government collects more revenue. If labor supply is smooth in response to uniform transfers to all consumers (no jumps in labor supply), then this revenue gain can be used to make a Pareto improvement. Of course, an argument that a better policy is available is only an argument against a policy proposal if the alternative is pursued. As with the Hicks-Kaldor criterion, hypothetical alternatives not to be taken up are not legitimate arguments against a policy that would increase social welfare. That is, arguing against a distorting tax that would increase progressivity in taxation on the basis of the existence of a dominating proposal is somewhat hypocritical if the dominating proposal is not supported and will never be adopted.

The underlying logic behind the Atkinson-Stiglitz result is that with separability and the same preferences, distorting consumption taxation can not accomplish any distinction among those with different earnings abilities beyond what is already accomplishable by the earnings tax, but still would have a cost from distorting spending. That is, the optimum encourages work by providing the utility from the consumption that can be purchased by earnings in the most efficient manner. This logic gives insight into

several changes in assumptions that would prevent the conclusion in the Atkinson-Stiglitz model that capital income should not be taxed.

One obvious change would be that preferences do not exhibit separability between consumption and labor. Then the Corlett-Hague (1953) style analysis in a 3-good model (current work, current consumption, and future consumption) can examine whether a move towards taxing savings or towards subsidizing savings raises welfare. The key issue is the pattern of cross-elasticities between labor supply and consumptions in the two periods. But we do not know much about the relevant cross-elasticities. Although the commonly-used assumptions of atemporal and intertemporal separability strike me as implausible, that does not lead to a straightforward conclusion about the cross-elasticities. In particular, those in the second period (who are retired) have more time to do home production and also more time to enjoy consumption opportunities that are time-intensive. It is thus not clear which cross-elasticity is higher and so whether savings should be taxed or subsidized. Recognition of home production is an argument for differential taxation of different goods in a point of time (Kleven, Richter and Sørenson, 2000), but does not appear to help clarify the issue of intertemporal taxation.

Two arguments limiting the policy applicability of the Atkinson-Stiglitz theorem based on savings patterns in a model with skill differences have been made by Saez (2002b) and Deaton (1979). Saez argues that it is plausible that there is a positive correlation between labor skill level (wage rate) and the savings rate. In a two-period certainty setting with additive preferences, this is consistent with those with higher earnings abilities having less discount of future consumption. In terms of the conditions of the Atkinson-Stiglitz theorem, Saez preserves separability in preferences but drops the assumption that the subutility function of consumption is the same for everyone. With the plausible assumption that those with higher earnings discount the future less (and so save more) then taxation of savings helps with the equity-efficiency tradeoff by being a source of indirect evidence about who has higher earnings abilities.

A different argument comes from Deaton (1979). Deaton notes that if the income tax is constrained to be linear, then the Atkinson-Stiglitz conditions that are sufficient for the non-taxation of capital income with optimal nonlinear taxation are no longer

sufficient for the result. A further condition is needed when the income tax function must be linear even when preferences are weakly separable between goods and leisure (as in Atkinson-Stiglitz) - that all consumers have parallel linear Engel curves for goods in terms of income. Thus, even with weak separability and uniformity of preferences, different savings rates for different earners because of nonlinear or nonparallel Engel curves prevent the general holding of the result. If higher earners save higher fractions of their incomes, then there should be taxation of capital income. Note that this argument applies as well to each piece of a piecewise linear tax function, with application of the condition to those on a single linear stretch of the tax function. That is, with a linear income tax and differing savings rates, an increase in the tax rate can not reproduce the tax pattern from taxing savings and so be generally a dominant policy change.

As noted above, Naito (1999) has shown that with endogenous relative wages of skilled and unskilled workers, the Atkinson-Stiglitz theorem does not hold. In the intertemporal interpretation, there is an aggregate production set involving first-period consumption, second-period consumption, skilled labour and unskilled labour. By shifting consumption demand between periods, if one can shift relative wages, then the incentive compatibility constraint can be weakened, breaking the dominance of the earnings tax over non-proportional taxation of consumption.

Implicit in the model used by Atkinson and Stiglitz, and by almost all analysts, is the uniformity of prices charged to different consumers. In this multi-period setting, uniformity in the rate of return implies that all investors are equally good at choosing investments. Without getting into the complications that come from portfolio opportunities that involve diverse choices on a risk-return frontier and without getting into complications from non-diversifiable risks, such as direct loans to small businesses, there is still the issue of differing returns for the same risk pattern. This is obvious with mutual funds that charge different fees to investors with different size portfolios and with apparently identical mutual funds that charge different fees. It also results from the use by some people of investment advisers charging fees and placing investors in the same mutual fund portfolios that others choose without paying for such advice. Plausibly, the level of available returns is positively correlated with earnings potential. To explore whether these facts imply that taxation of capital income could improve social welfare,

one would need a model that has reasons (or simply assumes) that investment decisions are made separately person-by-person. Such a model is likely to show two effects – that those who can get a higher rate of return are better off, ceteris paribus, and they are more efficient at converting resources into utility. These two effects naturally point in opposite directions. Such a model might also address implications of the gap between borrowing and lending interest rates.

One way in which savers try for higher returns is by devoting labor effort to seek higher returns. Thus, in a model without taxation of capital income, the pursuit of higher earnings is taxed like leisure, less than earnings are taxed. But a more efficient solution is likely to be achieved by taxing the fruits of the pursuit of higher returns. However, we are not aware of formal modeling incorporating this with non-linear taxation of regular labour earnings.

The standard model assumes that a worker knows the return to working before deciding how much to work and, since work is in the first period, knows the earnings from work before doing any consumption. Uncertainty about earnings given work does not influence taxation of savings if the uncertainty is resolved before first-period consumption - the Atkinson-Stiglitz result carries over. But consumption decisions before earnings uncertainty is resolved does impact the Atkinson-Stiglitz result.

Modifying the model so that earnings occur in the second period (with no advance knowledge of future earnings) would imply that the first-period consumption decision is made before the uncertainty about earnings is resolved, while second-period consumption occurs after.[14] The Atkinson-Stiglitz result no longer holds and second-period consumption should be taxed at the margin relative to first-period consumption (Cremer and Gahvari, 1995). We get this result whether we have general taxation on earnings and savings or have only a linear tax on savings with a nonlinear tax on earnings. We can compare this result with that of taxing savings when higher earners have less discount of the future. In the latter case a worker choosing to imitate someone with less skill values savings more than that worker with less skill since the discount of the future is less for

---

[14] With annual taxation, consumption during the year is happening before earnings levels later in the year are known, at least for some workers. This parallels analyses of the demand for medical care with an annual deductible or out-of-pocket cap.

the potential imitator. Thus taxing savings eases the incentive compatibility constraint. In the uncertainty case, a worker planning to deviate by earning less than the optimized amount in the event of high opportunities has a higher valuation of savings than a worker not planning to deviate (assuming normality of consumption). Thus again taxing savings eases the incentive compatibility constraint. Below, we consider models with labor supply in both periods. Then, with uncertain second-period wages, first-period consumption is occurring after first-period opportunities are realized but before second-period opportunities are realized. The advantage of differential tax treatment of first- and second-period consumptions naturally occurs in this setting.

We also note that the basic model has variation in earnings ability, and sometimes in preferences, but not in wealth at the start of the first period, and so variation in capital income if one were to consider a capital income tax. With variation in initial wealth holdings and an ability to tax initial wealth, the optimum may call for full taxation of initial wealth, particularly when higher wealth is associated with higher earnings abilities. If immediate taxation of initial wealth is ruled out, the presence of capital at the start of the first period, which can earn a return when carried to the second period, can also prevent the optimality of the non-taxation of capital income. As a modeling issue, one needs to ask where such wealth came from. Presumably gifts and inheritances are a major source when considering a tax ignoring transition issues. But since these might themselves be taxed and since gifts and bequests might be influenced by future taxation of capital income, a better treatment of this issue would be embedded it in an OLG model that incorporates the different ways that people think about bequests.[15] A similar issue arises in tax reform given past savings under the previous tax regime. This links to the issues of government commitment and credibility and is discussed in Part II.

We have focused on the two-period model with earnings in the first period. Models with education choice have two periods, with education in the first and earnings in the second. Optimal tax treatment depends on the mix of opportunity and out-of-pocket costs (Hamilton, 1987, Bovenberg and Jacobs, 2005). On-the-job investment in

_____

[15] See, for example, Boadway, Marchand, and Pestieau, 2000, Cremer, Pestieau, and Rochet, 2001. That optimal taxation depends on bequest motivation is brought out in Cremer, Helmuth, and Pierre Pestieau, 2003.

human capital at the expense of foregone wages has also been studied. If labor income tax rates are constant and there is positive taxation of capital income, then there are unequal tax incentives, with human capital favored over physical capital. Combining a linear income tax with a progressive labor income tax can help address this issue (Nielsen and Sørensen, 1997). While there is some analysis of tax treatment of education and of the implications of the presence of formal education for later taxation of earnings, we do not explore this issue. A fuller treatment would incorporate randomness in the increase in future earnings from investments meant to increase earnings potential, whether through formal education, on-the-job training, or work experiences that vary with jobs. Randomness in earnings potentials is a key part of the analysis in models with two periods of earnings, which we turn to below.

Another approach to limiting the applicability of the Atkinson-Stiglitz theorem is to recognize that relative wages depend on the demand for different skills, rather than being parameters, as in the basic model. The commodity tax literature has noted that taxes can modify labor demands as different goods make use of different proportions of different kinds of labor. Since there is an advantage to altering relative wages which are taxed subject to a single formula, there is a case for distorting taxes even with separable utilities. In an intertemporal context, taxation that affects capital accumulation affects relative wages. That is, central to the analysis would be the impact of aggregate savings on the relative wages of high and low productivity workers. Such an impact matters for optimal capital accumulation, and its influence on taxation depends on the link between capital taxation and capital accumulation which is dependent on the total policy toolkit of the government. As noted above, empirical work supports the finding that increased capital raises unskilled relative to skilled wages (Krusell et al., 2000).

Uncertain preferences and lifetimes

In addition to uncertainty about future earnings, there is uncertainty about future preferences. In the certainty setting, the Atkinson-Stiglitz theorem required separability between labor and the vector of consumptions and the same subutility function for all individuals - $U^i\left[x_1, x_2, y\right] = A^i\left[B\left[x_1, x_2\right], y\right]$. The subutility function

might be additive or reflect an impact of first-period consumption on second-period utility. Above we explored the possibility of different subutility functions for workers with different earnings potentials, opening up the use of taxation of savings to improve the ability to tax higher earners. Here we consider a setting where everyone is the same but there is uncertainty about preferences and incomplete markets, giving a role to taxation in helping with the inefficiency from incomplete markets.

In making first-period savings decisions, an individual may be uncertain about the future utility from consumption. This might hold in an additive structure or as a function of current consumption. For example, individuals may be aware that getting used to a standard of living in period one will affect marginal utility in period two, but not be sure how much. In the additive structure, there may be uncertainty about how much consumption will be enjoyed when older – either from an inability to fully appreciate future preferences or from shocks which for some reason are not fully insured – such as health shocks or spending shocks (medical or legal expenses) or an inheritance.[16] With a shift parameter α to reflect the different possibilities, we would write utility as $U^i[x_1, x_2, y, \alpha] = A^i\left[B[x_1, x_2, \alpha], y\right]$. If earnings occur in the first period, then the impact of utility-of-consumption uncertainty depends on the correlation between probabilities of different levels of the shift parameter α and skill level. In the absence of a range of models, it is not clear what sign to put on the optimal taxation of savings from this consideration.

One example of significant uncertainty is in length of life. Moreover, longer expected lives are positively correlated with earnings abilities. A full modeling of this interaction would need to explore the properties of the annuities market (uniform pricing or risk-class varying pricing and the degree of accuracy in risk classification) and the social evaluation of bequests from incomplete annuitization. While the social security literature has examined the impact of different life expectancies on labor market efficiency in a setting of uniform pension rules, consideration of the implications for taxing savings is limited – either inside annuitization or outside. Analysis would need to

---

[16] Another source of uncertainty comes from uncertain future relative prices. This is present even with savings in real assets based on a price index that is not precisely the right one for a given individual.

reflect the greater availability of historic information regularly used by social security systems as opposed to the less historically structured income taxation.

Risky returns

Many models of optimal taxation assume safe returns to savings. Yet returns to savings are random. The randomness may be modeled as perfectly correlated across individuals – as would be the case with the risk coming from access to a capital market with stocks and bonds and the same subjective probabilities for everyone. Empirically, portfolios vary widely across households. Different people have different subjective probabilities about assets and access to different information sources and different investment opportunities. Also, not all investments are fully in market-traded assets, which would matter even if everyone had the same opportunity set. This may be a basis for using capital income taxes as part of optimization even with separable preferences, but the literature incorporating nonlinear earnings taxation and stochastic returns is limited.

The difference between taxing consumption and taxing income has been described as exempting the safe rate of return from taxation, but still taxing the difference between risky and safe rates of return the same. Lying behind this view is the analysis of Gordon (1985) and Kaplow (1994) that linear taxation of the difference between risky and safe returns has no effects with the uses of the revenue that they describe. Gordon assumed that the tax revenue from each person was returned to that person in a (stochastic) lump sum way. Kaplow's assumptions are equivalent to having the government sell the stochastic tax yields in the market and return the proceeds of the sale to each consumer as a lump sum. In both cases, the imposition of the tax and lump sum transfer policy has no effect on equilibrium.

However, if we are concerned with the distributional impact of taxing the difference between risky and safe returns, we need to consider alternative uses of the revenue, involving other tax changes. Such analysis needs to consider differences in portfolios and differences in savings rates. And it needs to consider the supply of safe and risky opportunities. We are not aware of analysis of this tax comparison in these different settings. However, we have done some preliminary analysis of a model with

two types with the stochastic revenues returned to each in equal shares, drawing on the related issue of investing social security funds in stocks (Abel, 2001, Diamond and Geanakoplos, 2003). If the two types have the same preferences and one has access to stocks while the other does not (perhaps reflecting a fixed cost of learning about stocks that is higher than for the investor in stocks) and ignoring any change in the savings rate, such a tax has no effect on the saver with a diversified portfolio while increasing expected utility for the saver without access to stocks when the availability of safe and risky assets is perfectly elastic. However, in the other extreme, of perfectly inelastic investment opportunities, which are purchased from others (e. g., an earlier cohort), the increased demand for risky assets and decreased demand for safe assets implies that the return on the risky asset goes down and the return on the safe asset goes up, implying further utility effects.

Another case to consider is where the risk in tax revenues is initially absorbed in debt issues and responded to over time with tax changes, thereby spreading the risk across (possibly all) future cohorts. Analysis of this case depends on how the government spreads risk across future cohorts. The analysis of Gollier (2005) contrasting optimized defined contribution and defined benefit pension plans with perfectly elastic investment opportunities suggests that optimal adjustment of taxes and public debt can significantly increase expected utility of a representative cohort.

2-period models – 2 labor supplies

While the model with a single labor supply decision can shed light on the relative treatment of consumption when working and when retired, a model with two labor supply decisions opens up issues about consumption and earnings during a career. Moreover, it opens up issues of the relationship of modeling to implementation that are not present in the single-labor supply model. Consider a setting where individuals work in each of two periods and consume in each of two periods. For comparability to the simpler model (in order to highlight what changes) assume that preferences are additive, both between consumption and labor in a single period and across time - $U = \sum_t \left(u_t \left[x_t \right] - v_t \left[y_t \right] \right)$. The

implications of alternative preference structures are likely to be similar to those discussed in simpler models above and we focus on earnings patterns over time.

Two key ingredients are the available tax tools and the pattern of productivities for an individual over time - that the age-earnings profile is steeper for more highly paid workers and that there is uncertainty about second-period earnings possibilities.

Mechanism design

The approach commonly taken in optimal tax analyses by public finance economists has been to analyze tax structures that resemble actual ones. In contrast, analyses by macroeconomists have explored optimization in a mechanism design setting.[17] This allows far more complex policy tools than we ever see. For example, in a setting of two periods with two labor supplies, the link between second period consumption (after-tax available spending) and second period earnings can depend in a nonlinear way on both first-period earnings and first-period consumption. That is, second-period consumption would depend on all three of the other variables, with no restriction on the complexity in the functional form. Framing the problem in this way represents a restriction that everyone has the same safe rate of return on savings since otherwise we would also need to track capital income, involving a generalization over the bulk of the existing literature. Once one envisions modeling longer lives, this degree of interaction becomes implausible to implement. One strand of the literature has explored assumptions under which the optimum can be implemented with tax structures that are not so complex. Simplification is accomplished by taxing the wealth carried from period t to period t+1 at a rate that varies not only with past earnings but also with earnings in period t+1 (Albanesi and Sleet, 2006, Kocherlakota, 2005). Moreover, while taxes on wealth need to vary with individual position, they collect no expected revenue, being a combination of taxes and subsidies. The combination of taxes and subsidies is chosen to preserve the wedge on savings that needs to be present – current marginal utility exceeds future expected marginal utility assuming savings at the marginal product of capital. This

---

[17] Public finance economists have largely focused on certainty models, while macroeconomists have paid attention to individual uncertainties.

insight is intriguing, but it is not clear how directly useful this is given remaining complexity and difficulties in measuring wealth.

It is not clear how the insights should carry over from a complex to a simple setting. This is particularly an issue when we recognize the reality that there are more types than there are tax tools, which raises further issues about how to learn from the simpler models. This issue about inferences from simpler models arises with more dimensions than types even when the number of types remains small (Judd and Su, 2005, Tarkiainen and Tuomala, 1999). Thus a key question is what lessons to draw from such modeling. One way to proceed is to note the properties of an optimal mechanism design and then check to see which properties are also present in models with less general government policies.

The literature has explored the presence of what have been dubbed "wedges" – differences between the marginal rates of substitution and transformation at the optimal allocation. In an economy with linear taxation, a wedge would correspond to a nonzero tax, but wedges in a nonlinear tax structure are not generally implementable in a (partially) linear one. There are four wedges that seem useful to consider – two intratemporal wedges between earnings and consumption in the two periods and two intertemporal wedges – one for consumption and one for earnings. While any three of the wedges would permit derivation of the fourth, paying attention to all four is useful when contemplating alternative restrictions on tax tools, related to implementation. Thus if one has annual taxation of earnings (age varying or not) then the presence or absence of an intertemporal consumption wedge is suggestive of the role of taxation of capital income. On the other hand, if there is annual taxation of consumption, then it is the intertemporal earnings wedge which is suggestive of whether the consumption tax should be supplemented by taxation of capital income. Possibly, how the wedge varies with other variables might be suggestive of whether taxation should be dual or integrated.

In the mechanism design setting, we can look at the relationship between the intertemporal MRS in consumption and the matching MRT as well as the intertemporal MRS in earnings and the matching MRT. That is, we can consider the marginal utility impact of delaying consumption or delaying earning if there were no

implicit taxation (if the delay involved the market rate of interest). If, with zero implicit taxation, there is an incentive to delay either consumption or earnings (or both) at the optimal consumption and earnings plan, then there must be implicit marginal taxation (a wedge) so that the full market rate of interest is not appropriate for an individual's calculation.

If preferences are additive, as above, with the same subutility functions for everyone, and if there is certainty in earnings possibilities, then the Atkinson-Stiglitz theorem tells us that there is no intertemporal consumption wedge. Nevertheless, there is generally an intertemporal earnings wedge given the evolution of earnings possibilities. In the case of certain future earnings, if higher earners have steeper age-earnings profiles, the sign of that wedge is to discourage savings. Progressive annual taxes of earnings generates such a wedge for those with rising earnings (and relates to the issue of human capital accumulation mentioned above).[18] Age-varying taxes can address this as well. But having the PDV of lifetime taxes based on the PDV of lifetime earnings does not have such a wedge. And note that annual taxes on consumption do not generate an intertemporal earnings wedge. Moreover, if the age-consumption profile with optimal taxes is not flat (as is empirically the case with existing taxes), then progressive annual consumption taxes generate an intertemporal consumption wedge, which is not wanted under these assumptions, while not generating an intertemporal earnings wedge, which is wanted.

Apart from cases where the mechanism design optimum is simply implementable, a key question is the relationship between findings in a mechanism design optimum and findings in an optimization with fewer tools. One such analysis has been done for a setting where the Atkinson-Stiglitz result holds (no intertemporal consumption wedge), and taxation depends in a complex manner on earnings in all periods. That is, in a two-period model, implementation can be done by taxing first period earnings, $T_1[z_1]$, in the first period and then having a tax on second-period earnings, collected in the second period, that now depends on earnings in both periods, $T_2[z_1, z_2]$. This intertemporal

---

[18] Vickrey (1947) was concerned with the relative treatment by progressive annual taxes of those with constant incomes and those with fluctuating incomes.

earnings interaction matters and the full optimum can not be implemented by separate tax structures in each period, $T_1[z_1], T_2[z_2]$ when there are income effects. Gaube (2005) shows that the zero marginal rate at the top of the tax structure with complex taxation, $T_2[z_1, z_2]$, does not carry over to the optimum with separate tax structures, $T_1[z_1], T_2[z_2]$, since higher earnings in one period lowers tax revenue in the other period given normality. Thus the mechanism design optimum can not be implemented in this way. Income effects are key to the connection between separate incentives and linked incentives.

As indicated above, we consider uncertainty about future earnings to be a central element to be addressed in the design of direct taxation. Even with all the Atkinson-Stiglitz preference assumptions, uncertainty about second-period earnings implies an intertemporal consumption wedge for optimal taxation with mechanism design (Golosov, Tsyvinski and Werning, 2007). Moreover, an intertemporal earnings wedge is also generally part of the optimum.

It is natural to expect some of these properties to carry over to settings with less general taxation, and some of them are readily checked, but the literature has not explored all of them. In contrast with the case of certain earnings discussed above, with uncertain future earnings progressive taxation of annual earnings should be supplemented by a tax on savings – which can be done with a tax on capital income. As noted above, we are not aware of analysis of the case with uncertainty in both future earnings and financial rates of return. As above, annual taxation of consumption does not generate the intertemporal earnings wedge one would want when there is discretionary savings.

It would be interesting to explore the time shape of such intertemporal wedges in models with realistic life spans and patterns of earnings growth, and alternative amounts of information that individuals receive about future earnings. Higher current consumption is then a signal of anticipated higher future earnings and may be relevant for the optimal wedges.

With our topic being the tax base, it is natural to focus on wedges and implied marginal tax rates. The theoretical results from the optimal tax literature have been

primarily focused on marginal tax rates. In contrast, calculated optimal tax structures also shed light on average tax rates, something that has been harder to explore in more general theoretical frameworks. Yet average tax rates clearly matter, particularly when the intensive margin is being considered (see Choné and Laroque, 2001, 2006, Diamond, 1980, Saez, 2002c for the case of personal incomes or Griffith and Devereux (2002) for the case of multinational corporations). They would be an integral part of the design of the complex tax structures coming from mechanism design and matter in the attempt to use less complex tax structures as well as possible.

3-period models – 2 labor supplies

If we consider a model with two earnings periods and one retirement period, we need to face together issues that were faced separately above, leading to further complications. In a model with only one earnings period and a retirement period, there is a case based on separability for non-taxation of capital income. This case is undercut to the extent that higher earners have less discounting of the future and longer life expectancies that induce greater savings rates. In the model with two earnings periods and two consumption periods, there is further strengthening of the need for some capital income taxation from the uncertainty about future earnings. Turning to a model with two earnings periods and a retirement period, we have all of the above working. That is, as has been noted in a number of different contexts (da Costa, 2003, Mirrlees, 1995), the intertemporal consumption wedge between retirement consumption and consumption in the late earnings years depends on the issues in the two period model with only one earnings period. The intertemporal consumption wedge between retirement consumption and consumption in early earnings years is a compound of successive period rates and thus also depends on the issues that call for an intertemporal consumption wedge between early and late earnings years. Thus there is an interesting question how to address taxation of capital income when using less complex structures than implicit in mechanism design.

In practice, some tax systems provide special tax treatment for retirement savings. In addition, countries have mandatory public pension systems that collect contributions

when working and provide benefits in retirement years. Consideration of the tax treatment of retirement savings needs to be integrated with consideration of mandatory retirement savings systems. The latter have focused a great deal on the behavioral issues that, left to their own devices, many people apparently would not save enough for an appropriate replacement rate and little use would be made of annuities. Thus there is an inherent tension between the concern that many people do not save enough and the optimal tax analysis above which calls for discouraging savings in the form of taxation of capital income. To address this issue, one needs to recognize the wide disparity in wealth to earnings levels (at any age) and the apparent diversity in the motivations behind individual savings. Thus there is no necessary contradiction between mandatory retirement savings, which will matter little (at the savings margin) for those with large savings, and discouragement of savings for those who would save a great deal. Indeed, it is tempting to think that there might be analysis recognizing such individual diversity and finding simultaneous roles for mandatory savings that is capped for high earners and retirement savings incentives that are also capped for high savers. But such analysis does not yet exist. Nor have we seen analyses of the optimality properties of the different ways of doing tax-favoring (EET (as in IRAs in the US or Personal Pensions in the UK), TEE (as in Tax Exempt Special Savings Accounts or their successor, Individual Savings Accounts in the UK, or Roth IRAs in the US), or both available (as in the US), and partial taxation of accumulation (as was in Australia). [19]

Overlapping Generations (OLG) models

The analysis discussed above focused on the intertemporal dimension of direct taxation and noted a role for age-varying tax structures. A natural question is the relevance of such analyses once one recognizes the reality of overlapping generations. There are two aspects of the connection between analysis for a single cohort (as is implicitly done above) and OLG analysis. One aspect is the determination of the

---

[19] Exempt, Exempt, Taxable treatment allows an income tax deduction for deposits in an account, no taxation during the accumulation phase and taxation at withdrawal. In contrast Taxable, Exempt, Exempt, has no deduction for a deposit but then no taxation during accumulation or of eligible withdrawals.

government's role in affecting aggregate capital available to different cohorts. Second is the extent to which there are limits to how much taxes can vary with age.

If the government is free to use public debt and public assets to optimize national capital and if taxes are age-varying, then a full optimization in the standard model can be divided to include suboptimizations for each cohort in the usual formulation. That is, from the intergenerational optimization there is a constraint on the net contribution to national capital from each cohort. Using this net contribution as a constraint on optimization of taxes for a cohort, then the type of optimizations we have analyzed above hold in the basic case where there is no direct concern about relative prices. The analyses with a concern about relative prices, particularly a concern about relative wages, do not have this full separation. Presumably our analysis above remains strongly suggestive. Other links would naturally arise in a setting where parents look after children.

The case that needs attention has the assumption that taxes are not allowed to vary by cohort – that is they are period-specific rather than age-period specific. In the context of age-varying taxes, we have seen a case for taxing capital income in the setting of a single cohort. This section has argued that this case carries over, pretty much intact, to embedding the single cohort in an OLG model with age-varying taxes and the government free to coordinate debt policy with tax policy. An open question is whether the lack of age-varying taxes would influence the use of capital income taxes in this OLG setting. In the context of a single type of agent in each cohort, Erosa and Gervais (2002) have examined implications of uniform labour taxes. If the utility discount rate differs from the real discount rate, individuals will chose non-constant age profiles in both consumption and earnings, even if period preferences are additive and the same over time. This then calls for age-varying labour taxes if feasible and if not feasible for non-zero capital income taxation. With multiple types and nonlinear earnings taxes, it remains the case the age-varying earnings taxes are generally required for the optimum. It is plausible that, the requirement of uniform labour income taxation across periods for a single cohort would block the applicability of the Atkinson-Stiglitz result in general given the reality of age-varying consumptions, efficiencies, and labor elasticities, all of which can be present even with fully additive utility functions.

Infinite horizon agents

When agents have long horizons, modeling their current decision-making using an infinite horizon model can be mathematically more tractable than a long finite horizon, while doing little violence to some conclusions from the analysis. However, when considering the evolution of an economy over time, a model with a fixed number of infinitely lived agents behaves very differently from an OLG model.

Consideration of tax policy in the distant future may be dependent on the evolution of the economy and thus policy inferences from models with infinite horizon agents may be different from policy inferences from OLG models, even ones with very long-lived agents. Moreover, inferences from such models depend on the structure of the model – both its positive and normative assumptions.

The starting place for a discussion with infinite horizon agents is the famous and widely cited Chamley-Judd result that when such an economy is in a steady state, there should be no taxation of capital income (with a linked convergence result). As Chamley (1986) explained: "The main property of the model which is used in the proof is the equality between the private and social discount rate in the long run." (page 608) and, in the altruistic dynasty interpretation: "When the social planner uses the same discount rate for the future life cyclers as the discount rate applied in the altruistic families, the long-run tax rate on capital income is zero. This property … requires that individuals not be constrained at a corner solution for their bequest." (page 613) or "This assumes that the social planner and the individuals use the same relative utility weights for intergenerational transfers." (page 619). Once the weights differ, then the result changes.[20]

As with the Atkinson-Stiglitz result, a key question is how robust the conclusion is to realistic changes in the model. We reach the same conclusion in this case as in the

---

[20] Farhi and Werning, 2005, consider the case of respecting individual dynastic preferences and also giving weight to the dynastic preferences of later generations. As in Kaplow (1995) the thrust of such modeling is to subsidize gifts and bequests since they benefit both the donor and the donee. The results would change if the social welfare function treated dynastic concerns differently from utility of own-consumption in the social welfare function, an issue considered in the context of charitable donations in Diamond (2006).

earlier analysis – the finding is not robust for policy purposes. Let us start with the basic interpretation of the model before turning to detailed modeling assumptions. In the standard OLG model, individuals have no concern for the future after their deaths and leave no bequests. This is empirically inaccurate - most people leave some bequests and we think that some people adjust earnings and/or savings in light of planned gifts and bequests.[21] Results vary in models extending the basic OLG model depending on how bequests are modeled. Models with 'accidental bequests' because of incomplete insurance/annuitization and models with planned bequests arising from motivation that can influence earlier decisions will generate different positive and normative tax implications. Empirically, how important bequest considerations are for behavior is unclear and certainly widely varying in the population. Also key to further analysis is how to form a social welfare function since counting both the utility of a donor and the utility of a donee in a social welfare function has implications that can be questioned as being normatively unattractive.

In contrast, the standard infinite horizon agent model is viewed as a dynasty model with incorporation of future utilities in the decision-making of earlier cohorts and a normative evaluation of the utilities-of-consumption of each generation in the same way as viewed by the existing generation. This is typically done as if there were only one generation alive at a time and lasting only a single period, rather than the multiple overlapping generations that are present. In terms of the normative issue raised above, this can be viewed as counting the utility of the donor and ignoring the utility of the donee, and is one way to approach concern about overweighing the consequences of concern for others.

It is useful to complement models unrealistically ignoring bequests with models giving bequests a larger role in decision-making than they have in reality – at least until we have better empirics and analytics around bequests. So an evaluation of the role of other assumptions in reaching the no-capital-income-taxation conclusion is appropriate. Note that in the asymptote of the usual models, each period is exactly the same for each

---

[21] Part of the debate on the importance of intergenerational links for evolution of the capital stock relates to the treatment of the financing of education and other gifts that occur well before the time of life expectancy. This is ignored in this discussion which focuses on the transfer of financial wealth at death or at a time when remaining life expectancy is not so large.

of the dynasties at the time. Recognizing that the dynasties are a collection of successive individuals makes all of the issues considered above for a single cohort relevant in this model as well. For example, those working have on average an age-earnings profile that is not flat. Requiring uniformity in earnings taxation across workers of different ages alive in the same period would presumably raise similar issues of capital income taxation as it does in the single-cohort model. The analysis of Judd (1999) still gives an average capital income tax that tends to zero even if it is not zero in any period.

In the single-cohort model, Naito (1999) has shown that endogeneity of relative wages, together with a uniform earnings tax function, contradicts the optimality of zero capital income taxes when relative wages can be influenced, even with the Atkinson-Stiglitz separability assumptions. Correia, (1996) has shown something related in the infinite horizon model. She assumed two kinds of labour and an inability to tax one kind. The adjustment of capital to offset the absence of taxation of this labour results in a long-run equilibrium with non-zero taxation of capital, with the sign depending on the details of the technology. A similar result can occur if the two types of labour must be taxed the same (and capital affects relative wages) or if one of the two types of labour must be taxed the same as capital income is taxed (reflecting an inability to tell apart capital and some labour incomes.

Also, as in the one-cohort model, uncertainty about the future earnings of those alive and already working as well as about the earnings of those not yet in the labor market or not yet born removes the optimality of zero taxation of capital income (Golosov, Kocherlakota and Tsyvinski, 2003).[22] Aiyagari (1995) and Chamley (2001) considered borrowing constrained agents. Their precautionary savings leads them to over save relative to the social optimum, which means that a positive capital tax is welfare improving in the standard setup.[23]

When the model is interpreted as each generation living for a single period, a tax on capital income is equivalent to a tax on bequests. Once individuals live longer than a

---

[22] Analysis of uncertainty that affects all earnings possibilities proportionally is quite different. See Golosov, Tsyvinski and Werning, 2007.

[23] Chamley has an example where randomness is in the timing of future incomes, with the outcome learned ahead of time, giving an advantage to subsidizing capital income rather than taxing it.

single period, then one can distinguish between a tax on interest income and a tax on bequests, which has implications for optimal taxes. This point has been made by Chamley (1986, page 613) "If a specific tax can be implemented on the interest income of savings used for life-cycle consumption, its rate is in general different from zero." The same point can be seen in a model with time-varying period utility functions (that are not separable between consumption and labor). Assume the period utility functions are the same in all even-numbered years and all odd-numbered years, but different across adjoining years. Then there will be alternating taxes that would show long run zero taxation across pairs of years (consistent with taxation being zero on average in Judd, 1999). To preserve this long-run pattern while distinguishing between capital income and bequest taxes, if one were taxing capital income, then one would be subsidizing bequests. Such a starting place for analysis would focus attention, appropriately on analysis of bequest motives (and their heterogeneity).

Additional considerations arise when there is human capital as well as physical capital in an infinite horizon model. In the presence of both physical and human capital, labor is supplied jointly with human capital, which means that a positive labor tax is also taxing capital. In this setup, it is optimal to converge to zero capital and labor taxes (Jones, Manuelli and Rossi, 1997) unless human capital is observable. If a direct subsidy on human capital is available, then it is optimal to have positive labor taxes in the long run accompanied by a subsidy on human capital and zero taxes on physical capital (Judd, 1999). The result with unobservable human capital suggests that the accumulation of sufficient government resources, relative to expenditures, is a key part of the result on the optimality of zero taxation. Thus, at a point of time with a non-optimal tax structure, it is not clear whether the result that long run taxation of capital should stop is a call for increasing or decreasing the current taxation of capital income.

Another source of concern about the results in existing models is that the tax on capital income is linear. Saez (2002a) has examined the role of a linear tax with an exemption, as opposed to a tax linear from the origin. Asymptotically no one is paying the tax, as wealths above the exemption level decline to the exemption level – with everyone having the same discount rate the before-tax interest rate is driven to the discount rate in a steady-state, implying a lower after-tax return if there were dynasties

with wealth above the exemption level. But the tax has served to raise revenue from those with the highest wealth, reducing their wealth to the exemption level and an exemption level that is finite (as opposed to infinite which would be equivalent to no tax) is part of an optimum.

The standard presentation of the intuition behind the Chamley-Judd result is to examine the impact of repeated taxation on the relative price of current and future consumption in period T - $\left\{(1+r)/(1+r(1-\tau))^{T}\right\}$. With a positive rate of tax this expression goes to infinity as T goes to infinity. This explosive effect overrules other considerations for taxing capital coming from preferences. But we have seen that this is explosive effect does not overrule considerations coming from uncertain earnings or pure rents, suggesting that the real intuition for the result is coming from something additional, perhaps the convergence property, which would not be a strong foundation for basing future policies.

Thus we conclude that the Chamley-Judd result that there should be no taxation of capital income is not a good basis for policy. Nevertheless the issue remains of the compounding of taxation of capital income resulting in a growing tax wedge the longer the horizon for decision-making – a point also made in models with finite lives of many periods. This is suggestive of a possible role for capital income taxation that varies with the age of the saver and/or with the time lapse between savings and later consumption (as with tax-favored retirement savings). The role of capital income taxation when earnings are uncertain particularly suggests that rules might well be different for those at ages when workers are mostly retired.

Behavioral models

Behavioral economics has become a major research area for many economists and some of the findings are very exciting (for a survey see Bernheim and Rangel, 2005, forthcoming 2007). Indeed, analyses of the difference in outcomes with opt-in and opt-out rules are already influencing policy makers in both the US and the UK. And the details of tax-favored savings programs matter for the degree of take-up. Behavioral

analysis of savings behavior is highly relevant for the choice of tax base. It is also key for interpreting the role of mandatory programs that require contributions when working and provide cash benefits when retired. And these two policy institutions need to be considered together. A key tax policy design issue is how to combine concern that some fraction of the population saves too little for an adequate replacement rate in retirement while another fraction saves too much, resulting in their retiring too soon from the perspective of social welfare optimization. And heterogeneity in life expectancy, intertemporal preferences, and consumption history (in light of the realistic links between past consumptions and later marginal utilities of consumption) all call for diversity in individual saving rates. Indeed, consideration of the importance of both undersaving and oversaving for the taxation of capital income and for tax preferences for retirement savings is an important issue for future research. To date, the literature has addressed one of the other but not both, limiting the available inferences. EXPAND ??

Concluding remarks

The information needed for a full implementation of an optimal tax calculation is never going to be available, especially once one moves from simpler models to more realistic ones incorporating uncertainties and decision-making complexities. Thus one needs some default basis for tax policy – some basis for setting tax rules that is overruled in a context of sufficient information to warrant a judgment that an alternative tax really can do better. Is this a place where ability to pay might enter? Or where assumptions of separability and uniformity might be appropriate?

After discussion of some foundational issues in the place given to social welfare maximization in this essay (part II) we return to the policy discussion in Part III, which can be read while skipping the intervening discussion of additional normative issues.

Part II. Broader tax base issues

Social Welfare

The objective function typically used in optimal taxation studies is a concave function of individual utilities, possibly additive over a social cardinalization of individual utilities. Thus it is assumed that in doing the optimization the distribution of consumer preferences is known to the optimizer, even if individual preferences are (implicitly or explicitly) modeled as not known by the optimizer. Since empirical demand studies give us some information about the pattern of demands, but the detailed individual distribution is not known, usable policy inferences must be drawn carefully. The choice of a cardinalization of utilities (when utilities are added), or the shape of the social welfare function more generally, reflects an ethical choice in evaluating alternative distributions of utilities. Since such ethical choosing is not part of scientific economics, economic analysis explores the relationship between different welfare criteria and optimal tax structures. Much of the literature assumes that preferences are identical across people, with differences only in budget constraints (usually modeled as differences in productivity per hour of work). The identical-preference structure can be interpreted as a form of treating everyone similarly in the welfare structure – not paying attention to correlations between skill and other dimensions. But as we discuss below, these correlations have important implications.

This optimization approach is often accused of assuming a benevolent government. This criticism has both right and wrong elements. Calculation of what a benevolent government should do is not the same as assuming that there is a benevolent government. Rather it is asking a key question - what policies would one want to see a benevolent government follow. Used carefully, the answer to such a question can inform a democratic debate about government policies – which is all that academic economic research can hope to accomplish by itself. Moreover, it is hard to see how one gives policy advice without knowing the link between good design of policies and the accomplishment of social ends.[24]

---

[24] As Musgrave wrote: "Just as homo economicus or a competitive Walrasian system are useful fictions to model an ideal market, so it is helpful to visualize how a correctly functioning public sector would perform. … Unless "correct" solutions are established to serve as standards, defects and failures of actual performance cannot even be identified." Buchanan and Musgrave, 1999, page 35.

The relevant part of the accusation is that the political tendencies of actual governments are highly relevant for good policy recommendations. Awareness of political tendencies can readily take two separate forms. One is to extend optimal tax theory to incorporate additional constraints reflecting what governments are likely to do, either in response to recommendations or in future policies that follow after current legislation. This is a richer, and possibly more relevant, environment than considering a constitutional approach to limits on taxability. Indeed, the literature on tax policy without government commitment is a form of such analysis, although one that typically does not have a well-developed, empirically well-supported theory of government behavior in a democracy. A second form that awareness of political tendencies can take is through judicious use of the insights from optimal tax results when moving from basic theory to policy recommendations. Recommendations can reflect beliefs about the workings of the political process, based on the current state of politics and political science and projections of political evolution. In the absence of much literature on optimal taxes with political constraints, we try to be judicious in our inferences.

The optimal tax approach has generally considered taxes in a single period or for the lifetime of a single cohort (sometimes in an overlapping generations (OLG) setting). Some analysts think that when modeling individual behavior as a maximization of preferences, those individual preferences should always form the basis for the social welfare function (respecting revealed preferences). However, we question the appropriateness of requiring that tight link in several settings, as well as recognizing that not all behavior can be modeled as a time-consistent maximization. One such setting is where people care about each other. This is particularly an issue in models including bequests or charitable gifts. It is also an issue where the allocation of resources within the family is important. Taking the same preferences for both positive and normative uses has also been questioned in settings of negative feelings – particularly envy. We note these issues, but do not explore them since we consider annual direct taxation in model settings that ignore gifts and donations. This is not fully satisfactory since, for example, inferences about the tax treatment of capital income when savings are to finance later consumption may need to be adjusted for the partial use of savings for gifts and

bequests, gifts and bequests that may not be taxed in a way that is adequately integrated with the tax treatment of capital income.

Another source of concern about the formulation of the objective function arises in intertemporal settings to the extent that some people may not exhibit time consistency in their behavior.[25] Since this issue is indeed central to the analysis of the relative taxation of capital and labor incomes, we return to it later after exploring implications of models with fully-rational agents. For now, we simply proceed with preferences without incorporating the complications we have just identified. But it is worth noting before getting to the fairness issues we discuss next, that we recognize that there are questions about the social welfare approach based solely on utilities as revealed by behavior. This approach is based on the idea that a good starting place for policy is the policy for fully-rational agents, a policy that can then be adjusted in recognition of the inadequacy of the assumption that all individuals show fully-rational behavior. For example, in considering the taxation of capital income, we first ask how that should be done in an economy with only fully-rational agents and then ask about adjustment in recognition of some fraction of agents who do not save enough. Even the first step is complex given the many aspects of the economic environment that are present, which are modeled separately in optimal tax analyses because of the difficulty in making inferences if the model has many complications at the same time.

Fairness and Inequality

While the optimal tax literature works simply with a social welfare function, there are two other literatures showing normative concerns relevant for taxation that we consider. One is the attention paid to income distribution, particularly using a social income evaluation function as developed by Atkinson (1970). Second is the long tradition, linked to horizontal equity, of an ability-to-pay basis for taxation and the more recent formal considerations of horizontal equity for tax analysis.

---

[25] Examples exist of analyses with time-inconsistent quasi-hyperbolic preferences and with the simple assumption that some people do no savings at all. A similar issue of the appropriate objective function arises if the analyst is concerned that individuals discount the future excessively even if they are time-consistent.

Social Income Evaluation Functions

To make the distinction between a social income evaluation function and a social welfare function clear, let us consider the special case where each individual has a utility function that is additive, with a function of consumption and a function of labor worked - $U^i[x_i, y_i] = u^i[x_i] - v^i[y_i]$. A social welfare function is a function of individual utilities, for example a sum, $W = \sum_i \left(u^i[x_i] - v^i[y_i] \right)$. In contrast a social income evaluation function depends on the social evaluation of individual (net-of-tax) incomes or consumption levels. Again assuming a sum, this might be written $\tilde{W} = \sum_i \left(u^i[x_i] \right)$. And it may be informative to use the same utility function for everyone even though it is readily recognized that that is not the case. For example, this arises in considering medical expenses. These objective functions could be considered on both annual and lifetime bases.[26][27]

Appropriately, a great deal of attention is paid to income distributions – such attention can be informative about what is happening in an economy (see for example, Piketty and Saez, 2003, 2006) and can inform a concern for its social implications. And attention to incomes is also informative since there is so much variation in incomes. While there is also variation in hours worked, this is studied separately (Prescott, 2004; Greenwood and Guillaume, 2005) and does not have the same social implications. But the question for this essay is whether, when thinking about the base for direct taxation, it makes sense to start by considering taxes that optimize a social income evaluation function rather than a social welfare function?[28]

---

[26] This approach does not directly reflect concerns that large incomes and wealths can have impacts on the political process.

[27] One approach to extending the income evaluation function is to "discount" labour income for the cost of effort, thus converting an income measure into utility measure (under strong assumptions). From the perspective of this section, that would be a particular form of a social welfare function.

[28] Of course one might optimize a weighted sum of the two. And one might be concerned merely to limit the extent of income inequality, although defining that in an interesting way has difficulties, as brought out by Atkinson, op cit.

One approach to answering this question is to compare the implications of optimizing different objective functions. Lack of concern with the disutility of labor in the objective function will tend to seek allocations that involve more work since the income earned (or consumption produced) will raise the objective function, while the disutility does not impact the objective function. This can impact differently workers of different skills. The degree of difference in the implications depends on the tools and constraints for the optimization. In keeping with the basic income tax framework, assume that earnings are observable but hours of work are not.

If the distribution of productivities (among those not labeled disabled) is bounded away from zero (however low the bound), then maximizing a social income evaluation function would call for incentives that have everyone (except those labeled disabled) work, even those with very little productivity. Indeed, those with the lowest skill would work the maximum possible. Heavy labor by those with little productivity would have a zero direct cost to the social income evaluation function. The gain from having low productivity people work is that it would weaken the incentive compatibility constraint, making it less attractive for higher earners to imitate low earners, assuming that the basis of taxation is earnings not adjusted for productivity. That is, the gain is because higher productivity people, contemplating less work, and thereby imitating lower productivity people, would find this less attractive than imitating someone with minimal income and no work. This would be more important in a model without continuity in utility and constancy of earnings per hour as hours approach zero.[29] In that way higher incomes can be generated, enhancing the level of the social income evaluation function.[30]

If there are people who can not earn (and can not be identified as such), then the degree of inducing labor from productive people is limited by the incentive compatibility constraint that others not stop working altogether. Doing such an optimization has some interesting differences from optimizing a social welfare function, involving pushing

---

[29] The importance of this issue depends on the time frame being examined – shorter time frames separately evaluated make is harder to earn just a little money for a given annual total.

[30] A standard result in optimal taxation with a social welfare function is that the marginal rate at the top of the earnings distribution is zero. This follows since with any positive tax, there is a Pareto gain available by lowering the tax rate. Optimizing a social income evaluation function, those with the highest productivity are taxed (assuming a finite maximum), making clear that the use of this objective function calls for passing up a possible Pareto gain.

people to work more than if their disutility entered the objective function. An interesting comparison is with a Rawlsian social welfare function (maximin of individual utilities). If there are people who can not work, the Rawlsian optimum has a similar lack of impact on the objective function from the disutility of those who work. But there is also a matching lack of impact for the utility of their consumption. With a social income evaluation function, the utility of consumption counts in the objective function for everyone (except in the limiting maximin solution). This highlights the push for more work from the absence of the disutility of labor in the social objective. It is not clear why one would want an objective function that ignores the utility cost of generating the incomes that matter for the objective function.

In sum, while we share a concern about income distribution, a social income evaluation function is no substitute for a social welfare function in thinking about tax policy.[31] This approach appears to give too much weight to encouraging work and we do not think it is a useful variant on social welfare function maximization. Nevertheless, one might consider limiting income variation (perhaps because of political implications), which would also imply rejecting possible Pareto gains.

Ability to pay

Historically there have been two different approaches to an ideal tax base – one drawn from ability to pay and one drawn from benefits received from government spending.[32] We note that earmarked taxes for particular expenditures are a common feature of advanced countries (particularly in the context of social insurance) and recognize the important political role such earmarking can play. And there may be a direct normative gain from such earmarking in some circumstances. Discussion of the pattern of benefits received from government spending programs that affect the entire population did not achieve any consensus on the distributional significance and has

---

[31] Nor do we see a case for an objective function that combines both a social welfare function and a social utility function.
[32] For historical discussion, see Musgrave, 1959.

disappeared from discussion of an ideal tax base.[33] Our purpose, as in the Meade Report, is to examine the base for the provision of general revenues, not earmarked ones and, like the Report, we consider only ability-to-pay concepts.

Going back at least to Adam Smith, economists have considered what would be a fair base for taxation (along with the issue of the fair degree of progressivity, given the chosen tax base).[34] The Meade Report states: "No doubt, if Mr Smith and Mr Brown have the same 'taxable capacity', they should bear the same tax burden, and if Mr Smith's taxable capacity is greater than Mr Brown's, Mr Smith should bear the greater tax burden. But on examination 'taxable capacity' always turns out to be very difficult to define and to be a matter on which opinions will differ rather widely." (Page 14.)[35] The Report goes on to ask: "Is it similarity of opportunity or similarity of outcome which is relevant?" and "Should differences in needs or tastes be considered in comparing taxable capacities?"

We begin by recognizing the core argument for consideration beyond a standard social welfare maximization, as stated by Musgrave in Buchanan and Musgrave (1999).

> The state and its public sector thus form an integral part of a multifaceted socioeconomic order. …
> That order, I hasten to add, includes not only the Pareto efficient use of resources, important though that is but also other and no less vital dimensions of social coexistence-distributive justice and the balance of individual rights and obligations upon which a meaningful concept of liberty has to be built. A view of fiscal economics, which holds that all is well if only Pareto optimality prevails, bypasses these essential components of social coexistence and fails on both normative and positive grounds. Without allowing for a sense of social justice the

---

[33] For example, it is hard to see how to allocate the benefit of military spending by income level in a way that is not so arbitrary that it can not add to a discussion of taxes.

[34] "The subjects of every state ought to contribute towards the support of the government, as nearly as possible, in proportion to their respective abilities; that is in proportion to the revenue which they respectively enjoy under the protection of the state." Adam Smith, Wealth of Nations, New York: The Modern Library, 1937. page 777.

[35] The Meade report is not the only examination of taxation that concludes that taxable capacity is hard to define in a way to compel wide acceptance, as is needed for the role as an agreed-on normative basis. For example, Vickrey (1947) writes: "In a strict sense, 'ability to pay' is not a quantity susceptible of measurement or even of unequivocal definition. More often than not, ability to pay and the equivalent terms "faculty" and "capacity to pay" have served as catch-phrases, identified by various writers through verbal legerdemain with their own pet concrete measure to the exclusion of other possible measures. Ability to pay thus often becomes a tautological smoke screen behind which the writer conceals his own prejudices." [footnote omitted] (page 3-4.)

good society cannot be defined, and without it democratic society cannot function. Page 31-32.

It seems useful to distinguish three elements in the "fair" taxation of individuals. One, reflecting the role of individuals as ends in themselves, and not merely means to increase social welfare, calls for fair treatment of individuals in terms of an ethical basis for fairness. Second is the extent to which a concept of fair taxation used in tax analyses can influence government behavior, encouraging both the design of tax institutions and the implementation of policies that better satisfy social objectives. And third is the citizens' perceptions of fairness, which may or may not coincide with some philosophic measure, and which matter for both the political process and individual compliance.

Let us consider these issues in the somewhat analogous, but much starker, setting of punishment for criminal activity. First, severe punishments as deterrents, particularly in the presence of limited apprehensions of those committing crimes, may go too far, violating a sense of the proper treatment of individuals. Indeed, Amendment VIII of the US Bill of Rights states: "Excessive bail shall not be required, nor excessive fines imposed, nor cruel and unusual punishments inflicted." Similarly, taxes should not be defined differently for different people in ways that would violate "equal protection of the laws."

Second, reliance on selective enforcement and severe punishments might leave too much power to the discretion of officials deciding which alleged criminal acts are pursued in court. In the tax setting, Adam Smith argued: "The tax which each individual is bound to pay ought to be certain, and not arbitrary. … Where it is otherwise, every person subject to the tax is put more or less in the power of the tax-gatherer." Page 778.

And third the perception of excessive punishment may not only violate the extent to which actions of the state should reflect the views of the citizens, but also may be self-defeating if juries are not willing to convict when they view the punishment as too severe. Similarly, taxation perceived as unfair may encourage evasion.

Tax assessments do not affect individuals as sharply as some criminal punishments, as long as tax collections are not too large relative to an individual's ability to pay. Nevertheless we have the same three elements. Consider the situation analyzed

by Atkinson and Stiglitz (1976) and Stiglitz (1982b), where social welfare maximization calls for different tax treatment of two identical individuals.[36] Total reliance on social welfare function maximization would not be directly concerned by this difference in tax treatment. However, a concern for fairness would strictly prefer a truly random, ex ante equal probability mechanism for deciding which individual gets which tax assessment (Diamond, 1967).

But there are several concerns about such an approach. Will the implementation mechanism ensure that the randomization is done properly, avoiding improper assessments? And will individual citizens accept this approach to fairness? These issues arise even if there is sufficient information to conclude that unequal treatment is the right approach, as may or may not be the case, and even if the legislature is sufficiently sophisticated to be willing to accept and vote a suitable implementation. Randomization, as was done for the US military draft during part of the Vietnam war, might be safe from manipulation. But given the complexity and empirical uncertainty of an argument for different treatment, we have doubts that the citizens would ever accept the underlying argument that it is better than simply levying the same taxes on those in the same circumstances. This is particularly an issue if the tax rate differences are to be long-lasting. Such a concern, assuming it correct (without any underlying polls or focus groups) lends itself to the idea that some aspects of horizontal equity may best be addressed by viewing them as a limitation on allowable tax tools, as has been argued by Atkinson and Stiglitz (1980). We accept the view that tax tools should be limited by such considerations and that policies should be restricted to ones which are uniform over their stated tax base.[37] One would need a great deal of faith in the political process to not want some protections against arbitrary tax assessments under the guise of "better taxation." A complication in structuring protections lies in the definition of 'arbitrary.' If one actually can increase social welfare by drawing distinctions between individuals, are the distinctions still arbitrary? A concern with actual motivations in the political process

---

[36] As Atkinson and Stiglitz, 1976, Page 355 note: "If tastes are identical, the equal treatment of equals is still not necessarily implied by welfare maximization … where the feasible set is non-convex, treating otherwise identical individuals differently may increase social welfare."

[37] Randomized auditing of returns does not seem unfair to us or, apparently, the public as long as the probabilities are suitably selected and the audits are not unduly unpleasant.

needs to lie behind restrictions on tax policies, and concepts and discussion of horizontal equity is likely to be very helpful in addressing this issue.

Horizontal equity

Three arguments coming from horizontal equity have received considerable attention in the tax literature. One is that Haig-Simons income[38] is the best measure of ability to pay and therefore horizontal equity calls for Haig-Simons income as the tax base. Another is that annual consumption is a better measure of ability to pay and therefore horizontal equity calls for consumption as the tax base.[39] And a third, drawing on Feldstein (1976a and b) is based on utility rankings with and without taxes.

But there can be tension between tax bases thought to be fair and tax bases that optimize social welfare. What if one thinks that the best measure of ability to pay is Haig-Simons income and one also accepts the empirical validity of the conditions under which the social welfare optimum involves no taxation of capital income? What if one thinks that the best measure of ability to pay is consumption expenditures and one also accepts the empirical validity of the conditions under which the social welfare optimum involves positive taxation of capital income? The weight that should be given to a chosen measure of horizontal equity in offsetting the conclusions from social welfare optimization depends on the strength of conviction that one really does have a good (usable, widely accepted) measure for horizontal equity (and sufficient strength in the belief that this consideration matters).[40]

To pursue possible formulations of horizontal equity, let us consider a basic one-period, two-good model – where consumption and earnings are the same. As indicated in the Meade Report, there is tension between the idea that ability to pay is based on actual outcomes or on budget sets (potential outcomes). If everyone really does have the same preferences over work and leisure, and the preferences have plausible properties, then

---

[38] Haig-Simons income is labor income plus accrued capital income – Haig (1921), Simons (1938).
[39] This view is generally supported by the further argument that it is better to tax people on what they take from the economy (consumption) than a measure of what they provide (income).
[40] Another concern is that the choice of tax base will influence the degree of progressivity because of political behavioral effects – it is one thing to envision a consistent optimization across interacting dimensions of tax policy and another to recognize that the political process has some sequential elements.

there is no tension between the actual and potential measures and thus earnings are perfectly correlated with the potential earnings tax base. This convergence of different competing measures of ability to pay would strengthen the case for paying attention to the issue. However, this case has no bite since with identical preferences in this two-good model, there is no conflict between this horizontal fairness concept and the standard optimal tax calculation since individuals with the same productivities pay the same taxes in equilibrium.[41]

In modeling preferences in an optimal tax problem it is common to use $u[x] - v[z/n]$, where x is consumption, z is earnings, and n represents what varies in the population. The variable n is normally interpreted as skill. With this interpretation, there is no tension between optimal taxation and a horizontal equity measure based on potential earnings. But, the optimal tax structure is exactly the same if n reflects the extent of dislike of work rather than skill. In this case everyone has the same potential earnings, as normally interpreted in terms of a budget constraint in hours-consumption space, yet those with less dislike of work are taxed more heavily. If hours of work were observable, the two cases could be distinguished. If hours are not observable, does the distinction between interpretations matter for the appeal of the calculation? Is there really a good ethical basis for treating ability to earn per hour differently from dislike of working for an hour.

Similarly, with a continuum of skills and diverse preferences at each skill level, different earnings levels are reached by different workers with the same skill but different disutilities, thereby violating a measure of horizontal equity that is based on the workers' budget sets rather than the workers earnings or consumption levels. In other words, satisfying horizontal equity defined as workers with the same budget set should pay the same taxes is impossible in a sensible setting.[42]

---

[41] If all workers at each skill level have the same preferences, differences in preferences across skill levels may or may not be a problem for horizontal equity, although the degree of progressivity of an optimal tax is likely to be affected.

[42] We focus on the earnings picture since it makes the same point as the one with different discount rates and so different savings rates, which is the more common setting for calling for taxation that does not vary with savings levels since the budget sets are the same. We see no good basis for distinguishing between these cases.

There are two directions to go from this point. One is to argue that horizontal equity should be defined in terms of actual earnings or consumption, not the budget set – which will happen automatically for a tax defined in terms of a tax base that matches the equity measure, although this is more complicated if ability to pay is some combination of labor and capital incomes. The other direction is to consider some measure of the loss to the social objective function from differences in taxes paid by workers with the same budget set. Such a calculation can be made if the distribution of types is known, without knowing who is who. Such a concern will alter the degree of progressivity of the optimal tax function. And in a more complicated setting it may alter the relative tax treatment of different components of income or spending.

However, social reactions to chosen levels of earnings vary with the cause of the difference in earnings. Viewing a worker as lazy (liking leisure) is very different from viewing a worker as having difficulty working longer, perhaps for physical reasons. And some people choose lower paying jobs because of the characteristics of the jobs, which might reflect simply standard preferences or might reflect other concerns, such as a desire to "do good works" by working in the nonprofit sector, or perhaps pursuing a religious calling. That is, the realized relationship between earnings and earnings potential does not seem a sufficient statistic for a normative judgment. Should those choosing poverty for religious reasons be taxed on their abilities to earn in the commercial world? Admittedly, the presence of characteristics of jobs that are not subject to taxation along with taxation based on actual earnings implies a distortion in the choice of jobs. Perhaps these considerations would become less important if the tax code were accompanied by subsidies of certain activities – those viewed as generating externalities or particularly socially worthy in a way not captured by a standard social welfare function. But then we are choosing a complex solution, not only in taxation but also in spending, a complexity that may be beyond the capability of the legislature. In sum, we do not find a convincing basis for accepting the budget set as an adequate proxy for desired taxation. Nor do we find realized earnings appropriate, for pretty much the same reason viewed in reverse – sometimes the budget set is a better measure. We conclude that we can not see a good argument for adjusting taxes away from an optimal tax calculation based on concerns drawn from budget sets – which recognizes productivity but not preferences. Nor do we

see a strong case for deviating from an optimal tax calculation based on realized income or consumption. As the Meade Report put it: "But on examination 'taxable capacity' always turns out to be very difficult to define and to be a matter on which opinions will differ rather widely."

<center>Horizontal equity based on hypothetical alternatives[43]</center>

The discussion of ability to pay was based on a cross-section pattern of budget sets or actual outcomes in an existing equilibrium. Another approach is based on comparing outcomes in an existing equilibrium with outcomes in a hypothetical alternative. The latter may consider changed behavior by individuals one-at-a-time or by everyone at once, thereby incorporating general equilibrium responses. [44] A general equilibrium approach seems particularly relevant for transition issues, which are discussed below. A set of altered outcomes one individual at a time considers what a single individual would do if that individual were exempted from taxation, with prices in equilibrium unchanged. Thus, horizontal equity is approached in terms of the vector of utility calculations in the hypothetical alternative and the vector of utility calculations in equilibrium.

A sizable literature has explored horizontal equity based on such a comparison with particular attention to the rankings of utilities in equilibrium and in the hypothetical alternative. The focus on rankings derives from Feldstein (1976a, 1976b), who used them in considering tax reform (including a move from having no tax to having a tax), not in judging whether an ongoing tax was horizontally equitable. [45]

---

[43] This section draws particularly on Atkinson, 1980 and Kaplow, 1989.

[44] This distinction is not as clear as appears. For example, when considering tax exempt bonds, one can recognize that the bonds would pay higher interest if taxable, relying on an arbitrage interpretation of current equilibrium prices without considering interest rate changes that would occur in an equilibrium response to removal of tax exemption (as, for example, in Diamond, 1965).

[45] "The principle of horizontal equity in tax reform thus requires that any tax change should preserve the utility order, and should imply that if two individuals would have the same utility level if the tax remained unchanged, they should have the same utility level if the tax is altered." (Feldstein, 1976b P 124.) Feldstein recognizes that satisfying this definition of horizontal equity is not possible and thus calls for a balance between the degree of horizontal inequity and social welfare maximization.

As an example of the literature, Rosen (1978) considers the pattern of utilities if each person were allowed to maximize utility at equilibrium prices but without taxes. This resembles the measurement of sacrifice in sacrifice-based theories of optimal taxation (again, see Musgrave, 1959). Rosen then looks for utility reversals between this vector of utilities and the vector in the actual equilibrium. We see no reason to give normative consequence to this particular hypothetical alternative, nor have we seen one offered. [46] And we see no reason to be particularly concerned with utility reversals in this comparison or more generally. That is, the hypothetical alternatives depend on the behavior of both the government (through expenditures) and other individuals (in determining prices). Thus it is not clear why an individual has a particular claim to protection measured from such a position, since the position depends on everyone's behavior – it is not generally something achievable on one's own in a world without government expenditures and trade with others. Indeed the taxes themselves play a role in the determination of relative prices. Moreover, there are likely to be other hypothetical alternatives that appear as normatively plausible as this one, for example the world with no taxes and no government spending - no police, no regulation of markets, etc. This would take us back to the benefit approach to taxation, which has suffered from an inability to make useful distributional inferences. And why those best capable of looking after themselves in some such hypothetical setting should be tax protected is not apparent.

As to giving great importance to rankings – we agree with Kaplow's (1989) criticism of such measures: "Minute movements leading to order reversals count as full violations of [horizontal equity] while substantial disturbances in the initial distribution that result in no order reversals are ignored." [Footnote omitted] (Page 141.) More generally, there is no obvious reason why rankings matter at all normatively.

The end of this rambling discussion is that we reject the Meade Report view that taxes "should" relate monotonically to taxable capacity. In addition to finding taxable capacity not well-enough measurable and not sufficiently uniformly evaluated to be

---

[46] In referring to Feldstein and the literature pursuing measures of inequity following his approach, Kaplow writes: "HE [horizontal equity] is now frequently measured and applied even though there has been virtually no exploration of why one should care about the principle in the contexts and in the manner in which it is now being used." Page 139.

usable for this purpose, we also do not see an underlying normative basis for reaching the conclusion that taxes should be related to taxable capacity without full consideration of the equilibrium consequences of following such an approach. Our conclusion is similar to that reached by some economists earlier – that equal marginal sacrifice (minimized sacrifice – equivalent to optimized social welfare) was the appropriate criterion, not equal absolute or equal proportional sacrifices.[47]

Complexity and Observability

From the perspective of optimal contract theory, any costlessly observable variable correlated with unobserved characteristics or behavior should influence payoffs, even if it is poorly measured and the correlation is limited. In tax terms, labor income taxes should depend on all variables correlated with the ability to earn, even those measured poorly. While tax systems have stupefying complexity, it is not from incorporating many such variables. Income taxes depend on various measures of incomes from different sources, adjusted for some expenditure categories. To explore the extent to which further complications should enter, we consider three examples.

Income taxes are based on earnings without an attempt to measure hours worked and so average earnings per hour. Minimum wage rules and requirements for paying higher wages for overtime both require some measurement of hours worked. In this case the employer and the employee have conflicting interests in the measurement of hours. This makes enforcement easier than would enforcement of a tax that depended on hours worked, where neither the employer nor the employee have an interest in seeing higher income taxes. Nevertheless, an attempt to incorporate a measure of hours worked in the tax base would plausibly bear considerable correlation with actual hours. For many workers in large firms or government employment, existing financial records would form a good basis for estimating hours worked with reasonable accuracy. Moreover a requirement for self-declaration of hours, subject to some form of random monitoring,

---

[47] "Edgeworth, and later Pigou, held that there was no logical or intuitive choice between the equity principles of equal absolute and equal proportional sacrifice. Arguing on welfare grounds, they considered equal marginal sacrifice the only proper rule, not as a matter of equity, but because it met the welfare objective of least aggregate sacrifice." Musgrave 1959, page 98.

would fit the theoretical category of a correlated, poorly measured, but nevertheless useful basis for further tax distinctions. And it is not as if earnings were measured perfectly either.

Thus if it did not recognize factors other than observability, optimal tax theory would call for basing taxes in part on estimated earnings per hour. We do not think that using an hours measure in determining taxes would be a good idea, and it is useful to consider why not. Basing taxation on inaccurately measured variables leaves more scope for administrative discretion and encourages cynicism about the fairness of the tax system. As discussed above, both features are likely to add to the difficulty of voluntary accuracy in reporting and support for the politics of better taxation. The theory of how to use poorly measured variables would not be intuitive to either legislators or the public, again making good tax politics more difficult. In sum, basing taxes in part on hours worked does not seem to be a good idea, although that intuition is not supported by formal analysis as far as we know. In the exploration of lessons from the literature, we do not explore the (small) literature on the use of hours in determining taxes.

As another example, this one where accuracy of measurement is not at issue, consider the finding of Case and Paxson (2006) that there is a correlation between height and earnings abilities. With different tax structures for adults of different heights (possibly distinguished by gender) one can then have higher social welfare than without such multiple tax structures. While it would be complicated for tax authorities to have multiple tax structures, there is not much complication for the taxpayer who does not get to choose among tax structures.[48] Unlike the example of different tax structures for different ages discussed below, a set of tax functions based on height is a setting of consistently different structures for different (fully-grown) individuals rather than individuals passing through the different tax structures over time.[49]

Consider a sequence that starts with extensive research documenting that such differences are real and robust to alternative measurement approaches, explains to the

---

[48] Allowing ex ante choice among tax structures is a source of potential welfare gains we do not explore – it seems that this added complexity would challenge the ability of many to figure out which tax structure to pick and could be viewed as inequitable as some workers successfully lowered taxes significantly by a good choice while others regretted poor choices.
[49] This ignores the shrinkage that occurs with aging.

public and convinces them that this is the case, and then explains to the public why this is a useful basis for differences in taxation. Then picture a legislature considering a half dozen or so different tax structures on this basis. (Think just about earnings, but it might also be the case that different heights are also correlated with different abilities to invest and so different possible rates of return and different intertemporal discount factors and so different tendencies to save.) Presumably the incentive for parents to stunt the growth of their children would be minimal if they also recognized that the factors that affect height affect earnings abilities. Should one be troubled by this scenario? Does it violate some sense of horizontal equity? If height were irrelevant, it would. But once height is linked to earnings ability, then people of different heights are not identical (as far as the government's ability to infer ability is concerned). This is similar to the view that people with different tastes for work are not identical, even if they have the same budget sets. Whether the gain in social welfare were small or large would depend on the magnitude of the correlation and the extent to which different tax structures had an impact on optimized social welfare.

An appropriate question to ask is how complicated a tax structure a legislature can use well. Historically legislatures have relied more on their own decision-making in the realm of taxation (and other topics in economics) than in other areas – legislatures vote money for bridges, they don't vote blueprints. Perhaps some addressing of complexity could be allocated to some expert group.[50] And perhaps the public would accept both the underlying idea and the use of experts. Otherwise, this seems a path unlikely to reach a good legislated end. Moreover, the public sense of equity may well be violated since there is only a stochastic relation between height and earnings abilities. We conclude that this does not seem something worth exploring at present, but the case against it is a weighting of subjective factors over the factors that can be readily captured in existing models..

A common assumption in formal models is that taxation is based on costlessly, perfectly observed variables while all other variables are not observable at any cost. But this description of observability is not accurate on either side – earnings is costly to

---

[50] As Breyer (1993) has proposed for dealing with health risks.

measure and is not perfectly observed and there are other observable variables that could increase social welfare if used optimally. Thus assertions about observability are not an adequate guide to the choice of a tax base for direct taxation. Complexity matters as well, as does a plausible sense of both political economy and public reactions. We simply refer to variables as taxable and non-taxable, reflecting an ex ante judgment call reflecting these multiple dimensions of relevance for choosing a tax base, rather than observable and non-observable.

In contrast to height, age is used by actual tax structures, but very little apart from retirement-related rules. In the US there are distinctions for children (who can be dependents and so provide additional deductions) and those over 65, who may receive an additional deduction. This is not much variation in taxes across ages, nor does it represent using knowledge of age-varying earnings abilities to explore alternative structures of marginal tax rates.[51] In contrast age does play a large role in the rules for both public pension systems and tax-favored retirement savings opportunities. Indeed, in the context of a one-period model of income taxation, and with a focus particularly on younger workers, Kremer (2001) called for such distinctions on the grounds that the distributions of income levels are so different across ages that the implied pattern of optimal tax rates would vary greatly by age. Let us consider a political process if such an approach is taken. The first step might be to allocate each age to one of a small set of ages, in order to limit the number of tax schedules.[52] Perhaps the set might be under-30, 30-50, 50-65, and over 65. For simplicity, there might be a given set of marginal tax rates with only the break points varying as a function of age. This doesn't sound too hard for a legislature to do.[53] And plausibly it could be worked out without undue pressure by

---

[51] A similar argument could be perhaps be made even more strongly with regard to gender, given gender-differences in life-expectancies and the shapes of life-cycle earnings profiles. As with age, gender is not used extensively in tax systems although, again, it does play a large role in public pension system rules in some countries, such as the UK (at present).

[52] If there are joint returns for couples based on a couples total incomes, labor income might be taxed on the basis of the age of the earner while capital income might be taxed as if each received half. Or all taxable income could be treated as if half were taxed on the basis of the age schedule of each of the couple.

[53] This assertion may be undercut by the common practice of adjusting public benefit formulae for the age at which they start with a linear formula, when multiplicative or more complex formulae seem to make more sense. Supporting the thought of delegation is the automatic adjustment in Sweden, done on a roughly actuarial basis, although one with rules for the actuaries set by legislation.

the politically better-connected ages. As discussed above, formal models do show advantages to age-varying earnings taxes.

A different approach looks at current earnings in the context of previous earnings (and possibly age). This could be done in a variety of ways, including a moving average over a fixed number of years or basing lifetime taxes on lifetime earnings, with annual taxes viewed as withholding toward the eventual determination of lifetime taxes.[54] Above, we noted how this might serve social welfare maximization. Now we consider the ability to implement. This certainly is doable, with the government providing historic information along with tax forms. Indeed, we can consider this as parallel to rules that determine public pensions. In defined benefit systems pensions are based on the history of earnings, possibly a full history (as in Sweden) or a long history (as in the US). Pension systems also commonly make retirement benefits dependent on the age at which they start (or started). Moreover, that relationship, while commonly involving a single parameter (annual percentage increase from a delay), involves age-varying parameters in the US (although not well-chosen). In a wage-indexed system for initial benefits (that are then price-indexed) as in the US, the benefit formula relating benefits to earnings varies with date of birth through automatic indexing. Indeed legislated future changes in the US age for "full benefits" vary with date of birth. In the UK any move to change the state pension age, by direct legislation or automatic adjustment would result in different structures for workers in different birth cohorts, although it can also be viewed as different age-varying rules year-by-year. And Sweden applies different determinants of both initial benefits (given earnings history) and the growth of benefits from a delayed start to each birth cohort, by use of automatic adjustments partially following actuarial principles.

Thus a key question is whether variation in annual tax rates as a function of age is a bad idea because of complexity or a case of theory being ahead of policy, with feasibility present, but reform called for. We are inclined to take the former views for countries thought to have a good legislative process.

---

[54] These would be similar to the approach in Vickrey (1947), who cumulated annual income, not annual earnings and who considered various lengths of time for the cumulation.

One approach to optimal tax theory has been to take as given a set of allowable tax tools, chosen to reflect actual (or plausibly potential) use and chosen to enable the inferences from a model to seem more useful for policy discussions. From this perspective one can ask about the payoff from additional or altered tax tools, with a need to recognize in some way the cost of greater complexity. Some analysts have considered it significant to replace this approach of designated tax tools by assuming that the choice of tax tools is an endogenous part of the optimization, but subject to observability constraints. If these constraints were a good approximation of actual constraints, there might be significant advances from such an alternative assumption (as there have been significant advances from allowing endogeneity in the structure of the tax given its base, as opposed to a given function of a limited number of parameters). For example, the common assumption that earnings are observable but hours worked are not is not a good approximation of reality. Since there has been little learned directly by substituting the label unobserved for the label unused in tax calculations, this purported distinction has not been important and we have continued in the older tradition.

Time Frame and Commitment

In the Arrow-Debreu complete market model, complete (contingent) plans for the rest of time are made before any economic activity takes place. Moreover, government is commonly fit into the model by having a complete (contingent) set of government policies to which the government is committed. There is a considerable literature on the implications of an inability of government to commit, but primarily in the context of a unitary (often infinite horizon) government. There is a small literature recognizing tax changes arising from political changes. In a complete market and complete government policies setting of time-consistent individual execution of lifetime contingent plans, it seems appropriate to evaluate social welfare in terms of lifetime utilities since the entire economic outcome lies in the future. Presumably the relevant measure of lifetime well-being would reflect the uncertainties about both earnings and capital returns, which would matter even with complete markets since there are social risks as well as fully poolable individual risks.

However, there are multiple limitations in the complete markets Arrow-Debreu model that are important for tax theory. Among these are the presence of overlapping generations, the incompleteness of markets, and the incompleteness and time inconsistency of some individual plans and actions. Also present are the incompleteness of government (contingent) policies, and the stochastic pattern of changes of government, and, for both reasons, the lack of commitment to policies. The literature contains many papers analyzing single period models and lifetime models. Single period models do not do an adequate job of distinguishing the roles of capital and labor incomes. The models we examine are primarily lifetime utility models. Lifetime models can provide useful insights, but must not be taken too seriously, and particularly not literally. The specification of social welfare for tax optimization is complex when individuals are modeled behaviorally, particularly when the model does not have individuals being time-consistent. And it is complex when the taxes are likely to be altered by future governments. Thus it seems appropriate to supplement lifetime considerations assuming preservation of the tax structure with annual (or several-year) considerations that thereby recognize a greater likelihood of the tax being in force in the near term.

Returning to our discussion of the Chamley-Judd model, the early papers had two findings. The first is to have no taxation of capital income, either after a finite date or asymptotically (that is taxation can be positive indefinitely, but with a steadily shrinking tax rate) as discussed above. The second is to tax initial wealth as heavily as possible, at least in the representative agent version. The second finding has had little direct purchase on the policy recommendations drawing on the literature, although the same perspective, clearly stated, lies behind arguments in OLG models for switching from income taxation to consumption taxation as a way particularly to transfer wealth from older cohorts at the time of tax implementation.[55]

It is appropriate that these two findings have had different standings. Taxing initial wealth as much as the available tax tools allow (whether as a wealth tax or a capital income tax) strains the relevance of the assumption that the government can

---

[55] This basis for a change in taxation is very sensitive to implementation. It works for taxing consumption directly and for taxing consumption as income less savings provided initial wealth is measured, but may not work for taxing consumption as income less savings if initial wealth is not measured.

commit to a tax policy (and that this taxation of wealth will end). Confiscatory wealth taxation would adversely affect savings behavior and have serious efficiency costs (even if the government saves the revenue) because of concern that such taxation will return. A switch from income to consumption taxation (with limited grandfathering of existing wealth) could be interpreted as a move against wealth which has limited implications for future taxation since the set of politically plausible tax policies has not changed very much – increases in the taxation of consumption are limited by the fact that they fall on everyone.

These ex cathedra assertions raise the critical question of how to model the link between tax legislation and expectations about future taxes. The Chamley-Judd finding of asymptotically vanishing taxation of capital income with full commitment has been extended to a setting without commitment (Dominguez, 2006, Reis, 2006).[56] These models have a single infinitely lived government maximizing social welfare and infinitely lived private agents. Government tax policies are chosen in light of the threat by households to switch to some other equilibrium of the economy and the equilibrium achieved is assumed to be the best one, which is achieved by the threat point being the worst one that is sustainable. It is not clear how much to draw policy conclusions from this game-theoretic modeling. This modeling does not capture the threat of switching to a different elected government. And it relies on modeling expectations-related behavior of individual agents that is unlikely to hold generally across different policies. The literature is interesting since it makes clear the issue of expectations in economic incentives. It needs to be supplemented with models that recognize the diverse, and often behavioral, expectation formation that is not part of standard game-theoretic equilibrium. Thus, even when rejecting the Chamley-Judd zero tax of capital result, it is worth recognizing the insights from the Chamley-Judd framework although recognizing that drawing further lessons is difficult.

An alternative way to view 'commitment' is in the realm of precedents, paralleling their role in legal decisions. Assume the government announces a one-time capital levy. That is a precedent for doing the same again, and so lacks credibility that it

---

[56] These papers assume a single infinite horizon budget constraint. Zero asymptotic taxation of capital is not optimal when the government faces period-by-period budget constraints.

really is one time. Perhaps there are special circumstances, a war or meteorite strike not likely to recur. Then the precedential cost may be much lower, although there remains the effect of possibly increasing the perception of a widening of the precedent. Just as individuals set rules for themselves, with bright-line rules easier to adhere to,[57] so too the government process recognizes that crossing a bright-line rule runs the risk of major backlash – whether it is losing elections, with possible reversal of the policy, or street demonstrations, or political backlashes in other realms. Thus one might prefer a small annual wealth tax rather than a large one-time tax, on the grounds that expectations of continuing and possibly slow growth of the annual tax has less of a deterrent effect on savings through perceptions of future policies. Switching from an income tax to a consumption tax has the effect of taxing existing wealth, with possible increases in the tax rate as the risk discouraging savings. Again, we would expect less of an impact. This way of approaching the issue of commitment, or its lack, differs from a game-theoretic approach in not relying on backwards induction (which is missing in the analyses of some people) and in recognizing the limited awareness of politics of some and the multiple motivations affecting voting, which combine to affect the nature of a political-economic equilibrium that determines taxes.

With governments that can change and individuals with diverse and limited attention to the future, policy inferences need to be drawn carefully from models of single governments and lifetime optimizations. The Meade report call for "a certain stability in taxation in order that persons may be in a position to make reasonably far-sighted plans" (Page 21.) also suggests seeking tax instruments that are relatively simple and transparent to aid the formation of appropriate tax expectations by individuals. With sensible voters and an informative political process, tax instruments should reduce the possibilities for future governments to use obfuscation as a guise to introduce potentially unpopular reforms.

Transition

---

[57] It appears easier to comply with a no cookies or no cigarettes rule than trying to allow oneself only a few.

Transition issues arise in two ways in a discussion of the right tax base. One is that analysis of the right tax base needs to recognize that there will be future tax changes, and those changes will involve transition issues. This is discussed here. Second are the one-time transition issues if the contents of this essay (or some other) were to be accepted as the basis for future taxation. This issue is not discussed here – not because it is unimportant but from limitations of time and space. One difference between the two is that when considering future changes, but not when considering the initial adoption of a new policy framework, the expectations are endogenous to the policy framework being created. Both circumstances call for giving some degree of respect to legitimate expectations. For discussion of the issue of an initial change, see Auerbach (2006) who presents many issues and highlights the importance of transition by contrasting simulations that have the same long-run tax incentive properties but very different transition impacts. Whether ending the taxation of capital income raises or lowers social welfare varies with the transition impact in some simulations.

In the ongoing process of the adaptation of tax policies to economic and demographic developments as well as to changing normative perceptions and political balance, a set of rules/guidelines for transition issues is important both economically and politically. From this perspective we can appreciate the Meade Report's concern for flexibility and stability: "A good tax structure must be flexible for two rather distinct purposes. … there must be recognition of the need to be able to adjust total tax burdens reasonably rapidly and frequently in the interests of demand management. … In a healthy democratic society there must be broad political consensus – or at least willingness to compromise – over certain basic matters; but there must at the same time be the possibility of changes of emphasis in economic policy as one government succeeds another. … But at the same time there is a clear need for a certain stability in taxation in order that persons may be in a position to make reasonably far-sighted plans. Fundamental uncertainty breeds lack of confidence and is a serious impediment to production and prosperity." (Page 21.)

Beyond any possibility of short-run demand management, there are changes in long-run fiscal needs that are likely to occur from trend developments in economics and demography as well as the spreading over the future of short run changes

in fiscal needs (e. g., a war). A research program that would address the need for both adjustment and stability would seek a tax structure that would have enough political acceptability to relegate tax changes primarily to parameter changes in a class of parameters anticipated to adjust to circumstances.[58] The design should recognize that tax expectations are endogenous to the policy framework being created. Such modeling would examine a standard optimization of social welfare in the context of incomplete markets and policies, striking a balance between the different effects of changing policies.[59] Such modeling would also need to examine how the structure of taxation influences the political process, noting variations in later government policies to different structures. Indeed, links between the form of public pension design and anticipated future legislation has been part of the US debate between defined benefit and defined contribution systems.

In modeling changing governments, it is not clear how to set up a suitable social welfare function, particularly once one recognizes the endogeneity of the election process. Beyond standard social welfare analysis in terms of lifetime expected utilities, there may be a further normative concern of limiting the deviations from appropriately held expectations about policies.[60] The latter requires an equilibrium analysis since the expectations that are held and expectations that are appropriate to respect to some degree both depend on the policy process. If it is anticipated that tax rates will adjust within some guidelines, then some subjective probabilities of such adjustments would be a necessary part of expectations to be respected. The presence or absence of an ongoing political discussion would affect the appropriate degree of respect for actions based on expectations. And one would need an evaluation of the political process that might have very different normative treatment between "loopholes" that come from less satisfactory aspects of politics and "appropriate" political outcomes. That is, the degree of respect to

---

[58] Currently discretionary fiscal policy, while pursued by governments, is not in high favor among academic economists (Auerbach, 2002). But built-in stabilizers, while not getting much active attention, remain in positive evaluation (Auerbach and Feenberg, 2000). It is odd that there was not discussion of built-in stabilizers in the Meade Report.

[59] Such analysis might parallel for an economy the analysis for individuals in Amador, Werning and Angeletos, 2005.

[60] This might parallel the same issue in the legal analyses of contracts, where courts attempt to interpret contracts in the light of the expectations of the contract parties. The endogeneity of legitimate expectations to court processes that try to decide in terms of the expectations of the parties has not always received adequate attention.

past taxes and the expectation of their continuation need to recognize a widely held view that the tax structure is not satisfactory and ought to be reformed (a view that underlies the commissioning of this report).

An individual who made commitments (in education or investment, for example) based on a legitimate expectation of a continuation of existing taxes and is greatly harmed by a change in tax structure would have a complaint that seems to us to be legitimate, calling for some response. Hence the importance of a policy process that incorporates awareness of some future changes. The complaint based on the commitment is likely to have more salience and may have more legitimacy if the tax change matters for some people and not for others. Indeed, an explicit commitment by an individual is likely to increase the salience of the tax change and so pressure for a response. Analysis of restrictions on the political process is likely to find a role for both delayed implementation (although the announcement of delayed implementation can have inefficient effects) and grandfathering as part of protecting expectations and preserving incentives. Use of these tools were raised in Feldstein (1976b) as part of adjusting for the implications of the commitments that some people will have made based on the earlier tax structure (or more precisely on the expectation of continuation of the earlier tax structure).

Part III. Concluding remarks

The long-standing debate on the best base for nonlinear (progressive) annual individual taxation has been between total income and total consumption expenditures (with recognition of special treatment for some incomes and/or some expenditures). A focus on taxation in a single year highlights the advantage of total income. A focus on longer periods, up to lifetimes, highlights the advantages of consumption. A focus beyond lifetimes that incorporates bequests raises further issues about individuals born at different times. Exclusive focus on any one of these three time frames seems incomplete in a world with liquidity constraints, time-inconsistent individuals, accidental bequests, incomplete government policies, and changes in

government. These realities, along with the complexity and uncertainty in the evolution of individual earnings, returns to capital, and individual consumption preferences make it hard to think about policy design and inappropriate to rely too heavily on any single model's implications.

These realities also lead us to the conclusion that the long-standing debate is misdirected. A more informative debate may be about the relative taxation of different sources of income and, relatedly, the implications for progressive taxation of different uses of income, with the focus here on savings, but plausibly also on medical expenses, education expenses, housing expenses, taxation by other governments. We have proceeded as in the quote from Alfred Marshall at the start of this essay, "it [is] necessary for man with his limited powers to go step by step; breaking up a complex question, studying one bit at a time, and at last combining his partial solutions into a more or less complete solution of the whole riddle." (Marshall, 1948, page 366.) Thus we have seen the implications of a wide variety of individual analyses and asked about policy inferences that seemed appropriate to draw. We do not think we have "a more or less complete solution of the whole riddle." But policy formation, and so policy recommendations, can not wait for a complete solution.

While there are policy recommendations that seem sensible to make without knowing much about an individual country's political and economic circumstances, these tend to be of the negative sort – recognizing policies that are likely to work badly in a wide swath of circumstances. For positive recommendations one needs a more detailed context. And while this essay, like the Meade Report, is supposed to focus on the UK, we frame our conclusions in a set of if-then propositions in terms of policy debates that might occur at some time, while implicitly accepting the underlying economics and administrative capabilities of an advanced country like the UK.

This is limiting since the constraints from the political debate can narrow the choices, sometimes in ways that make recommendations easier to derive and justify. It does seem good for democratic policy discussion to include analyses of better policies given perceived political constraints and analyses of even better policies if less binding political constraints are assumed. Focusing on a better way to collect revenue rather than

the advantages of more or less revenue may fit a particular political context well. Economists viewing actual tax structures often favor base widening and rate reduction in a revenue (and sometimes distributionally) neutral way if that is the prime available route to more efficient taxation. Indeed, Peter Birch Sørensen (2001) has argued that basis as part of the appeal of the Nordic dual income tax – wider and more uniform taxation of different sources of capital income in return for lower tax rates. We have no quarrel with this approach in such a circumstance, although one still needs to consider the particulars of what should be treated uniformly and what is the best available approximation to uniform treatment. A tradeoff of lower taxes for a wider base does not appear to require linearity of taxation. But our focus has been on the relationship between taxation of capital income and of labor income, not on the details of the taxation of either.

Any real policy recommendation must address issues of transition. These may include particular concerns about individual equity and may include recognition of the effects of taxing existing capital. The former is lost when equity analyses look only at lifetimes of cohorts living under a new system. And the latter is lost with consideration of steady-state properties that are derived as the best steady state rather than the steady state that arises from a full optimization. If one shifts relative taxation from capital income to labor income or from income taxation to consumption taxation, there will be important differences in the impacts (on average) on people of different ages at the time of implementation and different levels of accumulated wealth within an age cohort. Whether and how these are addressed as part of a reform can matter greatly. Without special rules, a shift of taxation from capital income to labor income benefits older cohorts at the expense of younger ones. And a shift from income taxation to consumption taxation costs older cohorts to the benefit of younger ones. Moreover, the pattern of impacts within a cohort depends on how the transition is done. If a tax deduction for savings is introduced, the pattern of impacts depends on whether the deduction is really measuring savings, or is allowing the transfer of existing wealth among assets to be treated as savings. Depending on the goals and the remaining features that an inability to measure and use existing wealth as part of tax calculations may or may not be important. Combining transition issues along with evaluation of ongoing implications of tax structures would be too large a question for this essay. So we discuss

the lessons from the optimal tax literature for the ongoing effects of taxation, recognizing that this is only part of the story.

Similarly, implicit in our focus on the tax base, separate from tax rates, is an assumption that tax rates are being optimized for given tax bases, thereby ignoring the political linkage that may well be present between tax base and tax rates. It is incomplete to say that suitable choice of tax rates can make different bases of comparable overall progressivity if that suitable choice will not happen. Recognition of the link between the form of tax institutions and the perceptions and salience that then influence policy making is important. This is part of the debate that has occurred between defined benefit and defined contribution national pension systems and would be appropriately part of a fuller debate on tax base than we will engage in. Similarly, political links (or 'hypothecation') between tax bases and government expenditure policies matter. This is clearest with dedicated taxes for particular programs but they plausibly matter for general taxation as well. Again, this is missing from our discussion.

As noted at the start, the Meade Commission Report recommends a three-part structure made up "of a new Beveridge scheme, … of a progressive expenditure tax regime, … and of a system of progressive taxation on wealth with some discrimination against inherited wealth." We have not considered issues particularly important in a focus on those with very low or no earnings and limited wealth. Also, we have not explored models that might shed light on the relative advantages of annual taxation of wealth relative to taxation of capital income, as the models we have examined have mostly been restricted to a single safe asset, available on the same terms to all, leaving the two sources of taxation the same – neither uncertainty nor realization of income nor measurement of the value of illiquid assets has been considered.

The Meade Report discussed measuring the ability to pay taxes as part of tax design. It concluded that: "on examination 'taxable capacity' always turns out to be very difficult to define and to be a matter on which opinions will differ rather widely." (Page 14.) A moderate number of papers since the report have explored horizontal equity for tax purposes. We see no reason to reach a different conclusion from that in the Report –

indeed, we have gone further in dismissing such a measure from a central place in tax design.

In considering the Meade Report recommendations in light of thirty years of additional research, experience, and economic development, we explore two questions that shed some light on the Meade Report recommendations –

- If there is an annual earnings tax, how should capital income be taxed?

- If there is an annual earnings tax, should there be a deduction for net savings, resulting in a tax on consumption?

In addition, we explore an issue not addressed in the Meade Report, the potential advantages, despite increased complexity, in age-varying tax rates. Each of these three issues has both a design dimension and a transition dimension, but we consider only the former.

Taxation of capital income with an annual earnings tax

Support by economists and tax lawyers for exempting capital income from direct taxation has been influenced by the well-known Atkinson-Stiglitz and Chamley-Judd analyses.[61] However, we conclude that the policy relevance of the sharp finding of the optimality of no taxation of capital income is thoroughly undercut by the implications of large uncertainty about future earnings and the growing disparity in earnings as a cohort ages. Adding such uncertainty and disparity to the frameworks employed by Atkinson-Stiglitz or Chamley-Judd results in a finding that taxation of capital income or of wealth is indeed part of optimal taxation.

In addition, in light of the widely varying individual savings rates in the economy, there is a natural presumption that during working years there is a positive correlation between the tendency to save and earnings potential (although the empirical underpinning is not so clear). This is another reason for taxing capital income as a means of more efficiently taxing those with higher earnings potentials. A further case comes from the

---

[61] Whether this is seen as supporting taxation of expenditures or alternatively of earnings depends on intertemporal equivalence or lack thereof of revenue and the modeling of returns to capital.

difficulties in distinguishing between labor and capital incomes, which gives an advantage to reducing the difference in taxes between them. The empirical evidence that capital raises skilled labor earnings more than unskilled labor earnings argues for taxation of capital income in the usual model with infinite horizon savers, but not in the OLG model, where the government can increase capital to accomplish this effect. While we have not explored the literature incorporating human capital investment into tax considerations, a progressive earnings tax (particularly one that is not age-varying) and the presumption that human capital investment steepens the age-earnings trajectory can call for some taxation of capital income to get closer to even treatment of these two forms of investment. While we do not know of any modeling.

Taxation of capital income needs to consider two issues. Should capital income be taxed more or less heavily than labor income? With a thought process that starts with the conditions for zero taxation and then adds some taxation for elements not in the models that imply zero taxation, there is the danger of "anchoring" towards zero resulting in a conclusion that capital income taxation should be lighter, without a good basis for reaching that conclusion. In contrast, if one started with the recognition that with a tax system based on comprehensive nominal income, marginal taxes on (nondeferred) real capital income are larger than those on real labor income, one might be asking how much of this heavier taxation should remain. Again, there does not seem a good basis for the conclusion that the optimum lies with equal or heavier taxation. There is probably no substitute for extensive calculation using calibrated models, with models that incorporate the elements thought to be most important in determining relative taxation. Some existing calculations show heavier taxation while others show lighter taxation. We did not attempt to evaluate the relevance of different calculations, but point to the need for lots more.

A second issue is the appropriate relationship between marginal taxation of capital income and marginal taxation of labor income. The Nordic dual tax has linear taxation of capital income and so a greater disparity between marginal rates for those with higher labor incomes.[62] Apart from the point that trying to discourage conversion of

---

[62] On the Nordic dual tax, see Sørensen, 2005.

labor income into capital income seems to call for marginal tax rates on the two types of income that relate positively to each other, it is not clear without extensive calibrated calculations what the relationship should be. In the US, recent lower tax rates on dividends do relate that tax rate to the rate on labor income.[63] The old system that had inclusion of one-half of capital gains in taxable income (for those with lower tax brackets) also had a clear relationship. To explore the normative properties of such an approach, one would again need extensive calculations. We think such calculations are called for and do not see a way to draw a firm conclusion from the evidence we have examined.

A deduction for savings with an annual earnings tax

One way to have a consumption tax base is to deduct from earnings the net increase in savings – purchases of capital assets less the sum of capital income and realized capital gains. In countries such as the United Kingdom that already have EET tax-favored retirement savings accounts, this corresponds to removing limits on deposits in such accounts along with removing limits on withdrawals. Thus, compared with an accrual-based income tax (or an approximation from taxing realized capital gains to adjust for deferral) a consumption tax gives the advantage of deferral on all savings for future consumption. As Judd (1999) has pointed out this approach does not get incentives right for human capital.

This framing of the issue is different from that in Gentry and Hubbard, 1997. They consider consumption taxation implemented by a wage tax combined with a business cash flow tax. Although they purportedly are addressing distributional implications, their focus is on evaluating the difference in taxation from the perspective of a firm's investment decisions, as opposed to a household's life-cycle labour supply savings choices, and as a consequence they focus on the marginal value of immediate depreciation of investment to a firm, which they value using the safe rate of interest, supporting the view that consumption taxation exempts the safe rate of interest but not

---

[63] The tax rate is 5% for those whose top tax bracket is 10% or 15% and 15% for those with higher top tax brackets.

the return to bearing risk or pure rents. Modeling individual choice as a base for examining the impact on the distribution of utilities of giving the deferral advantage is more complicated. While stocks and bonds have the same marginal value with portfolio optimization, the impact of deferral on the inframarginal gains from the availability of stocks is relevant for distributional analysis. As a quick example of this issue for given wealth and Cobb-Douglas the higher the distribution of risky returns the greater the gain from deferral for a given portfolio mix. Since the optimized portfolios may well be different, a full analysis is more complicated. But this seems the appropriate way to approach the distributional impact.

It is worth noting that there are significant differences between exempting capital income from taxation and a consumption tax base. In a model with a single safe rate of interest, the two are the same apart from differences needed in transition rules to match them. However, both different rates of return for different investors and uncertain rates of return make the two approaches quite different.

Age-varying taxes

Public pension systems have age-varying rules for eligibility for claiming benefits, for determination of the size of benefits, and for the taxation of earnings. They also have rules that have a strong reliance on individual histories over a long period in the determination of benefits.[64] Income taxes make little use of such structures (apart from what is inherent in measuring capital gains). An implicit exception, similar to pension calculations, comes with tax-favored retirement savings. This incorporates explicit tax rules based on age when withdrawing funds as well as different implicit degrees of tax-favoring depending on the age at which funds are put into an account.

The mechanism design approach to optimal taxes uses both age-varying rules and full history dependence. Traditional optimal tax analyses have contrasted optimal rules for linear taxation of capital income with and without age-varying earnings taxes. In considering whether it is worth the administrative complexity and the added political

---

[64] Funded defined contribution and notional defined contribution systems do this in terms of the summary statistic of balance in an account.

process to extend tax structures to include such features, their presence in existing national pension rules suggests feasibility. And analyses of optimal pension systems suggests value. It is important to recognize the difference between arguments coming from differences in the distribution of circumstances across different ages and those coming from individual forward-looking calculations when making decisions. The former may have more robustness in policy implications than the latter across the very real diversity in individual decision-making.

Because age-varying taxes can address both of these issues, we think it is useful for governments to contemplate introducing them in some form and for analysts to explore them in more detail than has happened so far in the literature that has tax structures similar to actual ones. For discussion purposes, we consider a tax structure that distinguishes between labor and capital incomes with related marginal tax rates and revisit an example of such an approach. The first step might be to allocate each individual to one of a small set of age groupings to limit the number of tax schedules.[65] Perhaps the set might be under-30, 30-50, 50-65, and over 65. There might be a given set of marginal tax rates for all ages with different break points between the marginal rates for each group. Analysis of the break points would reflect the distribution of earnings possibilities by age and the intertemporal incentives inherent in facing different break points over time. The latter might reflect uncertainties about future earnings, human capital accumulation, and liquidity constraints. This doesn't sound too hard to model nor too hard for a legislature to legislate. And plausibly this could be legislated without undue pressure by the politically better-connected ages. Obviously, any optimal tax analysis will find a higher-valued optimum from having more policy tools that are not superfluous. The literature suggests that the gains from age-varying taxes may not be trivial and detailed analysis could explore how substantial the gains might be.

The optimal tax literature recognizes that accumulated assets during working life affect labor supply, particularly retirement decisions. This implies a basis for distinguishing the taxation of capital income (or wealth) depending on the fraction of the

---

[65] If there are joint returns for couples based on a couple's incomes, labor income might be taxed on the basis of the age of the earner while capital income might be taxed as if each received half. Or all taxable income could be treated as if half were taxed on the basis of the age schedule of each of the couple.

age cohort in the labor force (or close to the decision margin of still being in the labor force). This distinction loses bite for those adjusting their savings for strong bequest motives or for utility that is based on wealth ownership per se. Perhaps tax-favored retirement savings with suitable limits is an adequate way of addressing this issue. Or perhaps the typical age-earnings and age-retirement savings profiles together with liquidity constraints suggests that there is scope for further distinctions, as precautionary balances are built up.[66]

In contrast with the concern of too much precautionary savings limiting the ability to tax, mandatory pension systems are based on a presumption of too little retirement savings by part of the working population. Of course, there is no contradiction in assuming that some save too much for social purposes, while others save too little. What is called for is an integrated analysis considering both taxation of savings and mandating of participation in a national pension system.

The literature since the Meade Report has gone well beyond earlier literature in considering more complex tax structures, particularly age-varying rates. Maybe it is time for policy makers and tightly policy-relevant analyses to take this up.

Concluding remarks

The Meade Report wanted to tax both consumption and wealth annually. We share the view that capital income (or wealth) should be part of the ideal tax base, whether the remaining part of the ideal base is labor income or consumption. We do not find any support in optimal tax considerations for the argument that annual capital income should be taxed exactly as annual labor income is taxed – a tax base of Haig-Simons income. We have also argued for the advantages of explicit and significant variation of taxation with age. We have noted repeatedly issues that warrant further research. A call for the obvious need for further research is not meant to undercut the relevance of research developments to date for improving policy debates, and possibly policy.

---

[66] The connection to saving for home purchase could be accommodated inside or outside dedicated tax-favored savings vehicles.

References

Abel, Andrew B. 2001. "The Effects of Investing Social Security Funds, in the Stock Market when Fixed Costs Prevent Some Households from Holding Stocks." *American Economic Review.* 91 (1) March: 128-48.

Aiyagari, S. Rao. 1995. "Optimal Capital Income Taxation with Incomplete Markets, Borrowing Constraints, and Constant Discounting." *Journal of Political Economy*, 103(6): 1158-75.

Albanesi, Stefania and Christopher Sleet. 2006. "Dynamic Optimal Taxation with Private Information." *Review of Economic Studies*, 73(1): 1-30.

Amador, Manuel, Werning, Iván and, George-Marios Angeletos. 2005. "Commitment Versus Flexibility." *Econometrica*, 74(2): 365-96.

Atkeson, Andrew, V. V. Chari, and Patrick J. Kehoe. 1999. "Taxing Capital Income: A Bad Idea." *Federal Reserve Bank of Minneapolis Quarterly Review*, 23(3): 3-17.

Atkinson, Anthony B. 1970. "On the Measurement of Inequality." *The Journal of Economic Theory*, 2(3): 244-63.

Atkinson, Anthony B. 1980. "Horizontal Equity and the Distribution of the Tax Burden." In *The Economics of Taxation*, ed. Henry J. Aaron and Michael J. Boskin, 3-18. Washington, D.C.: Brookings Institution.

Atkinson, Anthony B. and Joseph E. Stiglitz. 1976. "The Design of Tax Structure: Direct Versus Indirect Taxation." *Journal of Public Economics*, 6(1-2): 55-75.

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

Auerbach, Alan. 1991. "Retrospective Capital Gains Taxation." *American Economic Review*, 81(1): 167-78.

Auerbach, Alan. 2002. "Is There a Role for Discretionary Fiscal Policy?" In *Rethinking Stabilization Policy: Proceedings of a Symposium Sponsored by the Federal Reserve Bank of Kansas City*, 109-50. Kansas City: Federal Reserve Bank of Kansas City.

Auerbach, Alan. 2006. "Choice between Income and Consumption Taxes: A Primer." NBER Working Papers No. 12307.

Auerbach, Alan, and Daniel Feenberg. 2000. "The Significance of Federal Taxes as Automatic Stabilizers*." Journal of Economic Perspectives*, 14(3): 37-56.

Bernheim, B. Douglas and Kyle Bagwell. 1988. "Is Everything Neutral?" *Journal of Political Economy*, 96(2): 308-38.

Bernheim, B. Douglas and Antonio Rangel. 2005. "Behavioral Public Economics: Welfare and Policy Analysis with Non-Standard Decision-Makers." in *Behavioral Economics and Its Applications*, ed. Peter Diamond and Hannu Vartiainen, 7-84. Forthcoming in 2007. NJ: Princeton University Press.

Boadway, Robin, Maurice Marchand, and Pierre Pestieau. 2000. "Redistribution with Unobservable Bequests: A Case for Taxing Capital Income." *Scandinavian Journal of Economics*, 102(2): 253-67.

Bovenberg, A. Lans, and Bas Jacobs. 2005. "Redistribution and Education Subsidies are Siamese Twins." *Journal of Public Economics*, 89(11-12): 2005-2036.

Breyer, Stephen. 1993. *Breaking the Vicious Circle: Toward Effective Risk Regulation*. Cambridge, MA: Harvard University Press.

Buchanan, James M., and Richard A. Musgrave. 1999. *Public Finance and Public Choice*. Cambridge, MA: MIT Press.

Carroll, Christopher D. 2000. "Why Do the Rich Save So Much?" In *Does Atlas Shrug? The Economic Consequences of Taxing the Rich*, ed. Joel B. Slemrod, 463-485. Cambridge, MA: Harvard University Press.

Case, Anne and Christina Paxson. 2006. "Stature and Status: Height, Ability, and Labor Market Outcomes." NBER Working Papers No. 12466.

Chamley, Christophe. 1986. "Optimal Taxation of Capital Income in General Equilibrium with Infinite Lives." *Econometrica*, 54(3): 607-22.

Chamley, Christophe. 2001. "Capital Income Taxation, Wealth Distribution and Borrowing Constraints." *Journal of Public Economics*, 79, 55-69.

Choné, P. and G. Laroque, 2001, Optimal incentives for labor force participation, INSEE working paper No 2001-25

Choné, P. and G. Laroque, 2006, Should low skilled work be subsidized?, INSEE working paper No 2006-08

Corlett, W. J. and D. C. Hague. 1953-54. "Complementarity and the Excess Burden of Taxation." *Review of Economic Studies*, 21(1): 21-30.

Correia, I. 1996. Should capital income be taxes in a steady state? *Journal of Public Economics*, 60, 147-51.

Cremer, Helmuth, and Firouz Gahvari. 1995. "Uncertainty, Optimal Taxation and the Direct Versus Indirect Tax Controversy." *Economic Journal*, 105, 1165-1179.

Cremer, Helmuth, and Pierre Pestieau. 2003. "Wealth Transfer Taxation: A Survey**."** CESifo working paper 1061.

Cremer, Helmuth, Pierre Pestieau, and Jean-Charles Rochet. 2001. "Direct Versus Indirect Taxation: The Design of the Tax Structure Revisited*." International Economic Review*, 42(3): 781-99.

Cremer, Helmuth, Pierre Pestieau, and Jean-Charles Rochet. 2003. "Capital Income Taxation when Inherited Wealth is Not Observable." *Journal of Public Economics*, 87(11): 2475-90.

Da Costa, Carlos E. 2003. "Optimal Taxation with Gradual Learning of Types." Fundaçao Getulio Vargas paper 499.

Deaton, Angus. 1979. "Optimally Uniform Commodity Taxes." *Economic Letters*, 2(4): 357-61.

Deaton, Angus, and Christina Paxson. 1994. "Intertemporal Choice and Inequality." *Journal of Political Economy*, 102(3): 437-67.

Devereux, M. and R. Griffith, 'Taxes and the location of production: Evidence from a panel of US multinationals, *Journal of Public Economics, 1998*

Diamond, Peter. 1965. "On the Cost of Tax Exempt Bonds." *Journal of Political Economy*, 73(4): 399-403.

Diamond, Peter. 1967. "Cardinal Welfare, Individualistic Ethics, and Interpersonal Comparison of Utility: Comment." *Journal of Political Economy*, 75(5): 765-66.

Diamond, Peter. 1980. "Income Taxation with Fixed Hours of Work," *Journal of Public Economics* 13, February, 101-110.

Diamond, Peter. 1994. "Integrating Allocation and Stabilization Budgets." in *Modern Public Finance*, ed. John Quigley and Eugene Smolensky, Cambridge: Harvard University Press.

Diamond, Peter. 2006. "Optimal Tax Treatment of Private Contributions for Public Goods with and without Warm Glow Preferences." *Journal of Public Economics*, 90(4-5): 897-919.

Diamond, Peter and John Geanakoplos. 2003. "Social Security Investment in Equities," *American Economic Review*, 93 (4) September: 1047-1074.

Dominguez, Begona. 2006. "Public Debt and Optimal Taxes Without Commitment." Forthcoming in *Journal of Economic Theory*.

Edgeworth, Francis Ysidro. 1925. *Papers Relating to Political Economy.* Vol. II. London: Macmillan and Company.

Erosa, Andres, and Martin Gervais. 2002. "Optimal Taxation in Life-Cycle Economies." *Journal of Economic Theory*, 105(2): 338-69.

Farhi, Emmanuel and Ivan Werning. 2006. "Inequality and Social Discounting." Working paper.

Feldstein, Martin. 1976a. "On the Theory of Tax Reform." *Journal of Public Economics*, 6(1): 77-104.

Feldstein, Martin. 1976b. "Compensation in Tax Reform." *National Tax Journal*, 29(2): 123-30.

Gaube, Thomas. 2005. "Income Taxation, Endogenous Factor Prices and Production Efficiency." *Scandinavian Journal of Economics*, 107(2): 335-52.

Gentry, William M. and R. Glenn Hubbard. 1997. "Distributional Implications of Introducing a Broad-Based Consumption Tax." In *Tax Policy and the Economy,* vol. 11, ed. James M. Poterba, 1-48. Cambridge, MA: The MIT Press.

Gollier, Christian. 2005. "Intergenerational Risk Sharing and Risk Taking of a Pension Fund." No. 391, IDEI Working Papers from Institut d'Économie Industrielle, Toulouse.

Golosov, Mikhail, Narayana Kocherlakota and Aleh Tsyvinski. 2003. "Optimal Indirect and Capital Taxation." *Review of Economic Studies*, 70(3): 569-87.

Golosov, Mikhail and Aleh Tsyvinski. 2006. "Designing Optimal Disability Insurance: A Case for Asset Testing." *Journal of Political Economy*, 114(2): 257-69.

Golosov, Mikhail, Aleh Tsyvinski, and Iván Werning. Forthcoming. "New Dynamic Public Finance: A User's Guide." NBER Macroeconomic Annual, 2006.

Gordon, Roger H. 1985. Taxation of Corporate Capital Income: Tax Revenues vs. Tax Distortions. Quarterly Journal of Economics, Feb. 1-27.

Gordon, Roger H., and Jeffrey K. MacKie-Mason. 1995. "Why is There Corporate Taxation in a Small Open Economy?" In *The Effects of Taxation on Multinational Corporations*, ed. Martin Feldstein, James R. Hines, Jr., and R. Glenn Hubbard. Chicago: University of Chicago Press.

Greenwood, Jeremy and Guillaume Vandenbroucke. 2005. "Hours Worked: Long-Run Trends." NBER Working Papers No. 11629.

Haig, Robert M. 1921. *The Federal Income Tax.* New York: Columbia University Press.

Hall, Robert E. 1968. "Consumption Taxes Versus Income Taxes: Implications for Economic Growth." In *Proceedings of the 61st Annual Conference on Taxation*, 125-45. San Francisco: National Tax Association.

Hamilton, 1987,

Hausman, Jerry A. 1979. "Individual Discount Rates and the Purchase and Utilization of Energy-Using Durables." *The Bell Journal of Economics*, 10(1): 33-54.

Helliwell, John. 1969. "The Taxation of Capital Gains." *Canadian Journal of Economics*, 2(2): 314-18.

Hurd, Michael D. 1987. "Savings of the Elderly and Desired Bequests." *American Economic Review*, 77(3): 298-312.

Jones, Manuelli and Rossi, 1997)

Judd, Kenneth L. 1985. "Redistributive Taxation in a Simple Perfect Foresight Model." *Journal of Public Economics*, 28(1): 59-83.

Judd, Kenneth L. 1999. "Optimal taxation and spending in general competitive growth models," *Journal of Public Economics*, 71: 1-26.

Judd, Kenneth L., and Che-Lin Su. 2005. "Optimal Income Taxation with Multidimensional Taxpayer Types." Working Paper.

Kaplow, Louis. 1989. "Horizontal Equity - Measures in Search of a Principle." *National Tax Journal*, 42(2): 139-54.

Kaplow, Louis. 1994. Taxation and Risk Taking: A General Equilibrium Perspective. National Tax Journal. 47, 879-798.

Kaplow, Louis. 1995. "A Note on Subsidizing Gifts." *Journal of Public Economics*, 58(3): 469-78.

Kaplow, Louis. 2006. "On the Undesirability of Commodity Taxation Even When Income Taxation Is Not Optimal." *Journal of Public Economics*, 90(6-7): 1235-50.

Kleven, Henrik Jacobsen, Wolfram F. Richter, and Peter Birch Sørenson. 2000. "Optimal Taxation with Household Production." *Oxford Economic Papers*, 52(3): 584-94.

Kocherlakota, Narayana. 2005. "Zero Expected Wealth Taxes: A Mirrlees Approach to Dynamic Optimal Taxation." *Econometrica*, 73(5): 1587-621.

Kremer, Michael. 2001. "Should Taxes be Independent of Age?" http://www.economics.harvard.edu/faculty/kremer/papers.html.

Krusell, P., LE Ohanian, JV Rios-Rull, GL Violante. 2000. Capital-Skill Complementarity and Inequality: A Macroeconomic Analysis. Econometrica.

Laroque, Guy R. 2005. "Indirect Taxation is Superfluous under Separability and Taste Homogeneity: A Simple Proof." *Economics Letters*, 87(1): 141-4.

Marshall, Alfred. 1948. *Principles of Economics*, 8th ed. New York: Macmillan.

Meade, James Edward. 1978. *The Structure and Reform of Direct Taxation, Report of a Committee chaired by Professor J. E. Meade*. London: George Allen & Unwin.

Mirrlees, James. 1995. "Private risk and public action: The economics of the welfare state," European Economic Review, 39(3-4), 383-397.

Musgrave, Robert A.1959. *The Theory of Public Finance: A Study in Political Economy*. New York: Mcgraw-Hill.

Myles, Gareth D. 1995. *Public Economics*. UK: Cambridge University Press.
Nielsen, Søren Bo and Peter Birch Sørensen. 1997. "On the Optimality of the Nordic System of Dual Income Taxation." *Journal of Public Economics*, 63(3): 311-29.

Naito, H. 1999. "Re-examination of Uniform Commodity Taxes under a Non-Linear Income Tax System and its Implications for Production Efficiency." */Journal of Public Economics/*, 71(2): 165-88.

Pigou, Arthur C. 1928. *A Study in Public Finance.* London: Macmillan and Company.

Piketty, Thomas and Emmanuel Saez. 2003. "Income Inequality in the United States, 1913-1998." *Quarterly Journal of Economics*, 118(1): 1-39.

Piketty, Thomas and Emmanuel Saez. 2006. "The Evolution of Top Incomes: A Historical and International Perspective." *American Economic Review Papers and Proceedings*, 96(2): 200-205.

Prescott, Edward C. 2004. "Why do Americans Work So Much More Than Europeans?" *Federal Reserve Bank of Minneapolis Quarterly Review*, 28(1): 2-13.

Reis, Catarina. 2006. "Taxation Without Commitment." Working Paper.

Rosen, Harvey S. 1978. "An Approach to the Study Of Income, Utility, and Horizontal Equity." *Quarterly Journal of Economics*, 92(2): 307-22.

Saez, Emmanuel. 2001. "Using Elasticities to Derive Optimal Income Tax Rates." *Review of Economic Studies*, 68(1): 205-29.

Saez, Emmanuel. 2002a. "Optimal Progressive Capital Income Taxes in the Infinite Horizon Model." NBER Working Papers No. 9046.

Saez, Emmanuel. 2002b. "The Desirability of Commodity Taxation under Non-Linear Income Taxation and Heterogeneous Tastes." *Journal of Public Economics*, 83(2): 217-30.

Saez, Emmanuel. 2002c. "Optimal Income Transfer Programs: Intensive Versus Extensive Labor Supply Responses." *Quarterly Journal of Economics*, 117(3): 1039-73.

Salanie, Bernard. 2003. *The Economics of Taxation*. Cambridge, MA: The MIT Press.

Simons, Henry. 1938. *Personal Income Taxation.* Chicago: University of Chicago Press.

Smith, Adam. 1937. *Wealth of Nations*. New York: The Modern Library.

Sørensen, Peter Birch. 2001. "The Nordic Dual Income Tax – In or Out." Invited speech delivered at the meeting of Working Party 2 on Fiscal Affairs, OECD 14 June 2001.

Sørensen, Peter Birch. 2005. "Dual Income Taxation: Why and How?" CESifo Working Paper 1551.

Stiglitz, Joseph. 1982a. "Self-Selection and Pareto Efficient Taxation." *Journal of Public Economics*, 17(2): 213-40.

Stiglitz, Joseph. 1982b. "Utilitarianism and Horizontal Equity: The Case for Random Taxation." */Journal of Public Economics/*, 18(1): 1-33.

Tarkiainen, Ritva and Matti Tuomala. 1999. "Optimal Non-Linear Income Taxation with a Two-Dimensional Population: A Computational Approach." *Computational Economics*, 13(1): 1-16.

Summers, Lawrence H. 1981. "Capital Taxation and Accumulation in a Life Cycle Growth Model." *American Economic Review*, 71(4): 533-44.

Tresch, Richard W. 2002. *Public Finance: A Normative Theory*. Second edition. Plano, Texas: Business Publications, Inc.

Tuomala, Matti. 1990. *Optimal Income Tax and Redistribution*. New York: Oxford University Press.

Varian, Hal R. 1980. "Redistributive Taxation as Social Insurance." *Journal of Public Economics*, 14(1): 49-68.

Vickrey, William. 1947. *Agenda for Progressive Taxation.* New York: The Ronald Press Company.