

TIMING AND EXPECTATIONS IN THE THEORY OF TAXATION

by

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## Chapter I

### INTRODUCTION

This dissertation is concerned with individual intertemporal choices, and how alternative tax institutions and taxpayer expectations about the employment of tax institutions can affect those choices. This study is largely directed toward a reexamination of issues now generally accepted in the standard public finance literature. It will be demonstrated that even using the tools and central assumptions of orthodox analysis, many of which are open to question themselves, that conventional propositions in the theory of taxation cannot be viewed as proven.

As taxation is a collective activity, individuals cannot, by definition, make rational intertemporal choices on the basis of market signals alone. In addition to market information, they must form an expectation about the state of future public activity. This has not been taken into account in orthodox tax theory. The implicit assumption underlying the theory of taxation is that current tax institutions will continue to be applicable indefinitely and this is precisely what taxpayers expect. In other words, the world is one in which the current state of tax arrangements are expected to, and in fact do, remain forever. The objec-

tive of this dissertation is to remove this implausible assumption from consideration and examine the implications for timing questions in the theory of taxation when expectations of government activity are taken into account.

The analysis this author intends to undertake is positive, as it intends to examine the effects of alternative tax regimes on the intertemporal choices which individuals make. The ultimate value or usefulness of this positive analysis is to inform the citizen-taxpayer in his choice between fiscal rules. In some senses it is not appropriate, therefore, to have a well developed model of "how government behaves," for the choice of tax rules to be made by the citizen-taxpayer logically takes place prior to this issue. Individuals are in the process of choosing the rules which will determine, at least in part, the nature of the outcomes generated by political institutions.<sup>1</sup>

In undertaking a positive examination of the impact of alternative tax regimes, interest is focused on individual behavior. For example, how does the individual respond in

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<sup>1</sup>Clearly it is the case that some understanding of the implications of different constitutional rules is required. For example, what are the conceivable outcomes of allowing governments unbridled fiscal powers, or how effective will given electoral constraints be in the absence of specific constraints on fiscal powers. These issues are, however, not part of the subject matter of this dissertation. For an example of a discussion of some of these issues, see Brennan and Buchanan (1980b).



attempting to minimize his tax burden and what are the implications of this for interesting economic variables. Whether government is viewed as an instrument for maximizing social welfare, or as responding to the demands of narrow, self-interested groups, or indeed as an individual or group pursuing its own self-interested ends, is not of direct concern here, for individuals will respond to tax institutions in specific ways irrespective of the appropriateness of one or more of the above hypotheses. Individuals are modeled as price takers and, as such, it matters little whether a commodity is provided monopolistically or competitively. This is not to say, however, that individuals' expectations will not be influenced by the perceived nature of government behavior. If the individual associates some positive probability with the existence of a Leviathan government, then the nature of expectations of future tax regimes will be quite different to a case of majoritarian democracy where, for the purpose of argument, electoral constraints are seen as effective. Although these issues are important, the argument to be presented here emphasizes a different question. It is, that changes to tax institutions occur in both of these worlds, and the free-rider principle suggests that the taxpayer will adjust his behavior to any specific tax reform (potential or actual) in an identical fashion, irres-

pective of the form of government; it is this adjustment process and its implications which this dissertation will examine.

The role of this study, therefore, can be viewed as one element of the positive analysis required in order to advise the voter-taxpayer of the implications of various tax institutions and fiscal rules.<sup>2</sup> To the extent that the discussion presented in this dissertation is undertaken on the orthodoxy's own ground, it would seem to be more convincing than an argument which resorts to debate outside the standard domain. Nevertheless, this approach does have significant drawbacks which we shall now proceed to note.

The examination of the intertemporal incidence of alternative tax bases is undertaken within an equi-revenue framework. The rationale, and therefore the legitimacy, of such an approach is questionable. It ignores the fact that as differing tax regimes impinge on the relative prices facing taxpayers, that alternative tax arrangements will influence individual demands for the activities that government undertakes. Not only may the absolute magnitude of tax revenues

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<sup>2</sup>The other two elements, following Buchanan (1979), are, first, the effects of alternative fiscal institutions on individuals' public choices as distinct from their private choices, that are the focus in this dissertation. The second element is the implication of different collective choice institutions for the nature of individuals' public choices.

differ under alternative tax institutions but also the temporal pattern of desired revenue acquisition may vary. Both of these possibilities are overlooked by the employment of the analytical device of equi-revenue comparisons.

Secondly, the adoption of standard tools of analysis means that the two sides of the budget are divorced from one another. As a consequence, in examining issues of taxation the expenditure side of the budget is ignored. To the extent that individuals receive benefits from publicly provided goods, the negative income effects introduced by an examination of the tax side of the budget alone will not be so large (in absolute value). However, the substitution effects encountered in the use of different tax institutions will remain; and it is, of course, these effects which are of crucial importance in comparing different tax bases. In this instance, it would therefore seem to be the case that no significant problems are generated by this assumption. This assumes, however, a somewhat extreme form of utility function--one where the taxable activity and publicly provided goods are separable. If there is either a complementary or a substitutability relationship between a specific tax base and publicly provided goods, then the income effects of alternative tax bases will vary.<sup>3</sup> And, as a  
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<sup>3</sup>For a discussion of a case of complementarity, see Thompson (1974).

consequence, the emphasis on the revenue side of the budget is not appropriate.

The contribution of this dissertation must, as a consequence, be focused on presenting a convincing case that the orthodox analysis has ignored relevant dimensions of its own analysis. The cost resulting from pursuing the orthodox approach is that the intertemporal implications of alternative tax institutions and of tax reform more generally have been both inadequately and incorrectly presented. The final step will be to point out relevant issues which subsequent study, recognizing the deficiencies of orthodox modes of analysis, might undertake.

The concept of a tax institution to be employed throughout this dissertation can be interpreted broadly as a means by which resources are transferred from private to public control. Changes to tax institutions therefore include the standard tax reform propositions of the adoption or abandonment of specific tax bases and the more recent discussion of the acquisition of resources through the employment of a monopoly franchise in the creation of money. However, a further logical inclusion in this definition of tax reform is adjustments in rates of taxation, discretionary or otherwise, while maintaining the tax base unchanged. While such changes are not conventionally recognized as being encom-

passed by the concept of tax reform and have, perhaps as a consequence, received little attention, it will be demonstrated that tax rate adjustments can have as important an impact as changes in tax bases. Furthermore, the relative frequency of tax rate changes suggests that this is an important line of inquiry.

A useful point of departure is an examination of the orthodox approach to the question of timing and expectations. As a specific example, consider Pigou's (1928) discussion of what he refers to as "announcement effects." This term is intended to include the tax-induced changes to behavior consequent on the announcement of tax rules. In fact, Pigou defines announcement effects to be equivalent to the total incentive effects of taxes. Implicit in this definition is the assumption that taxpayers never expect tax changes, although such changes do occur in the analytic exercises Pigou undertakes. In the second chapter, the view expressed in the literature will be expanded in more detail. The particular emphasis of that discussion will be to isolate the nature of the intertemporal models which have been employed and the form of expectations assumed.

The third chapter will reexamine the debate over whether consumption or income provides the "best" base on which to levy taxes. The intertemporal neutrality of the consumption

base has gained it numerous proponents. In contrast, as concern with issues such as capital accumulation have grown, the income tax, which distorts between present and future consumption due to the "double taxation of savings," has lost support. The neutrality characteristic of the consumption or expenditure tax was a major reason for its support by both the U.S. Treasury in its Blueprints for Basic Tax Reform and the Meade Committee in the United Kingdom. It will be demonstrated, however, that by incorporating taxpayer expectations into the analysis that this conclusion is erroneous.

The taxpayer placed either in a life cycle model with a progressive tax rate structure, or in the circumstances experienced by U.S. taxpayers with respect to tax rates this century, would reasonably expect to face a regime of rising tax rates over time. When the behavioral adjustments induced by changing tax rates are examined, it can be demonstrated that the expenditure tax is no longer intertemporally neutral: in fact, it would seem that had it been used in the U.S. over the period 1929 to 1978, it would have distorted more than an inflation-adjusted income tax would have done, under a comparable set of expectations.<sup>4</sup>

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<sup>4</sup>If tax rates are falling, similar arguments remain applicable.

Two further questions are raised by this conclusion, and they will form the basis for the fourth and fifth chapters. In the theoretical literature, it has always been recognized that the labor income tax had the same attributes as the expenditure tax, that is, it is intertemporally neutral. This relationship between the taxes exists due to the equality of taxing the initial capital value (the labor income tax) and the future consumption possibilities that this capital generates (the expenditure tax). The fourth chapter will examine the labor income tax/consumption tax equivalence theorem with the objective of determining whether or not it is destroyed by the variation in tax rates. It can be shown that the labor income tax remains intertemporally neutral under a variety of cases in which the consumption tax is not. This fact demolishes the equivalence theorem and also leads to the conclusion that the labor income tax may be worthy of greater interest than it has so far received.

A major motivation for the recent debates on the desirability of the consumption base relative to the income base has been the concern with questions of capital accumulation. It has been suggested that because the income tax raises the price of future consumption relative to current consumption, it discourages saving; further, a shift to the supposedly

intertemporally neutral expenditure tax would raise accumulation. Although this proposal continues to be presented, it has been demonstrated in the literature that this proposition is generally invalid in the absence of specific elasticity assumptions about the demand for future consumption with respect to the rate of return. In the absence of such assumptions, no definitive conclusion can be drawn about the relative magnitudes of accumulation under expenditure and income taxation. However, this analysis is concentrated solely on private accumulation. In the fifth chapter, we shall inquire into the implications of assuming that the government undertakes a particular time pattern of expenditure independently of the time stream of tax revenues. In contrast to the standard approach, which implicitly assumes that the government balances the budget in each period, aggregate accumulation (private plus public) will move in predictable directions on the substitution of one tax regime for another. Interestingly, in the orthodox constant tax rate world, it is true that the consumption tax results in a greater degree of capital accumulation. However, in the more realistic world of changing tax rates, the reverse conclusion seems to hold. A movement from the income tax to the expenditure tax may reduce accumulation. Therefore, solutions to the asserted inadequate degree of accumulation may have to be sought elsewhere.



In Chapter VI, we will examine an issue of timing which has received considerable attention in the orthodox literature, namely the tax treatment of asset depreciation. The aim of this literature has been to isolate those depreciation policies which are neutral, that is, those which do not modify the investment decision. As in other cases, this literature has ignored the empirical relevance of changing tax rates which influence the relative magnitude of the tax burden on the one hand and, on the other, the value of depreciation allowances. This modifies the conventional conclusions and has implications for the supposed bias of the income tax in favor of human versus physical capital accumulation. The question of the choice of tax base therefore not only concerns the magnitude of aggregate accumulation but also its composition.

An examination of the analysis in Chapters III to VI illustrates the general conclusion that reforming tax institutions can impose costs. If these chapters are treated as a case study of the manner in which taxpayer expectations impinge on one aspect of the theory of taxation, it is then a logical step to examine tax reform in more general terms. One dimension of this question is the timing of announcement of tax changes or reforms. As the welfare cost of taxation arises due to tax-induced substitutions by taxpayers, it

would seem a priori that retrospective announcement of taxation rates might be desirable. The implications of this will be examined in Chapter VII.

In contrast to this, Feldstein (1976a) has argued for delayed enactment of currently legislated tax changes on equity grounds. He suggests that as the tax preferences will be capitalized into the prices of the favored activities, any tax changes will result in windfall gains and losses thus violating equity criteria. This proposition assumes that individuals expect there will be no changes in tax institutions, an assumption inconsistent with the ability to change taxes through political institutions. In the absence of this assumption, individuals may well have different views as to the present value of specific tax preferences. In this case, Feldstein's conclusion on tax reform does not seem to be applicable.

As this particular case illustrates, the ability to change the tax system injects a degree of uncertainty into the environment in which individuals make choices. Therefore, it is of interest in a discussion of intertemporal choice to inquire into the implications of the "power to reform taxes." This question must be confronted at the stage of constitutional choice. For example, is the government to be provided with a carte blanche to reform the tax

system or is it to be restricted by some electoral constraint or, in fact, have certain reforms eliminated from consideration by constitutional rule?

The less restrictive is the power to change taxes, the greater is the uncertainty introduced into individual choice. Consequently, as uncertainty is generally recognized as being of negative economic value, individuals in choosing fiscal rules might wish to trade off the benefits of the ability to reform the tax system as desired with the uncertainty that this ability to reform creates. Apart from the costs of rent seeking to modify taxes in specific ways in an unrestricted system, there will be resource costs in predicting change and the presence of uncertainty will cancel some otherwise profitable entrepreneurial activity. Other discussions have similarly come to the conclusion that tax reform should be restricted. These contributions which are based either on welfare cost arguments<sup>5</sup> or on the equity of tax reform,<sup>6</sup> are different in a crucial dimension from the proposition to be presented here. Those studies rely on actual tax reform occurring, while the argument presented here rests solely on the existence of the potentiality of change to impose costs.

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<sup>5</sup>See Brennan and McGuire (1976)

<sup>6</sup>See Feldstein (1976a)

In short, therefore, we shall examine the role of expectations and timing in one specific area of the theory of taxation, namely, the choice of tax base, and we shall then go on to examine some broader dimensions of these same issues by considering the implications for tax reform more generally.

## Chapter II

### TIMING AND EXPECTATIONS IN TAXATION: AN OVERVIEW AND CRITIQUE OF THE ORTHODOXY

#### 2.1 INTRODUCTION

The object of this chapter is to present the current understanding of the subject matter to be examined in this dissertation. The public finance literature has broached the question of intertemporal choice but has rarely explicitly considered the role of expectations in these choices. In this chapter, we shall examine the theory of public debt where such an analysis has been undertaken and then consider the issue of the choice of tax base where this examination has not been pursued. This omission provides much of the material for this dissertation.

#### 2.2 TIMING AND EXPECTATIONS

The objective of the tax system is to gain revenue for the government which it can employ to purchase real resources. It matters, however, in what way any given amount of revenue is obtained. One dimension of this issue which tends to be glossed over by the orthodoxy, perhaps due to its use of equi-revenue comparisons, is the time pattern of the tax burden. In conventional public finance analytics, the essential characteristic of differential incidence

analysis is that the alternative tax institutions provide equivalent present value revenues. The issue of the temporal pattern of the tax burden may be relevant as:

1. different temporal patterns of the tax burden lead taxpayers to substitute less valued activities for more highly valued activities. This is what is measured by the welfare loss of taxation.
2. if taxpayers have different time preferences, the temporal tax burden may discriminate between individuals on the basis of their preferences.

The core of the study of timing in taxation is the examination of the implications of tax bases for intertemporal choice. It will be emphasized in this dissertation that this issue is of wider significance than usually conceived as the whole question of tax reform, at its most general level, is an intertemporal question. A tax reform implies that there is both an ex ante state and an ex post state; the movement from one to the other has implications for timing or intertemporal choice.

It will be the taxpayer's expectations in the ex ante state which will determine what the implications for intertemporal choice will be. It can be argued at a more general level, however, that a logical corollary of any question of

intertemporal choice is that individual expectations of the future are necessarily involved. As individuals make decisions currently which will influence their future well-being, it is a logical consequence that they will attempt to assess their positions at the point in time when their current choices will be binding. It is this assessment which is being defined as their expectation. One component of this expectation will be the tax regime prevailing in the future.

In the setting under consideration here, a tax change is not qualitatively different from the change in the price of a private good consumed by the taxpayer. In both cases, the individual is assumed to be a price-taker whose consumption opportunities are being influenced by exogenous price changes. As an individual can profit by predicting price change, the incentive to form expectations is present in both public and private markets. It should be stressed that there is nothing in the rational ignorance argument which suggests that the individual will rationally invest greater resources in forming expectations about private markets than about public.<sup>7</sup> In both instances, all benefits and costs are -----

<sup>7</sup>It might be suggested that arguments under the general rubric of fiscal illusion would result in a conclusion suggesting that expectations in private and public markets would be qualitatively different. It is not clear to me that this is the case. Fiscal illusion is at least partly based on the proposition that there is no marginal benefit

private. To the extent that change is perceived to be more likely or is of greater significance to the individual in one area than another, then this will, ceteris paribus, result in greater investment in prediction there than elsewhere. Therefore, in summary, it is suggested that issues of timing in taxation center on the analysis of intertemporal choice and that an element of such choices must be taxpayers' expectations.

### 2.3 PUBLIC DEBT

Although not comprising any part of the main subject matter of this dissertation, the examination of public debt in many ways provides the springboard for its discussion. The theory of public debt is perhaps the one area where traditional theory has focused on questions of timing and

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to be gained by seeking out the nature of current tax regimes and thereby the amount of taxation being paid. In other words, the individual observes relative prices which may or may not contain taxes; as a price-taker, the individual simply has no incentive to seek out information on his tax burden. This is not so with future taxation where there exists potentially significant private benefits if changes in tax institutions can be predicted. For example, an expected increase in the level of excise taxation on a bottle of whiskey will lead consumers to build up a stock of whiskey equally as much as if the producer raised the price due to increased demand. It may well be more costly to predict one reason for change than another; this is an empirical question. The general principle remains, however, that there is a distinction between the behavior of the taxpayer with respect to current tax institutions and, that with respect to changes or reforms, to current tax regimes.



expectations. Due to the perennial concern with the burden of public debt, these questions have received considerable scrutiny.

The central issue of concern to public finance scholars has been the question of the incidence of public debt. The incidence of fiscal instruments has the objective of determining who is giving up private control of resources such that public expenditures can be undertaken or, simply who is bearing the opportunity cost of public expenditures. The controversy surrounding public debt in the literature reflects the failure of some writers to appropriately define this cost.<sup>8</sup> The use of the debt instrument is of particular interest from a timing perspective, for it implies that future taxation will be required to service and repay the currently issued bonds.

The true burden of debt is the opportunity cost of public expenditures that are financed by debt instead of taxes. This opportunity cost is the value of the private goods that are given up to provide the public expenditures, and this cost, it is suggested, is borne by the taxpayers who meet the debt. If this view is accepted, it is most likely that at least some of the burden of public debt will be placed on future generations.

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<sup>8</sup>For the literature on this debate, see Ferguson (1964) and Buchanan (1958, 1969).

Some justification for this view will now be provided. For analytic simplicity, it is useful to consider individuals in two separate roles--as bondholders and as taxpayers. When an investor purchases a bond (be it private or public), he is voluntarily exchanging present for future consumption. It cannot be argued that the bondholder is subject to a cost in exchange for public expenditures. It is true that as the bondholder is forgoing current consumption, there is a cost involved, but this cost is quite independent of the public expenditures. As we are interested in the question of who is paying for the provision of public goods, it is clear that the cost is borne by the taxpayer who must meet the debt undertaken by the government.

Let me now turn to focus on the temporal questions more directly by considering the Ricardian Equivalence Theorem. The Ricardian theorem states that in the presence of certain conditions, current taxation and debt will be identical in their burdens. The assumptions on which the theorem is based are:

1. that the magnitude of public expenditure is unaffected by the use of either the debt or tax alternative (enabling the use of equi-revenue analysis);

2. public debt will be redeemed by the use of taxes at some future time;
3. capital markets are perfect;
4. individuals behave "as if" they had infinite lifetimes and they recognize the future tax burden implied by the current issue of public debt; and
5. all taxes are lump-sum.

The Ricardian theorem follows directly from these propositions for they imply that individuals experience the same present value burden under either present taxation or debt. In the debt case, individuals capitalize the future tax payments and allocate the burden in terms of forgone private opportunities in a fashion that minimizes the burden they experience--similarly in the case of current taxation. The major dispute with this theorem which is evident in the literature relates to the assumption of infinite lifetimes and perfect expectations. We shall return to these issues later.

The validity of this theorem relies, for all intent and purpose, on assuming away crucial timing questions. Brennan and Buchanan (1980a) have demonstrated that the proposition of lump-sum taxes is equally important as the infinite life-

time and expectations assumption in deriving the Ricardian result. As noted above, an important dimension of the timing question is the intertemporal substitution of individual activity induced by the temporal pattern of the tax burden. For the Ricardian proposition to be valid, it must remove these possibilities; it does so by assuming that taxes are intertemporally lump-sum. The absence of this assumption introduces questions of timing and invalidates the theorem.

For example, assume the current tax regime is an income tax. Individuals would, to the extent they are able, adjust their temporal income streams to minimize their tax burdens. With the current taxation alternative, they will decumulate currently and raise earnings in the future, while the debt alternative would lead them to reduce investment in human capital (to the extent that would otherwise have raised future income) and in its place increase current earnings. In an equal preferences/equal abilities model, all taxpayers will be observed to be paying equivalent amounts to the fisc under each fiscal instrument, but, nevertheless, there will be proportionally more present consumption under the current tax alternative than in the case of debt financing of public expenditures. In other words, the two fiscal institutions will not be identical in their effects due to intertemporal modifications of taxpayer behavior.

The Brennan-Buchanan position is therefore that the validity of the Ricardian Equivalence Theorem rests not only on the assumptions listed previously but also on the ability to levy an intertemporally lump-sum tax. The fact that most tax institutions provide incentives to make intertemporal adjustments invalidates the general applicability of the Ricardian theorem.

Consider diagrammatically the difference between financing a project by an expenditure tax and financing the same project by debt. The model depicted in Figure 1 illustrates a two-period example where the proposed public project has a current value of  $PP'$  dollars, an amount which must be provided by one fiscal regime or the other. The slope of the pre-tax budget line,  $PF$ , is  $(1 + \rho)$  where  $\rho$  is the rate of interest. In this pre-tax case, the consumer equilibrates at point  $E$ . The line  $P'F'$  is constructed to enable an equi-revenue comparison of the alternative financing mechanisms. If a neutral fiscal institution existed, the taxpayers new equilibrium would be at  $E'$ . With the current expenditure tax alternative, the individual is faced by the budget line  $P''F$  and locates at the point shown as  $E^E$ . With debt and future taxation, the individual is confronted with the budget line  $PF''$  and locates at  $E^D$ . It is observed that the alternative fiscal instruments have different implica-

tions for the relative price of present to future consumption and consequently are associated with welfare costs due to intertemporal adjustments of consumption expenditures.

The Ricardian theorem would be valid if the conceptual ideal of lifetime averaging were possible. The Brennan-Buchanan argument is applicable precisely because individuals can influence their tax burden by intertemporal adjustments in their taxable activity. The other relevant aspect of this theorem for the discussion here is the possibility that individuals may experience debt illusion. In other words, the assumption that individuals correctly foresee the future taxation implied by the current issue of public debt. This assumption has been widely questioned (including by Ricardo, 1820). If there is debt illusion, the burden of the public debt will be relatively greater on future generations as taxpayers fail to adjust their current consumption levels as they would had they anticipated the future levels of taxation. The issue here, of course, is one of individual expectations of future taxation. Just as in the case of the prices of private economic activities, there will be an incentive to predict the level and nature of taxation in the future. However, for changes which may not occur until well into the future, this incentive may not be very strong, although in the short run, it could be significant. How-

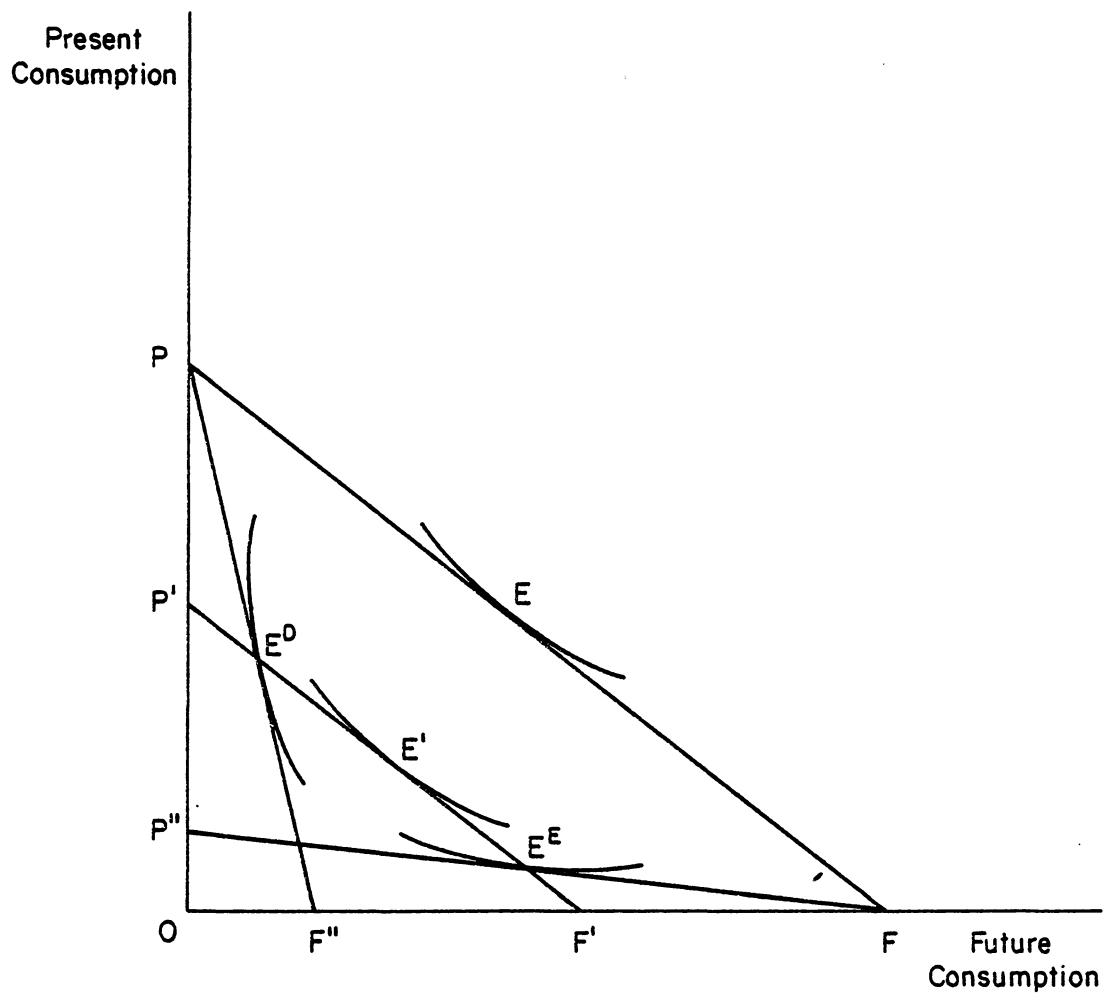


Figure 1: The nonequivalence of debt and expenditure taxation

ever, even the presence of the incentive to form expectations by no means guarantees their accuracy.

Barro (1974), attempting to discover the macroeconomic impact of debt-financed expansions in economic activity, rediscovered the Ricardian Equivalence Theorem. In his model, individuals from each generation were linked by interdependence of utility functions. Consequently, the current issue of public debt, which was to be repaid by a future generation, would result in an increase in bequests to that generation. In Barro's inquiry, the objective was to determine whether or not the government bonds represented net wealth. If individuals perceived a tax burden equal to the value of the bonds, then he suggested a bond-financed expansion would be ineffective, as with no change in net wealth, demand would not be stimulated. To the contrary, if bonds were perceived as net wealth, bond finance could be expansionary.

Barro, therefore, raised many of the basic issues of public debt discussed above. Does the current issue of debt lead people to modify their current consumption behavior in anticipation of the future tax payments implied by the public debt? Commencing with Kochin (1974), there have been several empirical studies attempting to resolve this question. The emphasis of Kochin was to examine the relation-



ship between private consumption behavior and the movement in public deficits. As a simple correlation, it is evident in Figure 2 that the ratio of saving to disposable income and the ratio of the deficit to disposable income have been highly correlated over the period 1961-1971. The same implication can also be drawn from the regression equations tested by Kochin. The general form of the equation tested is a consumption function which includes the federal deficit as an explanatory variable. Kochin's analysis suggests that consumers behave at least as if they perceive the taxation implied by federal government deficits.

Taking a contrary viewpoint, Yawitz and Mayer (1976) find no evidence of tax discounting. Their work is based on an equation which has consumption as a function of lagged disposable income,  $YD$ , net household wealth excluding government bonds also lagged,  $W$ , and the lagged market value of individual holdings of government debt,  $GDEB$ . In other words,

$$C_t = \alpha_1 YD_{t-1} + \alpha_2 W_{t-1} + \alpha_3 GDEB_{t-1} + \mu_t \quad (2.1)$$

They argued that, if the coefficient on government debt,  $\alpha_2$ , was not significantly different from zero, then the evidence would support the tax discounting hypothesis as it would suggest government debt had no net influence on private con-

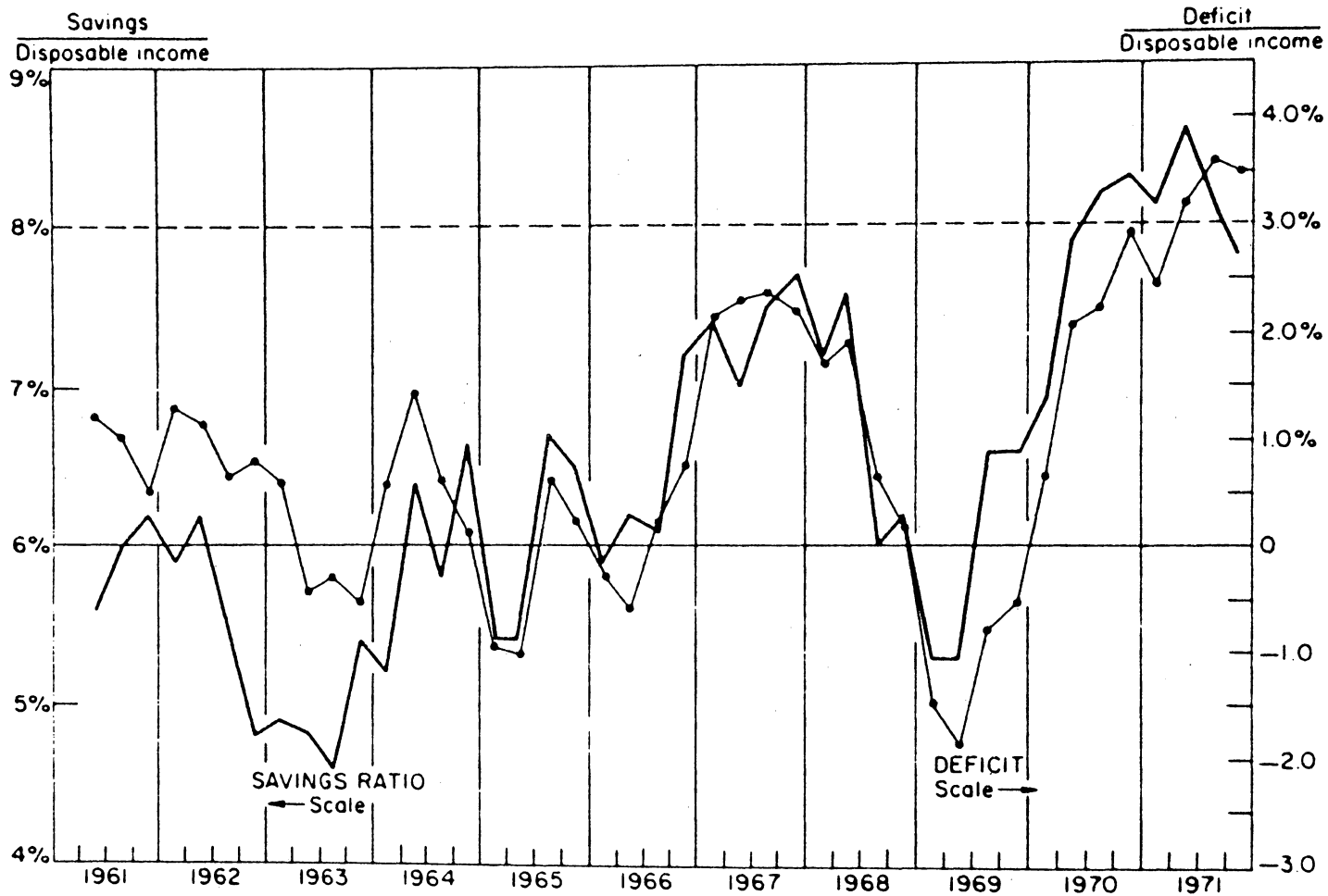


Figure 2: The savings ratio and the deficit

sumption. On the other hand, if the two components of private wealth had similar effects on private consumption,  $\alpha_2 = \alpha_3$ , then tax discounting could not be considered as having occurred. The results Yawitz and Mayer gained were consistent with this latter view.

This study has been the subject of some criticism by Tanner (1979). He argues that the consumption function employed by Yawitz and Mayer does not adequately measure future income or, more accurately, total lifetime resources, which is a major concern in the modeling of life-cycle consumption behavior. In an attempt to overcome this deficiency, Tanner includes the unemployment rate,  $UY$ , to assist in estimating future disposable income and takes account of other forms of accrued income, such as corporate savings,  $RE$ , and the stock of consumer desirables,  $DUR$ . As well as holdings of capital,  $K$ , and of government debt,  $GDEB$ , he includes as a separate variable the government surplus,  $TSUR$ , as a potential source of accrued income (it will, of course, be negative for deficits). The equation Tanner tests is, therefore:

$$C_t = \alpha_1 YD_t + \alpha_2 YD_{t-1} + \alpha_3 RE_t + \alpha_4 UY_t + \alpha_5 DUR_t \\ + \alpha_6 K_{t-1} + \alpha_7 TSUR_t + \alpha_8 GDEB_t + \mu_t \quad (2.2)$$

There are three possible outcomes. First, there is the case where future taxes are not anticipated, so there is no dis-

counting. This would be consistent with the data if  $\alpha_6$  and  $\alpha_8$  were equal indicating that wealth, both in the form of private capital and government bonds, had the same impact on consumption. In addition, if  $\alpha_7$  did not significantly differ from zero, it would imply that movements in the government surplus/deficit exerted no effect on consumption expenditures irrespective of the implications for the level of taxation. Secondly, if  $\alpha_8$  is not significantly different from zero, the implication is that the issue of government bonds has no net effect on consumption. In addition, if  $\alpha_7$  is positive, indicating that private consumption increases with government surpluses, it would suggest that future taxes are anticipated and in addition are being discounted. Finally, partial discounting of future taxes would be suggested by positive values for  $\alpha_7$  and  $\alpha_8$ . Employing U.S. data for the period 1947-1974, Tanner gets surprisingly strong results, suggesting that future taxes are anticipated, or at least consumers behave as if they expect them.

From this analysis, it can be concluded that:

1. expectations issues are crucial in a resolution of the controversy over the burden of public debt. If the Ricardian theorem is to be applicable, it requires accurate expectations of the future taxes implied by public debt. Where those taxes lie

well ahead in time, it is more likely that debt illusion exists; and

2. the empirical work examining this issue suggests that consumers behave as if they anticipate future taxes, although no evidence is offered to suggest whether they in fact do, or do not.

#### 2.4 THE CHOICE OF TAX BASE

Other areas in the theory of taxation involve precisely the same issues of timing and expectations which have received consideration in the analysis of public debt. In this section, we shall examine the centuries-old debate over the choice between income and consumption as the "best" tax base. This analysis will not be encyclopedic, as we are specifically interested in the nature of the intertemporal models employed and the form of taxpayer expectations presumed.

The preference for the consumption base over the income base has a long intellectual history. As with a major part of taxation theory, writers in this area have been concerned with the question of tax design as distinct from tax reform. The issue they have attempted to resolve is whether consumption or income provides the "best" base on which to levy

taxes, not whether a move from an existing tax regime to some other is desirable.

The early arguments in favor of a consumption base were presented in terms of whether or not it was "just" to tax savings. Thomas Hobbes (1651), for example, viewed it as inappropriate to tax a frugal individual. He measured equality in terms of consumption, for it was the activity of consumption which reduced the available national product (Hobbes, 1651, pp. 270-271). While a somewhat similar sentiment can be found in Mill (1848), he also expresses the basis for the more recent concern with efficiency issues. This has become the major rationale for many propositions in favor of the consumption base. Mill stated:

To tax the sum invested, and afterwards to tax also the proceeds of the investment, is to tax the same portion of the contributor's means twice over. The principal and the interest cannot both together form part of his resources; they are the same portion twice counted (p. 814).

A similar preference for the consumption base is found in Marshall (1926),<sup>9</sup> Pigou (1928), and Einaudi (1929),<sup>10</sup> but in all instances the consumption base was seen as an ideal rather than an attainable and realistic alternative.

It remained for Irving Fisher (1942) to demonstrate that in fact a progressive expenditure tax was feasible. Kaldor (1955) revived Fisher's argument in an environment where there was significant concern for economic growth to overcome a period of perceived economic stagnation. Kaldor regarded the consumption base as at least as equitable as income, but as having the unmatched advantage, he argued, of stimulating economic growth due to its intertemporal neutrality. It can reasonably be suggested that Kaldor

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<sup>9</sup>It is interesting to note Marshall's discussion of an expenditure tax. He appears as an early and novel precursor of the optimal tax theorists. Marshall states his preference for the consumption base but notes it still will not be perfect due to the inequity of failing to tax leisure. He states:

If, of two persons with equal capacity, one works twice as hard as the other, taxes adjusted to expenditure will strike him more heavily than the others, though he deserved better of the State. Some account might conceivably be taken of this consideration in adjusting taxation between different parts of the same country where different habits of activity prevail; as, e.g., between the north and south of Italy, or of France, or, again, between England and Ireland (p. 339).

<sup>10</sup>Buchanan (1960, pp. 50-51) notes that Einaudi introduced Mill's ideas into the Italian literature where they were disputed by De Viti De Marco. De Viti De Marco argued that it was incorrect to say that the future income stream resulting from accumulation could be imputed to the initial private savings decision. In his view, private accu-

remained the major proponent of the expenditure tax for nearly two decades. More recently, the expenditure tax has gained numerous adherents for precisely the same reasons which had led Kaldor to adopt it two decades previously. Concern with questions of capital accumulation and capital taxation led many public finance specialists to favor the consumption base. At the same time, Andrews (1974) provided a convincing case for an expenditure tax. He suggested that an expenditure tax would provide a manageable and more equitable tax system and that even if an income tax was desirable, it could not be effectively implemented. On the basis of this theoretical literature, the consumption base has now been proposed in the tax reform literature: the Meade report in the United Kingdom and the United States Treasury's Blueprints for Basic Tax Reform.

One approach to examining the orthodox argument for the consumption tax is to study the relationship between consumption, accumulation, and the timing of taxation. If any component of consumption expenditure escapes taxation, then it will have permanently avoided any tax burden. On the other hand, the taxation of accumulation is a matter of tim-

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mulation was only as productive as it was due to the provision of the environment for private investment by the State. From this perspective, it was suggested that it is appropriate to tax interest income so as to compensate the State for its contribution.



ing. The income from which saving derives can be taxed, or the return on accumulation can be taxed when it accrues or is consumed. The issue can then be posed in terms of the question: when is the "best" time to tax savings (Andrews, 1974)? The retirement-consumption model provides a useful, and is the traditional, means for undertaking this analysis.

The retirement-consumption model is a two-period consumption-saving model of a representative consumer. The individual works in the first period earning labor income, with the only income accruing in the second period resulting from first period saving. Saving can be considered as the accumulation of real capital which permits the intertemporal allocation of consumption opportunities toward the second (retirement) period. All accumulation is for the purpose of future or second-period consumption. The rate of return on accumulation is given, and it is assumed to be independent of the tax institution adopted. Finally, the labor-leisure choice is exogenous in the model.

The model therefore concentrates attention on the choice between present and future consumption and emphasizes the substitution effects induced by alternative tax institutions. This, of course, is the crucial characteristic underlying both orthodox efficiency and horizontal equity objectives. If a tax involves a relative price change in

addition to a negative income effect, it will result in a welfare loss as consumers are induced to modify their consumption behavior, and, secondly, it will be horizontally inequitable as it will discriminate on the basis of individual preferences.

The retirement-consumption model can be conveniently presented in algebraic form. The relative magnitudes of any substitution effects can be illustrated by the intertemporal price ratio facing the taxpayer. The outcome of the consumer's intertemporal maximization process would be an equality between the intertemporal marginal rate of substitution and this price ratio. Consequently, the maximization of the consumer's utility function need not be explicitly carried out. The following notation will be employed:

\*  $C_j$  = consumption in period  $j$ ,

\*  $Y_j$  = labor income in period  $j$ ,

\*  $\rho_j$  = the rate of interest in period  $j$ , and

\*  $t_j$  = the marginal (and average) tax rate for period  $j$ .

The nature of market possibilities for the substitution of present for future consumption is given by the ratio of maximum feasible future consumption to maximum feasible present consumption.

In the pre-tax situation, maximum feasible present and future consumption are, respectively,

$$C_1 = Y_1 \quad (2.3)$$

$$C_2 = (1 + \rho)Y_1. \quad (2.4)$$

The price ratio is, therefore,

$$C_2/C_1 = 1 + \rho. \quad (2.5)$$

In the intertemporal dimension, the most desirable tax will be that which leaves the price ratio exactly the same as that expressed in equation (2.5), in other words, a tax involving solely an income effect and no substitution effect. Consider a consumption tax. Individuals are only taxed when they consume, consequently the tax burden is independent of the receipt of income. Deriving the price ratio in a similar fashion to the previous case, we first note the maximum attainable consumption levels in each period.

$$C_1 = (1 - t)Y_1, \text{ and} \quad (2.6)$$

$$C_2 = (1 - t)(1 + \rho)Y_1. \quad (2.7)$$

From (2.6) and (2.7), the price ratio is:

$$C_2/C_1 = 1 + \rho. \quad (2.8)$$

A comparison of equations (2.5) and (2.8) indicates that the consumption tax is neutral with respect to the present-fu-

ture consumption decision. Consequently, it achieves both efficiency and equity objectives. This is not the case with an income tax. Deriving the price ratio associated with the income tax illustrates this distortion. The attainable consumption levels in each period are:

$$C_1 = (1 - t)Y_1, \text{ and} \quad (2.9)$$

$$\begin{aligned} C_2 &= (1 - t)(1 + \rho)Y_1 - t\rho(1 - t)Y_1 \\ &= (1 - t)Y_1 (1 + \rho - t\rho) \end{aligned} \quad (2.10)$$

The price ratio given by these expressions is:

$$C_2/C_1 = 1 + \rho - t\rho. \quad (2.11)$$

From this equation, it is evident that there is a distortion which raises the price of future consumption (or saving) relative to present consumption as compared with either the pre-tax or the consumption tax case. This distortion derives from the term,  $t\rho(1 - t)Y_1$ , in equation (2.10), which is the taxation of property income. Consequently, the income tax involves an excess burden and also discriminates against those who have a relatively greater preference for future consumption. It is clear that the magnitude of the distortion varies with the magnitude of the interest rate and the tax rate.

In summary, the orthodox analysis leads to three propositions:

- \* The consumption tax is neutral and therefore a desirable tax base;
- \* The income tax distorts between present and future consumption and consequently fails to meet standard efficiency and horizontal equity objectives; and,
- \* If the income tax exempted property income (a labor income tax), it would be neutral and therefore equivalent to an income tax exempting saving (a consumption tax). Therefore, both a labor income tax and a consumption tax are preferred to the comprehensive income tax.<sup>11</sup>

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<sup>11</sup>As Feldstein (1978) notes, this result is only strictly correct in a partial equilibrium setting, which is the nature of the model presented here. If the supply of labor was not perfectly inelastic, there may be second-best arguments for imposing a heavier burden of taxation on income derived from capital, in other words, the use of some form of a comprehensive income tax. This will depend on whether or not leisure and present consumption are closer gross substitutes than leisure and future consumption.

One instance when the substitution of a consumption tax for an income tax would be efficient is if the division of income between consumption and saving does not vary with the amount of leisure consumed. In that case, the marginal rate of substitution between present and future consumption is independent of the amount of leisure consumed. See Bradford and Rosen (1976).

In the standard model outlined above, it was concluded that an important characteristic of the expenditure tax was its intertemporal neutrality. This was in direct contrast to the income tax case. On the other hand, in the public debt example of the previous section it was demonstrated that the expenditure tax was not intertemporally neutral due to timing problems. This apparent contradiction of conclusions can be resolved by examining the settings in which the tax is assumed to be operating. In the presentation of the orthodox model, we are depicting a world in which there is no change in tax rates, whereas in the public debt example, there is, for the purpose of the argument, no taxation initially but taxation (or an increase in the rate of taxation) in the future. A central question asked in this chapter is what this analytic dichotomy implies about the nature of the tax system and the taxpayer expectations assumed in the orthodox framework.

Implicit in orthodox theory is the proposition that individuals expect current tax institutions, which have been defined to include current tax rates, to remain in effect indefinitely. This is not to say that tax arrangements never change--in fact, the major thrust of the orthodox literature is supposedly toward tax reform--but rather that in the comparative static exercises undertaken by taxation the-

orists, questions of transition are commonly ignored. For example, from the standard analysis outlined above, it appears that a move from an expenditure tax to a labor income tax will maintain the neutrality of the initial tax regime; this is not the case.

Consider Figure 3 which illustrates the retirement-consumption model. On the vertical axis is current consumption,  $C_1$ , while future consumption,  $C_2$ , is depicted on the horizontal. The pre-tax budget line is  $Y_1(1 + \rho)Y_1$ , and the consumer is facing an expenditure tax at a rate of  $t^E$ . Consequently, the taxpayer expects to equilibrate at  $E^E$  consuming the combination,  $C_1^{Act} C_2^{Exp}$ . In the first period,  $C_1^{Act}$  is actually consumed, and  $t^E C_1^{Act}$  is paid in taxes. The tax regime is then reformed and becomes a labor income tax. As the taxpayer receives no labor income in the second period, there is no further tax burden. Given his period one consumption decision, he must consume  $C_2^{Act}$  in the second period. The taxpayer is located at  $E^L$  on indifference curve  $i_1$ . Although both tax institutions are neutral, there is a welfare cost here, as the same revenue could have been received with the taxpayer better off on indifference curve  $i_2$  at  $E^{L*}$ . In fact, if the taxpayer had anticipated this tax reform, this is the position he would have chosen.

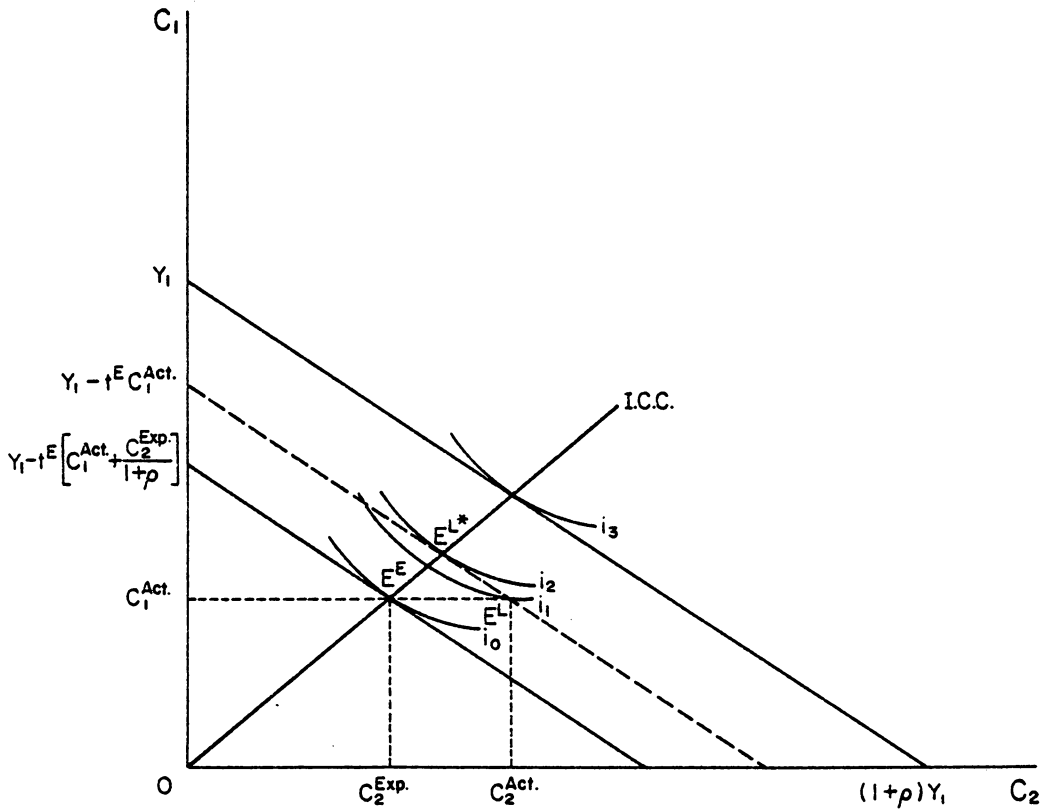


Figure 3: Transition from an expenditure tax to a labor income tax



To define the orthodox perspective with respect to taxpayer expectations more sharply, consider Pigou's treatise A Study in Public Finance. In that volume, Pigou coins the term "announcement effects." This expression is intended to cover tax-induced changes to behavior when tax institutions and rules are announced. In fact, however, Pigou defines announcement effects to be equivalent to tax induced incentive effects in general. Implicit in this definition is the proposition that taxpayers do not respond at all until tax regimes or changes to taxation are announced. In other words, Pigou and those following that general line of analysis have assumed crucial dimensions of the incentive effects of taxation to be totally absent by defining an equivalence relation between announcement and incentive effects. The proposition which I wish to stress is that the announcement effects of taxes are simply a subset of incentive effects in general. Just as interest rates anticipate changes in monetary policy, or share prices the future profitability of one enterprise or another, it shall be argued here that, contrary to Pigou, the incentive effects of taxation may anticipate the announcement of changes to tax institutions. This view is not without empirical support. For example, the circumstances surrounding oil depletion allowances have often been cited (Feldstein, 1976a). The frequent proposal

to eliminate the allowance has resulted in an increase in the cost of capital to the oil industry, although no removal of subsidy has been announced or additional revenue received.

## 2.5 TAX REFORM

The whole thrust of the standard discussion of tax bases has, in its own terms, been directly toward tax reform. However, it is clear from the discussion in section 2.4 that this is a very specific understanding of the concept of tax reform. For example, it clearly ignores transition questions. However, more recently there has been an examination of what can be termed a theory of tax reform. This discussion has centered on a perceived conflict between efficiency on the one hand and equity on the other. In this section, it is not intended to examine in any detail the issues raised by this theory, for they comprise part of the subject matter of Chapters VII and VIII.

The theory associated mainly with Feldstein (1976a) suggests that tax reforms based on efficiency grounds will necessarily create horizontal inequities. The reason for this is that tax preferences will be capitalized into the prices of the favored (or unfavored) activities. Consequently, the removal of the preferences on efficiency grounds will impose

losses on owners of the previously favored activities. Taxpayers have paid a price for those assets which reflect their favored nature, and so the removal of the preference represents a windfall loss.

If we investigate Feldstein's understanding of expectations in a little more detail, it becomes clear that it is precisely the view exemplified by Pigou's use of the term "announcement effects," namely as encompassing all responses to tax changes. As a result, it is subject to all the deficiencies indicated in the previous sections of this chapter. For example, the results of his argument rest on the assumption that nobody anticipates the tax reforms being discussed. Clearly this may be reasonable in some circumstances, but it cannot form the foundation of a general theory of tax reform.

## 2.6 CONCLUSION

This chapter has demonstrated both at the specific level of the choice of tax base and at the more general level of tax reform, that the theory of taxation depends crucially on issues of intertemporal choice and on the assumptions made about taxpayer expectations. In the second section of the chapter it was shown why taxpayer expectations were closely related to questions of timing in the theory of taxation.

In the examination of public debt, considered in the third section, the role of expectations in the intertemporal questions implied by the issue of public debt are obvious and have as a consequence received attention. It was demonstrated in the third section that the impact of alternative financing institutions in the intertemporal dimension depended on the nature of taxpayer expectations. In the fourth and fifth sections, we examined other aspects of the theory of taxation where expectations questions were relevant due to the presence of timing questions, but nevertheless taxpayer expectations had not received any attention. In this discussion, it became evident that public finance theorists had consistently made a specific assumption about taxpayer expectations, namely that the current tax regime was expected to continue unchanged. In the subsequent chapters, we shall examine the issues discussed in sections four and five by considering explicitly the role of taxpayer expectations and intertemporal choice for the choice of tax base and tax reform in general.

## Chapter III

### THE INTERTEMPORAL WELFARE COST OF EXPENDITURE AND INCOME TAXATION

#### 3.1 INTRODUCTION

Recent renewed concern with questions of capital accumulation and economic growth has resulted in considerable attention being placed on the intertemporal effects of the tax system. A common outcome of these discussions is the proposal that a tax system relying on a consumption or expenditure tax would be more desirable than one employing an income tax. This conclusion is based on the supposed neutrality of the expenditure tax with respect to individuals' choices between present and future consumption. More recently, on the basis of growing academic support, the expenditure tax has appeared in both U.S. and U.K. tax reform discussions as both a feasible and favored alternative.

In this chapter, it will be argued that much of this debate has been based on an implausible assumption which, if replaced by a more appropriate alternative, leads to a conclusion exactly the opposite of those stated above: the income tax (if adjusted for inflation) will, in general, be more intertemporally neutral than the expenditure tax. This conclusion is supported by an examination of U.S. data between 1929 and 1978.

The analysis in this chapter will be based on the retirement-consumption model presented in the previous chapter. The second section of this chapter presents an argument suggesting that the conclusions derived from the analysis of that model, although correct, lack practical relevance. The reason for this, it will be suggested, is that crucial dimensions of intertemporal taxation behavior are totally absent from the standard analysis. The circumstances in which tax rates remain constant are rare, if not nonexistent. Further, it is inconsistent with rationality postulates to assume that taxpayers will fail to observe this historically consistent occurrence. In the third section, these arguments will be presented in terms of the retirement-consumption model, and an examination of their relevance will be undertaken. Section 4 pursues this question further by undertaking an empirical analysis of the issues. The conclusions are presented in the final section.

### 3.2 TAX RATES AND EXPECTATIONS

In the previous chapter it was demonstrated that the standard position expressed in the public finance literature was that while the income tax distorted intertemporally, the expenditure tax was intertemporally neutral. It is suggested in this section that this conclusion is incorrect, as

it is based on an implausible assumption. Modification of this assumption suggests that the orthodox perspective can at best be viewed as a special case. The crucial assumption made in tax analysis is that while the burden of the income tax is subject to the problems of timing, the consumption tax is entirely independent of these concerns. In this section, we shall examine the implications of this observation.

As a point of departure, consider the statement of the U.S. Treasury in its Blueprints for Basic Tax Reform:

A consumption tax amounts to a tax on lifetime endowment. It may be viewed as an ideal wealth tax, that is, a tax that makes an assessment on lifetime wealth. An income tax will tend to assess tax burdens in a way presumably correlated with lifetime wealth, but because it depends upon matters of timing, the correspondence is nowhere near as close as would be the case under a consumption base tax (p.42) (emphasis added).

Contrary to this view, it will be argued here that the consumption tax will also depend on timing questions in all but one special (and unlikely) instance, namely, where tax rates are constant over the planning horizon of the consumer. The absence of changing tax rates in orthodox analysis is a serious theoretical omission as, even in a world governed by a unanimity rule, tax rates will change in accordance with tastes for the size of the public sector. It will be taxpayer expectations of tax rates which will be the relevant dimension of analysis. If taxpayers expect changes in the

rate of taxation, then the rationality assumptions underlying individual behavior suggest that people will modify their activities to minimize the burden of taxation. If this adjustment does occur, it is no longer clear that the supposedly intertemporally neutral consumption tax remains preferable.

It is a simple observation that the size of the public sector has rarely, if ever, been constant. The magnitude of change and the absolute size of the public sector depends on which measure is adopted (Brown and Jackson, 1978, p. 116). The general trend in the U.S. has been upward, as evidenced in the data provided by Borcharding (1977). In the 70 years since 1902, government spending has increased at an average rate of 5.3 percent per annum, while gross national product (GNP) has risen at only 3 percent per annum. If the period since 1932 is examined in isolation, the growth of government spending has been at 7 percent per annum, while GNP has only risen at 4.2 percent per annum. Similar evidence is found in Nutter's (1978) study of the size of government. Underlying such a change in the share of the public sector is a necessary increase in tax rates to finance the additional public expenditures.<sup>12</sup>

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<sup>12</sup>It is clear that it may not be necessary for current nominal rates of taxation to change. Money finance implies a tax on money balances not revealed in tax rates, while debt finance implies an increase in the future level of



However, even if the public sector were static, the justification provided by the orthodoxy for its use of constant tax rates is elusive. The paradigm of the economic theory of intertemporal consumption behavior is the life-cycle theory. The common characteristic of these models is the use of the capital market to create an essential independence between the income earnings stream and the time pattern of consumption. The individual maximizes utility by allocating his lifetime consumption opportunities. As it is generally assumed (and empirically verified) that individual's income streams rise over time, then the existence of a progressive income tax means that the individual's planning horizon will encapsulate a regime of rising tax rates. The impact of a rising tax rate will be seen on two margins. It will influence the returns to investment in human capital. This will influence both the magnitude and the nature of human capital investment. For example, the greater are the initial returns to the investment, the more preferred it will be to an alternative investment which does not yield a return until later in life. Secondly, and the relevant concern in the retirement-consumption model presented in this dissertation, is the consumption-savings choice. Interest

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taxation. Furthermore, changes in the population or income structure can change tax revenues without an explicit change in tax rates.

income will experience a different tax burden depending on the particular stage of the life cycle in which it is earned.

A similar argument can be presented in the case of a progressive expenditure tax. While the simple version of the life cycle model assumes equal consumption per period, longitudinal studies of given age cohorts provide evidence that consumption tends to rise through an individual's working life prior to tapering off. In this instance, the imposition of a progressive expenditure tax will see the individual faced with rising tax rates. It is worth noting that the argument to be presented in this chapter does not depend on rising tax rates but rather on changing rates.

Of equal importance is the nature of individual anticipations with respect to these changes in tax rates. Although obvious, individuals must form some expectation of future tax rates. This expectation may (implicitly) be that there will be no change over the planning horizon. In this chapter, it is assumed that individuals perfectly anticipate future tax rates. Given the historically consistent upward trend in tax rates, the rationality postulates of economic theory suggest that some change in tax rates be expected. It then becomes a question of the magnitude of those expected changes.

The available empirical evidence on this issue is limited. In response to Barro's (1974) examination of the issue of whether or not government bonds represent net wealth, there have been a number of empirical studies. The question being asked is whether the issue of public debt results in people anticipating the future tax burden that the debt implies. These studies, which were discussed in more detail in Chapter II, have estimated life cycle consumption functions to determine the impact on current consumption activities of future tax burdens. In the most recent contribution, Tanner (1979) claims that such taxes are nearly completely anticipated. Although the conclusion relates solely to the taxes implied by the issue of public debt, it may lend some support to the assumption being adopted in this paper, namely, that future tax rate changes are expected.

To the extent that the expectations of future tax rates are particularly conservative, then the arguments of this dissertation would require modification. However, even then the appropriate approach to consider those circumstances is not provided by the orthodoxy. In addition to the conventional welfare loss, it can be shown that there will also be a welfare loss due to incorrect expectations (see Chapter VII). Further, although the assumption of perfect foresight

seems extreme, in the presence of steadily growing tax rates it will not yield results qualitatively different to some constructions of adaptive expectations. Consequently, it is suggested that the assumption of perfect foresight provides a useful benchmark for analysis.

If it is assumed that taxpayers do anticipate changing tax rates, then they will adjust their intertemporal choices to minimize their tax burdens. These behavioral adjustments result in welfare costs not observed in the standard analysis outlined in Chapter II, section 4. Reconsider the question posed in the examination of the retirement-consumption model outlined in Chapter II. The objective was to determine the "best" base in terms of efficiency and equity goals. This question will be reexamined in the light of changing tax rates. As a specific example, consider the public debt case. Debt implies higher tax rates in the future to service and repay the debt. In this context, the question being asked is whether it would be more desirable to employ an income tax or a consumption tax, given that this tax rate variation will occur and is perfectly anticipated? The general answer to this question is that the consumption tax--supposedly the intertemporally neutral tax--will be more distorting than the income tax.

The intuitive rationale for this conclusion is not difficult to isolate. Initially, consider the consumption tax. The burden of a consumption tax, with rising tax rates over time, can be reduced by intertemporal shifts in any form of consumption. This point can in fact be illustrated by use of the existing public finance literature. Consider two of the arguments which have been presented in favor of the expenditure tax. First, it has been argued that macroeconomic objectives are better served by consumption taxes and, secondly, that a consumption base reduces the necessity for averaging provisions which are an essential adjunct to income tax systems. Intrinsic to both of these arguments is a proposition stressing the differing potential for the individual to make intertemporal adjustments to his taxable base under income and consumption taxes. In this same literature, however, it has not been recognized that these arguments are double-edged. An expenditure tax, by enabling the individual adjustment envisaged by these propositions, removes an important intertemporal lump-sum attribute of the income tax. The taxpayer is provided with significant opportunities to adjust the magnitude of his taxable base in any period and, consequently, to influence his total tax burden. If tax rates are expected to rise, for example, it becomes relatively more profitable to borrow on future

income (or save less) and consume more currently. This is not so with the income tax, where the tax burden can only be decreased by reductions in the amount of interest income. If a labor-leisure choice were to be incorporated into this model, it would have relevance at this point as changing tax rates impact on the price of current to future leisure. The general point remains intact; the income tax has significant intertemporal lump-sum attributes which do not characterize the expenditure tax.<sup>13</sup>

### 3.3 EXPENDITURE AND INCOME TAXATION: THE CASE OF CHANGING TAX RATES

#### 3.3.1 A Two-Period Example

To determine the importance of tax rate changes, let us reexamine the retirement-consumption model. The case to be studied is one where labor income is earned in period 1,  $Y_1$ , but there are now two tax rates,  $t_1$  and  $t_2$ , the subscripts indicating the relevant period. The price ratio in the absence of taxation is unaffected by these modifications and so remains  $1 + \rho$ . The price ratio in the income tax case can be derived by the same method as employed in Chapter II,

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<sup>13</sup>In the retirement-consumption model being employed in this dissertation, intertemporal shifts in labor income are not possible by assumption. This assumption is, it is suggested, empirically validated by the difficulty, if not inability, to transfer intertemporally the return to human capital.

and is

$$\begin{aligned} C_2/C_1 &= (1 - t_1)Y_1(1 + \rho - t_2\rho)/(1 - t_1)Y_1 \\ &= 1 + \rho - t_2\rho. \end{aligned} \quad (3.1)$$

This expression is similar to the constant tax rate case; the only difference is that the tax rate that influences relative prices is the second period tax rate. This result demonstrates that neutrality of the income tax in the intertemporal dimension does not require equalization of tax rates across periods but rather setting the second period tax rate, (i.e., the tax on interest income)  $t_2$ , equal to zero. In essence, this observation indicates that the adoption of a labor income tax rather than a comprehensive income tax would be a desirable alternative. This issue will be discussed further in Chapter IV.

In contrast to the income tax, the inclusion of changing tax rates significantly modifies the intertemporal price ratio associated with the consumption tax. The price ratio with a consumption tax becomes

$$\begin{aligned} C_2/C_1 &= (1-t_2)(1+\rho)Y_1/(1-t_1)Y_1 \\ &= (1+\rho)(1-t_2)/(1-t_1). \end{aligned} \quad (3.2)$$

When tax rates vary intertemporally, the magnitude of the distortion associated with the consumption tax varies with the ratio of one minus the future tax rate to one minus the current tax rate. An examination of expressions (3.1) and

(3.2)--the price ratios associated with each tax--leads to the conclusion that the consumption tax will distort to a greater degree than the income tax, except for very small changes in tax rates.<sup>14</sup>

Some indication of the strength of this conclusion can be illustrated by examining equations (3.1) and (3.2). In the case of increasing tax rates, the substitution effect associated with the consumption base, and its accompanying excess burden, will be greater than that of the income base as long as the value of equation (3.1) (the income tax price ratio) is greater than the value of equation (3.2). The closer is the value of the price ratio to  $1 + \rho$ , the less is the tax induced substitution toward current consumption and hence the smaller is the distortion associated with the particular tax. In order to examine the relationship between the tax institutions, let us define a term,  $\alpha$ , which equals  $t_1/t_2$ , the ratio of the current to the future tax rate. As long as  $t_2$  exceeds  $t_1$ ,  $\alpha$  will, of course, always be less than one. The objective is to derive a value of  $\alpha$ , say  $\alpha^*$ , at which the price ratios of the two taxes are equal. A sufficient condition for the intertemporal efficiency superiority of the income tax will then arise whenever the

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<sup>14</sup>These same conclusions are reached if the model is generalized, for example, by allowing labor income to be earned in more than one period.



actual  $\alpha$  takes on lower values than  $\alpha^*$ . Such a circumstance would mean that tax rates had increased by an amount such that  $(1 + \rho - t_2\rho)$  was greater than  $(1+\rho)(1-t_2)/(1-t_1)$ , indicating that the consumption tax distorts more than the income tax.

To derive the "indifference" value of  $\alpha$ , substitute  $\alpha t_2$  for  $t_1$  in equation (3.2) and solve for  $\alpha^*$  given an assumed equality of equations (3.1) and (3.2). That is,

$$1 + \rho - \rho t_2 - (1 + \rho) (1 - t_2)/(1 - \alpha^* t_2) = 0. \quad (3.3)$$

Solving for  $\alpha^*$  gives

$$\alpha^* = 1/(1 + \rho - \rho t_2.) \quad (3.4)$$

This expression gives the value of  $\alpha$  at which there is indifference between the consumption and income tax bases. For reasonable values of  $\alpha$  and  $t_2$ , this expression will not be significantly different from one. This indicates that only minor deviations of equality between  $t_1$  and  $t_2$  are required in order to justify the use of an income tax rather than a consumption tax. Consider an example using the above formulation of the  $\alpha^*$  value. Assume that the rate of interest is 5 percent and that the second-period tax rate is 25 percent. Given these values, the  $\alpha^*$  parameter equals 0.964. Using the definition of  $\alpha$ , we can then derive the  $t_1$  value which would leave the consumption and income taxes imposing equivalent distortions. That  $t_1$  value is 24.1 percent. In

other words, if the tax rate had increased by any more than 0.9 of one percentage point over the period, the income tax would have been preferable.

### 3.3.2 The T-Period Case

An important variable ignored in this analysis is the planning horizon of the taxpayer. The relevance of the calculations in the previous paragraph rest on an assumption that there are only two periods over which intertemporal choices are made. If the planning period is longer, the greater is the increase in tax rates which is likely to have occurred; but, also, the rate of return will be greater as the interest income compounds over several periods. In the social security and consumption theory literature, periods of 20 to 30 years are commonly assumed to be appropriate as planning horizons. Ando and Modigliani (1963) in their tests of the life cycle hypothesis assumed a 40-year working span and a 10-year retirement period. Within such periods, there have been dramatic changes in the level of taxation. In the appendix to this chapter, it is illustrated that this is unlikely to make any significant changes to the results derived in the two-period model. In summary, the magnitude of tax rate increases noted here (average increases of less than one percentage point per period) cannot be ruled out in the light of fiscal experience this century.

### 3.4 EMPIRICAL ANALYSIS

The object of this section is to contrast the intertemporal welfare cost of the income tax with the welfare cost which would have been associated with the expenditure tax had it been employed. The emphasis of this section will be on the implications of the growth of government for tax rate changes rather than on the change in tax rates inherent in the life cycle model. While the intertemporal welfare cost of taxation has been measured by Harberger's (1964) method, Feldstein (1978) has provided a more useful approach. Feldstein's method has the advantage of taking account of the intertemporal substitution of consumption induced by the tax (and hence the resulting welfare cost), even though there may be no net change in saving. Secondly, this approach gives an estimate of the welfare loss in each period rather than a single present value for all time which is the case with the Harberger approach. While we shall follow Feldstein's method, in order to facilitate the argument of this dissertation some modifications will be made.

Feldstein poses the question by considering an individual who saves now and plans to dissave  $T$  years later. Setting the price of current consumption as numeraire, a compensated demand curve for future (retirement) consumption,  $R$ , can be derived. This demand curve is drawn in terms of the current

price of retirement consumption. In the absence of taxation, this price,  $P_0$ , will be  $e^{-\rho T}$ , where  $\rho$  is the rate of return per year and  $T$  is the number of years. If the price  $P_1$  corresponds to the tax case, then  $P_1$  will equal  $e^{-rT}$ , where  $r$  is the net of tax rate of return (see Figure 4). It is then possible to calculate a linear approximation of the welfare loss resulting from the tax-induced price change, the triangle ABC in Figure 4. We commence with the basic measure of the welfare loss triangle:

$$L = 1/2 \tau \Delta Q, \quad (3.5)$$

where  $\tau$  is the tax per unit, and  $Q$  is the quantity. From this basic formulation, we can by substitution derive a formula in terms of the notation of the retirement-consumption model. First, substitute for  $\tau$  and  $\Delta Q$ ,

$$\begin{aligned} L &= -1/2(P_1 - P_0)(R_1 - R_0) \\ &\approx -1/2(P_1 - P_0)(\partial R/\partial P)(P_1 - P_0) \\ &= -1/2(P_1 - P_0)^2 (\partial R/\partial P), \end{aligned}$$

multiply by  $R_0/R_0$  and  $P_0/P_0$ ,

$$\begin{aligned} L &\approx -1/2(P_1 - P_0)^2 (\partial R/\partial P)(P_0/R_0)(R_0/P_0) \\ &= -1/2(P_1 - P_0)^2 \epsilon_{RP}(R_0/P_0), \end{aligned}$$

multiply by  $P_0/P_0$ ,

$$\begin{aligned} L &\approx -1/2(P_1 - P_0)^2 \epsilon_{RP}\{(R_0 P_0)/(P_0 P_0)\} \\ &= -1/2((P_1 - P_0)/P_0)^2 \epsilon_{RP} R_0 P_0 \\ &= -1/2((P_1 - P_0)/P_0)^2 \epsilon_{RP} S_0 \end{aligned} \quad (3.6)$$

In this expression,  $\epsilon_{RP}$  is the value of the compensated elasticity of R with respect to price, evaluated at  $P_0$ , while  $S_0$  is the value of saving at the pre-tax position. As both the elasticity and "quantity" of saving is defined at the pre-tax position, they will have the same value when applied to either the income or the consumption tax base. The difference in the measure of welfare cost applying to these tax bases will be evident in the current post-tax price of future consumption.

The pre-tax price of future consumption is the amount of current consumption which must be forgone in order to consume one unit of future consumption. If one dollar is saved in the first period, it will accumulate to  $e^{\rho T}$ , where T is the number of years the dollar is saved. The current price,  $P_j$ , is then equal to  $1/e^{\rho T}$ . In fact, as  $\rho$  changes from period to period in the following analysis,  $P_j$  is defined in the more general form:

$$P_j = 1/\prod_{i=j}^{j+T} e^{\rho i}. \quad (3.7)$$

Now consider the current price of future consumption in the consumption tax case,  $P_j^C$ . For any given dollar of labor income, the choice facing the taxpayer is to consume  $\$(1 - t_j)$  now or  $\$(1 - t_{j+T})e^{\rho T}$  in the future. The current price of future consumption, is, therefore,  $(1 - t_j)/\{(1 - t_{j+T})e^{\rho T}\}$ . Again, the more general form of the expression allowing the yield on accumulation to vary is

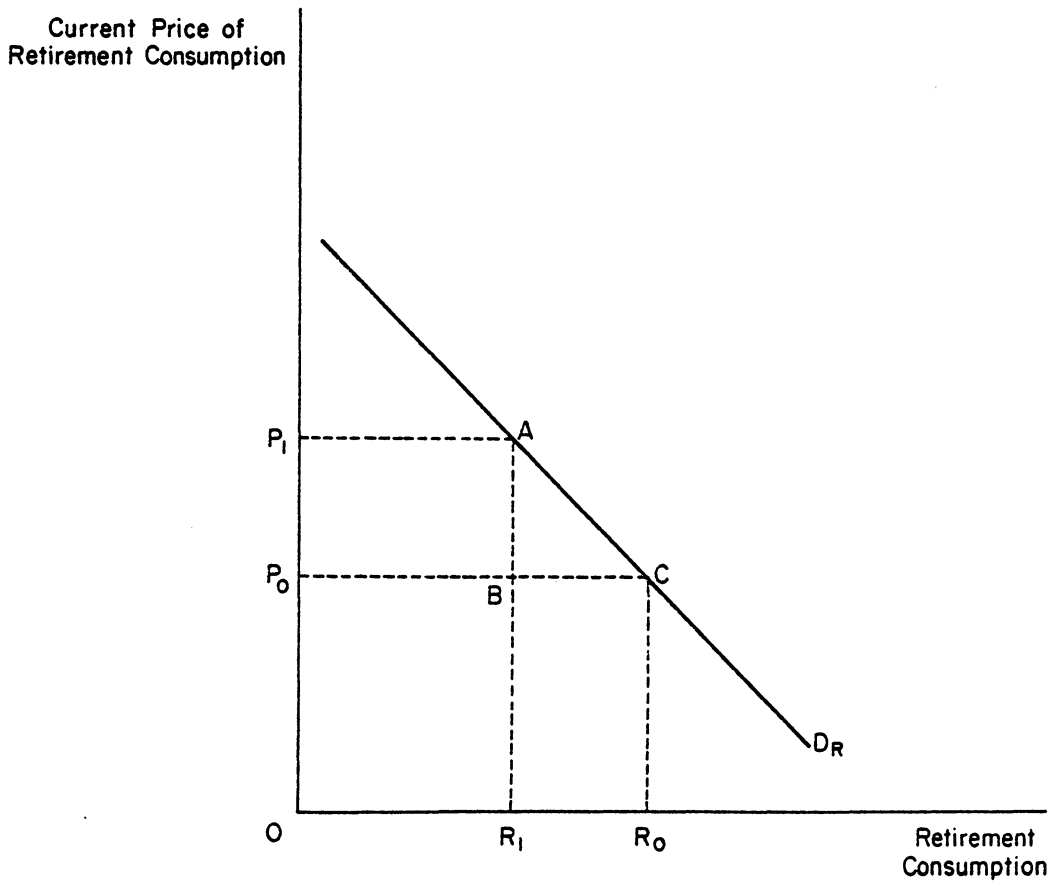


Figure 4: The demand for future consumption

$$P_j^C = (1 - t_j) / \left\{ (1 - t_{j+T}) \prod_{i=j}^{j+T} e^{\rho i} \right\}. \quad (3.8)$$

Finally, the current price of future consumption associated with the income tax,  $P_j^{Y*}$ , can be derived. By forgoing a dollar of current consumption, the saver can only earn a rate of return equal to  $\rho(1 - t)$  per period due to the tax on interest income. Allowing for both tax rate and interest rate changes, the current price of future consumption is:<sup>15</sup>

$$P_j^{Y*} = 1 / \left\{ \prod_{i=j}^{j+T} e^{\rho i} (1 - t_i) \right\}. \quad (3.9)$$

Equations (3.7), (3.8), and (3.9) indicate how much current consumption must be forgone in order to consume one unit of consumption  $T$  years in the future. Equation (3.7) is the pre-tax price and so corresponds to  $P_0$  in Figure 4, while equations (3.8) and (3.9) are the consumption and income tax prices, respectively, and so are analogous to the price depicted as  $P_1$  in Figure 4. The difference between the value of equation (3.7) and each of equations (3.8) and (3.9) therefore illustrates the tax-induced price distortion between present and future consumption. It is this price distortion which generates the welfare loss.

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<sup>15</sup>For purposes of calculation, it was convenient to work with average tax rates and interest rates, where the averages are defined over the  $T$  year planning horizon of the taxpayer. Therefore, equation (3.7) can be written, for example, as  $P_j = 1/e^{\bar{\rho}T}$ . Similar adjustments can be made to equations (3.8) and (3.9).

As a first step, it is necessary to define the taxpayers planning horizon. As noted previously, other areas in economic analysis have assumed periods of 20 to 30 years. In the analysis undertaken here, a time horizon of 20 years will be examined. Of major importance is the magnitude of the change in tax rates and this can be influenced by the period of time to be examined. This is particularly clear in equation (3.8) which includes the term  $(1 - t_j)/(1 - t_{j+T})$ . By choosing a 20 year planning horizon and given the initial data point of 1929, this means that the initial ratio of tax rates involves the rate applying in 1929 and that applying in 1949. This is an advantage, as by 1949 the exceptionally high tax rates associated with World War II do not enter into the calculations at this stage, although they do have influence around the years 1942-45. Shorter planning periods would see the war year tax rates having a significant effect in favor of the income tax. However, the adoption of a 20-year horizon rather than a shorter period reduces the number of measurable welfare losses which can be made from the data set. Due to the term  $t_{j+T}$ , the last case is that associated with 1958, as the data only run to 1978. Consequently, the results to be shown below indicate the welfare loss per year for a period of 30 years.



The data used to estimate this welfare loss are presented in Table 1, part A, and are taken from the Statistical Abstract of the United States. The tax rates to be employed are simply the proportion of GNP which is absorbed by the public sector (see column A1). While the absolute values of tax rates do matter, of major importance in this analysis is the change in the level of tax rates over time. Consequently, the use of government expenditures as a proportion of GNP provides a useful proxy. It does, however, mean an important assumption is being made. As the same tax rate is being used for estimation of the welfare loss of income and consumption taxes, it is being assumed that the growth rate of public expenditures is independent of which tax institution is adopted. The rate of interest used is the corporate bond rate provided by Moody's (column A3). Until this point, the impact of inflation has been ignored. It has been assumed that the rate of discount,  $\rho$ , is the real rate of return. Consequently, in the empirical analysis it is necessary to make a distinction between real and nominal yields. Specifically, the nominal bond rate must be adjusted by a price index to get a real rate of return (see column A5); the consumer price index has been used to do this. In columns A2, A4, and A6, the average of the tax rates, nominal interest rates, and real interest rates are

shown. These averages are defined over the 20-year planning horizon, and so for 1958, for example, the value of  $\bar{t}$  shown in column A2 is the average of the tax rates applicable over the period 1958-1978. These average values will be used to enable more convenient calculation of the prices of future consumption derived in equations (3.7), (3.8), and (3.9).<sup>16</sup> The presence of inflation harms the case in favor of the income tax for, among other reasons, movements in nominal rates of interest result in changes in the tax burden, irrespective of the direction of change in real rates of return. The importance of this factor, as will be revealed further below, suggests that it is important to isolate the impact of two factors in examining the income tax. First, as the theoretical analysis undertaken in the previous section of this chapter illustrates, the income tax distorts due to the taxation of interest income. In that analysis, however, it was assumed that the income tax was levied on real interest income. As many income tax systems impose taxes on nominal interest income, then the presence of inflation, by driving a wedge between nominal and real returns, will create an additional distortion. Not only is interest income taxed, but the effective rate of taxation is higher on that form of income. In equation (3.9), consist-

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<sup>16</sup>See footnote 15.

TABLE 1

Empirical Estimation of the Welfare Costs of Expenditure and  
Income Taxation\*

A. Tax Rates and Interest Rates

Year	A1 $t_j$	A2 $\bar{t}$	A3 $r_j$	A4 $\bar{r}$	A5 $\rho_j$	A6 $\bar{\rho}$
1929	.1	.2361	.0473	.0341	.0473	.0174
1930	.122	.2426	.0455	.0330	.0708	.0169
1931	.163	.2472	.0458	.0321	.1338	.0141
1932	.182	.251	.0501	.0312	.1532	.0049
1933	.192	.2554	.0449	.0302	.0963	-.0024
1934	.198	.2597	.04	.0295	.0065	-.0059
1935	.185	.2631	.036	.0290	.0111	-.0061
1936	.195	.2661	.0324	.0287	.0227	-.0100
1937	.165	.2687	.0326	.0288	-.0035	-.0052
1938	.198	.2734	.0319	.0291	.0505	-.0048
1939	.194	.2771	.0311	.0294	.0443	-.0068
1940	.184	.2815	.0284	.0301	.0188	-.0073
1941	.231	.2858	.0277	.0309	.0277	-.0068
1942	.404	.2885	.0283	.0317	-.0783	-.0063
1943	.486	.2826	.0273	.0319	-.0342	-.0007
1944	.49	.2724	.0272	.0332	.0098	.0025
1945	.437	.2617	.0262	.0340	.0034	.0025
1946	.218	.2535	.0253	.0349	-.0600	.0037
1947	.182	.2568	.0261	.0362	-.1175	.0078
1948	.195	.2629	.0282	.0377	-.0495	.0150
1949	.23	.2686	.0266	.0394	.0363	.0185
1950	.215	.2724	.0262	.0415	.0164	.0175
1951	.24	.2776	.0286	.0443	-.0505	.0177
1952	.27	.2816	.0296	.0465	.0077	.0218
1953	.278	.2839	.0320	.0487	.0245	.0234
1954	.265	.2855	.029	.0508	.0240	.0227
1955	.245	.2885	.0306	.0536	.0343	.0203
1956	.248	.2936	.0336	.0565	.0187	.0185
1957	.26	.2977	.0389	.0590	.0033	.0189
1958	.284	.3012	.0379	.0611	.0106	.0195
1959	.269		.0438		.0357	
1960	.27		.0041		.0425	
1961	.285		.0435		.0334	
1962	.285		.0433		.0321	
1963	.282		.0426		.0305	
1964	.277		.044		.0309	

Table 1, continued

A. Tax Rates and Interest Rates						
Year	A1 $t_j$	A2 $\bar{t}$	A3 $r_j$	A4 $\bar{r}$	A5 $\rho_j$	A6 $\bar{\rho}$
1965	.275		.0449		.0277	
1966	.284		.0513		.0277	
1967	.304		.0551		.0263	
1968	.31		.0618		.0198	
1969	.305		.0703		.0166	
1970	.317		.0804		.0212	
1971	.32		.0739		.0309	
1972	.317		.0721		.0391	
1973	.31		.0744		.0121	
1974	.324		.0857		-.0240	
1975	.348		.0883		-.0031	
1976	.336		.0843		.0266	
1977	.33		.0802		.0157	
1978	.325		.0873		.0113	
B. The Price of Future Consumption: Pre-Tax and Consumption Tax Cases						
Year	B1 $e^{\bar{\rho}T}$	B2 $P_j$	B3 $1-t_j/1-t_{j+20}$	B4 $P_j^c$		
1929	1.4164	0.7060	1.1688	0.8252		
1930	1.4009	0.7138	1.1156	0.7964		
1931	1.3266	0.7538	1.1013	0.8302		
1932	1.1034	0.9063	1.1205	1.0155		
1933	0.9541	1.0482	1.1191	1.1730		
1934	0.8880	1.1262	1.0912	1.2288		
1935	0.8843	1.1308	1.0795	1.2207		
1936	0.8193	1.2205	1.0838	1.3228		
1937	0.9015	1.1092	1.1284	1.2516		
1938	0.9077	1.1017	1.1201	1.2340		
1939	0.8722	1.1465	1.1026	1.2641		
1940	0.8647	1.1564	1.1178	1.2926		
1941	0.8728	1.1457	1.0755	1.2323		
1942	0.8823	1.1334	0.8336	0.9447		
1943	0.9853	1.0149	0.7159	0.7265		

Table 1, continued

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B. The Price of Future Consumption: Pre-Tax  
and Consumption Tax Cases

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Year	B1 $e^{\bar{\rho}T}$	B2 $P_j$	B3 $1-t_j/1-t_{j+20}$	B4 $P_j^c$
1944	1.0511	0.9514	0.7054	0.6711
1945	1.0506	0.9519	0.7744	0.7371
1946	1.0764	0.9291	1.0922	1.0147
1947	1.1692	0.8553	1.1738	1.0039
1948	1.3500	0.7407	1.1667	0.8642
1949	1.4470	0.6911	1.1079	0.7657
1950	1.4187	0.7049	1.1523	0.8122
1951	1.4255	0.7015	1.1176	0.7840
1952	1.5465	0.6457	1.0688	0.6912
1953	1.5956	0.6267	1.0464	0.6558
1954	1.5761	0.6345	1.0873	0.6899
1955	1.5022	0.6657	1.1580	0.7708
1956	1.4470	0.6911	1.1224	0.7756
1957	1.4586	0.6856	1.1045	0.7572
1958	1.4768	0.6771	1.0607	0.7183

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C. The Price of Future Consumption: The Income Tax,  
Adjusted and Unadjusted for Inflation

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Year	C1 $e^{(\bar{\rho}-\bar{tr})T}$	C2 $P_j^y$	C3 $e^{\bar{\rho}(1-\bar{t})T}$	C4 $P_j^{y*}$
1929	1.2059	0.8293	1.3046	0.7665
1930	1.1934	0.8379	1.2909	0.7747
1931	1.1322	0.9932	1.2371	0.8083
1932	0.9434	1.0660	1.0765	0.9290
1933	0.8178	1.2229	1.0356	1.0356
1934	0.7617	1.3129	1.0919	1.0919
1935	.7593	1.3171	1.0948	1.0948
1936	0.7032	1.8220	1.1575	1.1575
1937	0.7724	1.2947	1.0787	1.0787
1938	0.7742	1.2916	1.0729	1.0729
1939	0.7408	1.3498	1.1038	1.1038

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C. The Price of Future Consumption: The Income Tax,  
Adjusted and Unadjusted for Inflation

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Year	C1 $e^{(\bar{\rho}-\bar{t}r)T}$	C2 $P_j^Y$	C3 $e^{\bar{\rho}(1-\bar{t})T}$	C4 $P_j^{Y*}$
1940	0.7301	1.3098	1.1101	1.1101
1941	0.7317	1.3667	1.1020	1.1020
1942	0.7350	1.2605	1.0932	1.0932
1943	0.8227	1.2155	1.0107	1.0107
1944	0.8774	1.1397	1.0369	0.9644
1945	0.8793	1.1373	1.0371	0.9042
1946	0.9016	1.1091	1.0565	0.9466
1947	0.9707	1.0302	1.1232	0.8903
1948	1.1074	0.9030	1.2476	0.8015
1949	1.1711	0.8539	1.3103	0.7632
1950	1.1367	0.8839	1.2898	0.7753
1951	1.1149	0.8969	1.2919	0.7741
1952	1.1899	0.8404	1.3677	0.7311
1953	1.2104	0.8261	1.3974	0.7156
1954	1.1794	0.8479	1.3841	0.7275
1955	1.1026	0.9069	1.3358	0.7486
1956	1.0468	0.9629	1.2983	0.7703
1957	1.0263	0.9743	1.3035	0.7671
1958	1.0221	0.9784	1.3132	0.7615

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D. Tax Induced Price Distortions and Welfare  
Cost Ratios

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Year	D1 $(P_j^C - P_j)^2$	D2 $(P_j^Y - P_j)^2$	D3 $(P_j^{Y*} - P_j)^2$	D4 $W_C/W_Y$	D5 $W_C/W_{Y*}$
1929	0.0142	0.0152	0.0037	0.9359	3.8851
1930	0.0068	0.0154	0.0037	0.4430	1.8412
1931	0.0058	0.0058	0.0030	0.9987	1.9607
1932	0.0119	0.0236	0.0005	0.5053	23.2442
1933	0.0156	0.0305	0.0002	0.5107	99.5358
1934	0.0105	0.0349	0.0012	0.3023	9.0003
1935	0.0081	0.0347	0.0013	0.2327	6.2393
1936	0.0105	0.0406	0.0040	0.2575	2.6317
1937	0.0203	0.0304	0.0009	0.5893	21.8504

Table 1, continued

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D. Tax Induced Price Distortions and Welfare  
Cost Ratios

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Year	$(P_j^C - P_j)^2$ <sup>D1</sup>	$(P_j^Y - P_j)^2$ <sup>D2</sup>	$(P_j^{Y*} - P_j)^2$ <sup>D3</sup>	$W_C/W_Y$ <sup>D4</sup>	$W_C/W_{Y^*}$ <sup>D5</sup>
1938	0.0175	0.0361	0.0008	0.4845	21.1026
1939	0.0138	0.0413	0.0018	0.3346	7.5806
1940	0.0186	0.0455	0.0021	0.4077	8.6396
1941	0.0075	0.0489	0.0019	0.1533	3.9226
1942	0.0356	0.0516	0.0016	0.6900	22.0091
1943	0.0831	0.0402	0.0000	2.0666	4645.1788
1944	0.0786	0.0355	0.0002	2.2140	464.5594
1945	0.0461	0.0344	0.0124	1.3410	3.7280
1946	0.0073	0.0374	0.0003	0.2262	23.9680
1947	0.0221	0.0306	0.0012	0.7272	18.0091
1948	0.0152	0.0263	0.0037	0.5785	4.1226
1949	0.0056	0.0265	0.0052	0.2099	1.0699
1950	0.0115	0.0321	0.0050	0.3593	2.3220
1951	0.0068	0.0382	0.0053	0.1784	1.2946
1952	0.0020	0.0375	0.0071	0.0528	0.2776
1953	0.0008	0.0398	0.0079	0.0212	0.1069
1954	0.0031	0.0455	0.0071	0.0673	0.3960
1955	0.0111	0.0582	0.0069	0.1900	1.6087
1956	0.0072	0.0739	0.0063	0.0968	1.1406
1957	0.0051	0.0834	0.0066	0.0615	0.7718
1958	0.0017	0.0908	0.0071	0.0186	0.2376

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\*All figures are rounded off for presentation.

ently with the theoretical analysis of section 3.3, the price of future consumption associated with the income tax was determined on the basis of a tax on real interest income. We shall call this the inflation adjusted income tax and this is signified by the asterisk on  $P_j^Y$  in equation (3.9). If the income tax remains unadjusted for inflation, it will tax nominal interest returns,  $r$ , as distinct from the real return,  $\rho$ . The price of future consumption will then be

$$P_j^Y = 1 / \prod_{i=j}^{j+T} e^{(\rho_i - t_i r_i)} \quad (3.10)$$

The empirical analysis will demonstrate that inflation plays a significant role in determining the relative desirability of the income and consumption tax bases. In Table 1, parts B and C, the price of future consumption under four different sets of circumstances has been calculated. Column B.2 is the case in the absence of taxation and indicates how much current consumption it is necessary to forgo in order to consume one unit of consumption in 20 years time. This is the value expressed in equation (3.7). To gain the corresponding value for the consumption tax, equation (3.8), it is necessary to multiply the pre-tax price by the ratio of one minus the current tax rate to one minus the future tax rate. This ratio is shown in column B.3, while the solution to the multiplication is shown in column B.4. Table 1, part



C shows the calculation of the current price of future consumption associated with the income tax. In column C.2, the values are calculated on the basis of taxation on real interest returns; the inflation adjusted income tax associated with the price derived in equation (3.9). The income tax unadjusted for inflation, equation (3.10). is shown in column C.4.

Given these data and the expressions for the current price of future consumption associated with both the absence of taxes and each tax institution considered, it is possible to derive the welfare loss based on the formulation obtained previously (equation 3.6). However, some further simplification in presentation can be achieved. Let  $W_c$  and  $W_y$  be the welfare losses associated with the consumption and income tax, respectively. Combining these as a ratio, the following expression is gained:

$$\begin{aligned}
 W_c/W_y &= - 1/2 ((P_j^c - P_j)/P_j)^2 \epsilon_{RP} S_o / \\
 &\quad - 1/2 ((P_j^y - P_j)/P_j)^2 \epsilon_{RP} S_o \\
 &= (P_j^c - P_j)^2 / (P_j^y - P_j)^2 \quad (3.11)
 \end{aligned}$$

By subtracting one from this equation, the resulting answer demonstrates the percentage by which the welfare loss of the consumption tax exceeds that of the income tax.

As is evident from equation (3.11) and from Figure 4, the welfare costs induced by the different tax institutions is a function of the distortion in price brought about by the introduction of taxation. These price distortions are set out in the first three columns of Table 1, part D. The final two columns in that table show the result of calculating the ratio expressed in equation (3.11). Column D.4 indicates the ratio of the consumption tax welfare cost to that of the income tax where the income tax has not been adjusted for inflation. Column D.5 shows the same ratio, but where there is inflation adjustment of the income tax such that only real interest income returns are subject to tax.

These results can be studied in two stages; as a first step, the impact of the change in tax rates on the relative intertemporal efficiency of the income and consumption bases will be considered and, secondly, the further question to be considered is whether the presence of inflation modifies the conclusions reached when the analysis is concentrated on tax rate changes. The empirical results resting solely on the impact of changing tax rates, the case analyzed theoretic-

cally in this chapter, are shown in column D.5 of Table 1. These results indicate that in all but five of the 30 observations, the change in tax rates was sufficient for the consumption tax to have imposed greater welfare costs than the income tax. In a significant majority of cases, this difference was overwhelming. The change in tax rates observed over the period of examination was therefore sufficient to overturn the supposed intertemporal efficiency superiority of the consumption tax. However, as was pointed out earlier in this section, the income tax may be levied on nominal interest returns rather than the real magnitudes. The presence of inflation then raises the tax burden on interest income. The results for the case where there is no adjustment for inflation are shown in column D.4. The results in this case are directly the opposite of those observed in column D.5, which shows the inflation adjusted income tax case. With the exception of three periods, the consumption tax is more intertemporally neutral than this form of income tax.

These results yield two conclusions. First, the supposedly intertemporally neutral consumption tax would in fact not have been neutral had it been employed. Consequently, the consumption tax cannot automatically be presented in tax reform discussions as superior to the income tax in the

intertemporal dimension. Secondly, in order to determine whether the consumption tax is more intertemporally efficient or not, it is necessary to examine two cases. The examination of the income tax, unadjusted for inflation, showed that in fact the consumption tax was generally preferable; however, in comparison to an inflation adjusted income tax, it was inferior. Consequently, if we are moving from a standard income tax system, the efficiency criterion would suggest that inflation adjustment of the income tax is a more desirable approach than the replacement of the income tax base by the consumption base.

### 3.5 CONCLUSION

This chapter has addressed itself to a question which has long concerned public finance scholars. The question is whether the income tax or the expenditure tax approaches the ideal intertemporally neutral tax base. An examination of this question depends on an inquiry into the taxpayers response to the use of alternative tax institutions. The model presented in this chapter differs significantly from earlier examinations in two crucial senses. First, it is recognized that the size of the public sector is not constant over time, and that this implies that the level of taxation will change. A second point of departure from the

existing literature is the recognition that individuals may anticipate change rather than be passive reactors to new sets of circumstances. Orthodox tax theory has concluded that the consumption tax is preferable to the income tax, as it is intertemporally neutral and consequently minimizes the welfare cost of taxation.

The major thrust of this chapter has been to argue, incorporating into the analysis the propositions noted in the previous paragraph, that the case for the consumption tax is substantially weaker than that which is traditionally presented. In fact, in a dimension where the expenditure tax is supposedly neutral, it involves a welfare loss significantly greater than that associated with the income tax--a result diametrically opposite to that which is presented in the literature. Consequently, it is argued that the recent and growing widespread support for the consumption tax over the income tax has been misplaced. The welfare cost of an inflation adjusted income tax may have been less than that which would have been experienced had the expenditure tax been employed.

### 3.6 APPENDIX: MULTIPERIOD INTERTEMPORAL PRICE RATIOS AND TAX RATE CHANGES

It will be assumed that there is continuous compounding and that the taxpayer has a T year planning horizon. In general, if P dollars are accumulated for T periods with a return,  $\rho$ , it will yield  $Pe^{\rho T}$  dollars T periods in the future. The intertemporal price ratios can be derived in the same fashion as their simple two-period counterparts. In the case of the income tax, the consumption level for the  $j^{\text{th}}$  period is

$$C_j = (1 - t_j)Y_j \quad (3.1')$$

and for the  $j + T^{\text{th}}$  period, is,

$$C_{j+T} = (1 - t_j)Y_j \prod_{i=j}^{j+T} e^{\rho_i(1 - t_i)} \quad (3.2')$$

In this latter case, it is noted that the rate of return on saving is reduced by the annual taxation of interest income.

The intertemporal price ratio is,

$$C_{j+T}/C_j = \prod_{i=j}^{j+T} e^{\rho_i(1 - t_i)} = e^{\bar{\rho}(1 - \bar{t})T} \quad (3.3')$$

where  $\bar{\rho}$  and  $\bar{t}$  indicate statistical means defined over the appropriate period of time. In the consumption tax case, the maximum attainable consumption levels are,

$$C_j = (1 - t_j)Y_j \quad (3.4')$$

$$C_{j+T} = (1 - t_{j+T})Y_j \prod_{i=j}^{j+T} e^{\rho_i} \quad (3.5')$$

This yields the intertemporal price ratio,

$$\begin{aligned}
 C_{j+T}/C_j &= ((1-t_{j+T})/(1-t_j)) \prod_{i=j}^{j+T} e^{\rho i} \\
 &= ((1-t_{j+T})/(1-t_j)) e^{\bar{\rho}T}
 \end{aligned}
 \tag{3.6'}$$

In this somewhat more realistic setting, the  $\alpha^*$  value is

$$\alpha^* = (1 - e^{\bar{\rho}T}(1 - t_{j+T}))/t_{j+T}
 \tag{3.7'}$$

The result in this multiperiod setting is less definitive as there are  $T$  tax rates in contrast to the two tax rates ( $t_1$  and  $t_2$ ) of the previous case. This results as interest income is, with the income tax, taxed in each period. However, some simple numerical examples illustrate the magnitude of the tax rate increase required for the consumption tax to distort more than the income tax. Assume that  $t_{j+T}$  is 0.3 and also that capital income had been taxed at an average of 0.3 throughout the period of saving. This assumption imposes a bias against the income tax as if tax rates had grown steadily throughout the period,  $t$  would take on lower values than the tax rate applicable in the final period. It is assumed that the planning horizon is 20 years and that  $\alpha$  is 5 percent. This yields an  $\alpha^*$  value of 0.18, which implies a  $t_j$  value of 0.055. This, in turn, implies that indifference between the tax bases requires an average increase of 1.225 percentage points per period, with greater increases in tax rates indicating that the income tax is preferable. Now consider the  $\alpha^*$  parameter defined in terms of  $t_j$  values,

$$\alpha^* = \{(e^{\bar{\rho}T} t_j)/(e^{\bar{\rho}T} - 1 + t_j)\}
 \tag{3.8'}$$

Assume we commence with the  $t_j$  value derived above, 0.055, and also that  $\bar{t}$  takes on this value. This gives a limiting value in the other direction. The indifference value of  $t_{j+T}$  is 0.106, which implies an average annual increase of only 0.253 of 1 percentage point. A more realistic value might well fall between the two figures derived.



## Chapter IV

### THE LABOR INCOME TAX-CONSUMPTION TAX EQUIVALENCE THEOREM

#### 4.1 INTRODUCTION

The consumption or expenditure tax has recently appeared in both the theoretical and tax reform literature as a preferable alternative to the income tax.<sup>17</sup> A major reason for this choice is that the expenditure tax exempts saving from taxation and is, consequently, intertemporally neutral. There is, however, an alternative means of achieving intertemporal neutrality of the tax system: the adoption of a wages or labor income tax. While this alternative has not entered into tax reform discussions, it is a standard theorem in tax analysis that an income tax exempting property income (a labor income tax) and an income tax exempting saving (a consumption tax) are equivalent. This equivalence theorem is based on the fact that taxing the capital value of an asset and taxing the return on that asset are identical in their effect. The theorem depend crucially, however, on the assumption that tax rates are constant over the relevant time horizon.

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<sup>17</sup>See, for example, U.S. Treasury, Blueprints for Basic Tax Reform (1977), and The Structure and Reform of Direct Taxation, report of a committee chaired by James Meade, 1978.

A reexamination of the equivalence theorem incorporating changing tax rates yields results which are of both theoretical and practical relevance. Theoretically, the wages tax and the expenditure tax cannot be used interchangeably as alternative intertemporally neutral tax institutions. In all instances considered in this chapter, the labor income tax remains intertemporally neutral while the expenditure tax distorts. This suggests that the tax reform debates, rather than presenting the expenditure tax should have considered the labor income tax if intertemporal neutrality of the tax system was a major objective. This conclusion is reinforced when the policy proposal coupling the wealth tax with the consumption tax or the labor income tax is examined.

The subsequent sections of this chapter will be organized in the following manner. Section 2 will demonstrate the standard equivalence theorem alluded to previously. Section 3 will illustrate the theorem in the retirement-consumption model which has been used in this dissertation. Section 4 will then examine the more general conditions under which the equivalence theorem does not hold by examining the impact of tax rate changes and the role of the motive for accumulation. Finally, section 5 will turn attention to tax reform proposals and it will examine their validity in the

light of their stated objectives. Section 6 will provide some conclusions.

#### 4.2 THE LABOR INCOME TAX-CONSUMPTION TAX EQUIVALENCE THEOREM

The standard treatment of the labor income tax-consumption tax equivalence theorem is presented by Shoup (1968, 1969), and we will follow his presentation in this section of the chapter. Shoup derives the theorem by means of two steps. Initially, he considers the alternative tax bases in terms of national accounting identities and derives the condition which must be satisfied for equivalence to hold. At a second stage, he attempts to demonstrate from a behavioral perspective why that condition will be satisfied. The model under consideration is one of a closed economy consisting of two factors of production.

The notation to be employed is, as follows:

\* C = consumption,

\* W = wages,

\* P = net profit after depreciation,

\* D = depreciation,

\* I = gross investment, and

\*  $Y$  = income, which is equal to  $W + P$ .

In terms of these symbols, the base of the consumption tax can be represented as follows:

$$\begin{aligned} C &\equiv Y - I + D \\ &\equiv W + P - I + D \end{aligned} \quad (4.1)$$

In other words, the consumption base is equal to income less net investment. By observation of this expression, it is clear that the consumption tax will only be equivalent to a labor income tax in any year if the following condition is satisfied,

$$I = P + D. \quad (4.2)$$

In other words, equivalence will hold if net investment is equal to profit. In summary, the base of the consumption tax excludes investment, and in national accounting identities is,

$$W + P + D - I \equiv C \quad (4.3)$$

On the other hand, the wages tax is simply income less the return to capital.

$$Y - P \equiv C + I - D - P \equiv W. \quad (4.4)$$

An equality between  $W$  and  $C$  is achieved if  $P + D = I$ .

We now proceed to the second step of Shoup's analysis. The essential conclusion of this analysis is based on the proposition that individuals will, in the presence of perfect capital markets, be concerned with the present value of

future income streams. Consequently, it can be demonstrated that as the consumption tax and labor income tax impose the same tax burden in present value terms, the equivalence of the two taxes is achieved.

To demonstrate this result, Shoup envisages the existence of productive enterprises with lives extending over several periods. In a perfectly competitive environment, any investment must have an equality in the year of investment between its cost and the present value of the expected future returns. In other words, the sum of the present discounted value of the expected stream of profits,  $P_d$ , and that of the stream of depreciation,  $D_d$ , will be equal to the investment cost,  $I$ . The absence of this equality would imply the presence of either anticipated losses or the expectation of the earning of supernormal profits. This, in turn, would stimulate exit or entry into the industry, which would continue until the equality was regained. Given this competitive assumption, the following conditions will therefore apply in equilibrium,

$$I = P_d + D_d. \quad (4.5)$$

Given the presence of numerous investments commenced in different periods from one another, the jump from equation (4.5) to a similar equality in any period, equation (4.2), is not clear. In the national accounting identities for any

one year, the discounting procedure indicated above is not undertaken.

Consider a simple example. If an enterprise employs only labor to produce consumer goods in the present year (to be consumed this period), and, in addition, employs labor to produce a capital good, then its wage payments will be,

$$W = C + I. \quad (4.6)$$

Note that all these values are current period values, and, using the argument leading to equation (4.5), we can substitute for  $I$  and gain the following,

$$W = C + P_d + D_d. \quad (4.7)$$

The left hand side is the base for the labor income tax, and the right hand side is the base for the consumption tax (current consumption,  $C$ , and future consumption,  $P_d$  plus  $D_d$ ) resulting from the enterprises activity--both in present-value terms. This is based critically on the assumption that  $P$  and  $D$  represent consumption in the year in which it actually occurs.

The proposition that  $P_d$  and  $D_d$  reflect discounted consumption streams rests on the assumption that enterprises do not purchase capital goods unless they perceive that the product of their investment activity will eventually be consumed. In other words, the objective of all investment is eventual consumption. In the above illustration, the capi-

tal good was constructed solely through the employment of labor in the current period. If, on the other hand, the capital good was constructed through the use of existing capital, the same conclusion holds. The current use of capital will, through its depreciation, result in a current consumption tax; however, this possibility will have been taken into account when the capital good was initially produced. The current choice between depreciating a capital good to produce either another capital good or to produce consumption goods immediately, in discounted terms, will result in consumption taxes of equivalent value. The difference in this instance is the levying of the tax now or the tax being imposed in the future. The behavioral decision is, as a consequence, unaffected. Therefore, in present-value terms, the profit-maximizing calculus of entrepreneurs requires that in equilibrium the labor income tax and the consumption tax are equivalent. Just as the wages tax impacts on the labor employment decision, the only choice affected by the consumption tax is the amount of labor to be employed.

Although the two taxes impose equivalent tax burdens in present value terms, the allocative impact of the taxes will not be the same unless the differential incidence of the taxes is zero. In the absence of a model to illustrate this

either positively or negatively, Shoup concludes that the behavioral definitions of the tax bases justify an assumption of no allocational differences unless contrary evidence is offered. In the model to be considered, the taxes are, in the standard public finance setting, equivalent in all respects.

#### 4.3 THE MODEL

The model in which the equivalence relation will be examined is the two-period retirement-consumption model. The individual works in the first period earning labor income, the magnitude of this being determined exogenously, and in the second period the only income is that accruing as a result of first period accumulation. As in the previous chapter, the retirement-consumption model will be presented in algebraic form. The relative magnitudes of any substitution effect can be illustrated by considering the price ratio facing the taxpayer. The price ratio between present and future consumption will indicate whether or not the alternative tax bases have equivalent intertemporal effects or not; given the equi-revenue methodology, an equality of the price ratios implies that the taxpayer will face identical consumption possibilities under both taxes, while an inequality will imply that the equivalence theorem has been



severed. The following notation will be employed in expositing the model.

\*  $C_j$  = consumption in period  $j$ ,

\*  $Y_j$  = labor income in period  $j$ ,

\*  $\rho_j$  = rate of interest in period  $j$ , and

\*  $t_j$  = marginal (and average) tax rate in period  $j$ ,

The relative price of present for future consumption is given by the ratio of maximum feasible future consumption to maximum feasible present consumption.

In the pre-tax situation, maximum feasible present and future consumption are, respectively,

$$C_1 = Y_1, \text{ and} \tag{4.8}$$

$$C_2 = (1 + \rho) Y_1. \tag{4.9}$$

The price ratio is, therefore,

$$C_2/C_1 = 1 + \rho. \tag{4.10}$$

The use of this price ratio as a reference point will enable a further conclusion to be made. If the price ratios associated with the labor income tax and the consumption tax are identical, the equivalence theorem holds; if, in addition, they are the same as the price ratio in the absence of taxation, then both taxes are also neutral.

Initially, we shall examine an income tax exempting saving--the consumption based tax. In that case, the maximum feasible present and future consumption are, respectively,

$$C_1 = (1 - t) Y_1, \text{ and} \quad (4.11)$$

$$C_2 = (1 - t)(1 + \rho) Y_1. \quad (4.12)$$

The price ratio associated with the consumption tax is, therefore,

$$C_2/C_1 = 1 + \rho. \quad (4.13)$$

The consumption tax price ratio is the same as that characterizing the pre-tax situation, so we can conclude that the use of this tax does not impose any intertemporal welfare loss. For the labor income tax-consumption tax equivalence theorem to now hold requires that the labor income tax price ratio also equal  $(1 + \rho)$ . Let us examine such a tax which is the same as a general income tax but for the fact that it exempts all property income. In the model under consideration, there is no labor income in the second period, so the tax burden is experienced solely in the first period. Maximum feasible present and future consumption are, therefore,

$$C_1 = (1 - t) Y_1, \text{ and} \quad (4.14)$$

$$C_2 = (1 - t)(1 + \rho) Y_1. \quad (4.15)$$

Again, the price ratio is

$$C_2/C_1 = 1 + \rho. \quad (4.16)$$

It is clear, in these circumstances, that the equivalence relation holds. The price ratios associated with each tax are identical and consequently so are the consumption possibilities facing taxpayers. Although the timing of the tax burden differs between taxes, the presence of a perfect capital market will mean that the same consumption bundle will be chosen in each instance.<sup>18</sup> The general conclusion to be drawn from this model is, therefore, that if the income tax exempted property income (a labor income tax), it would be neutral and equivalent to an income tax exempting saving (a consumption tax). Therefore, from an efficiency perspective, the labor income tax or the consumption tax are preferable to a tax that distorts intertemporally such as the comprehensive income tax.

In this section we presented the standard analysis of taxation and found the labor income tax-consumption tax equivalence theorem to be valid. In the next section, we shall incorporate the empirically relevant occurrence of tax rate changes into the analysis and demonstrate that the equivalence theorem is no longer valid. In addition, the relaxation of the assumption that all saving is for the

<sup>18</sup>Equi-revenue analysis implies that, for a given pattern of public expenditures, the government will need to enter the capital market. To maintain the assumption that the rate of interest remains unaffected by the different tax systems, it can be assumed that the government borrows externally.

purpose of future consumption will provide a further case where the equivalence theorem is not valid. Given these cases, the issue then becomes one of the empirical relevance of the alternative sets of assumptions.

#### 4.4 THE THEOREM UNDER ALTERNATIVE ASSUMPTIONS

The major conclusion of this section is that the labor income tax-consumption tax equivalence theorem collapses in the presence of two empirically relevant circumstances. Despite suggestions in the tax reform literature that the consumption tax should be implemented on the grounds of intertemporal neutrality, it is shown in this section that the neutrality of the consumption tax is extremely sensitive to the specification of the model. In stark contrast to this, the labor income tax remains intertemporally neutral, irrespective of the assumptions incorporated into the analysis.

##### 4.4.1 Saving for Future Consumption and Changing Tax Rates

If the assumption about taxpayer expectations and tax rates presented in the previous chapter is introduced into the analysis, the labor income tax-consumption tax equivalence theorem is no longer valid. By permitting tax rates to change and with taxpayers anticipating this, taxpayers

are induced to modify their intertemporal choices in a way that severs the equivalence between the labor income tax and the consumption tax. While in this setting the expenditure tax is, as demonstrated in Chapter III, associated with an intertemporal welfare loss, the labor income tax remains intertemporally neutral. Consequently, the commonly-voiced proposal favoring the expenditure tax, on grounds including its supposed intertemporal neutrality should perhaps be replaced by support for a labor income tax.

The rationale for this conclusion is as follows. The burden of a consumption tax, with tax rates varying over time, can be reduced by intertemporal shifts in any form of consumption expenditure. An expenditure tax, by enabling this form of adjustment, removes an important intertemporal lump-sum attribute of the labor income tax. If tax rates are expected to rise, for example, it becomes relatively more profitable, in the case of an expenditure tax, to borrow on future income (or save less) and consume more currently. On the other hand, the burden of the labor income tax cannot, in this model, be influenced by any behavioral adjustment on the part of the taxpayer.

To demonstrate this result in terms of the previous analytics, consider, once again, the retirement-consumption model. The case to be studied is one in which labor income

is earned in period one,  $Y_1$ , but there are now two tax rates,  $t_1$  and  $t_2$ , the subscripts indicating the relevant period. The price ratio in the absence of taxation is unaffected by these modifications and so remains that derived in equation (4.1), that is,  $(1 + \rho)$ . The price ratio associated with the consumption tax can be derived by the same method as previously employed. The maximum feasible levels of consumption in each period are,

$$C_1 = (1 - t_1) Y_1, \text{ and} \quad (4.17)$$

$$C_2 = (1 - t_2)(1 + \rho) Y_1. \quad (4.18)$$

As a consequence, the price ratio associated with the consumption tax is

$$C_2/C_1 = (1 + \rho)(1 - t_2)/(1 - t_1). \quad (4.19)$$

This consumption tax price ratio is significantly different from that applying when tax rates are constant. It indicates that rather than being neutral, the consumption tax will impose a distortion whenever tax rates vary. The magnitude of this distortion will vary with the ratio of one minus the future tax rate to one minus the current tax rate.

The price ratio associated with the labor income tax is unaffected by changing tax rates. The maximum attainable consumption levels are,

$$C_1 = (1 - t_1) Y_1, \quad (4.20)$$

$$C_2 = (1 - t_1)(1 + \rho) Y_1, \quad (4.21)$$

which, in turn, yield the following price ratio,

$$C_2/C_1 = (1 + \rho)Y_1 \quad (4.22)$$

This price ratio is the same as that in the pre-tax case, and so the labor income tax is neutral and therefore no longer equivalent to the consumption tax. The labor income tax will always be preferable, given this criterion, to the consumption tax, and it will be as desirable as the consumption tax in the special case where tax rates are constant.<sup>19</sup> This latter instance is the only case when the equivalence theorem is valid.

#### 4.4.2 Saving for the Purpose of Accumulation

A less closely scrutinized dimension of the consumption-savings choice is that where the motive for saving is accumulation as an objective in itself. At the outset, it must be noted that the orthodox presentation of the equivalence theorem recognizes that it is invalidated by the presence of this form of saving. Similarly, the public finance literature has noted that the existence of this form of saving--essentially a consumption activity--means that the consumption tax is no longer intertemporally neutral, as some part of consumption remains untaxed. How important this form of saving actually is remains an empirical question. At times,  
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<sup>19</sup>This result generalizes to the case where labor income is earned in both the first and second periods. The price ratios associated with each tax, equations (4.19) and (4.22), are unaffected by such a modification.

it has been considered as quite important, and it has clearly had a significant impact in the tax reform literature. The interest in this section is that this is a further potentially significant factor which severs the equivalence theorem and once again sees the labor income tax remaining neutral.

This form of saving implies that accumulation yields a return, not from ultimate consumption, but simply from its existence. The return may be purely psychic, for example, the desire to have a significant level of saving from which to derive a sense of prestige, or it may in certain instances, as the Meade Committee appears to envisage, confer tangible benefits to the holders of wealth. In either case, the yield to the saver, although real, is not readily measurable and does not appear as a consumption activity, consequently it escapes the burden of a consumption tax.

This form of saving can be examined in the setting of the retirement-consumption model. Consider the individual's consumption opportunities in the absence of taxation. Maximum present consumption is:

$$C_1 = Y_1. \quad (4.23)$$

Maximum future consumption can be treated as the sum of two components. First, if all labor income is saved, it will enhance future consumption opportunities by the interest



accrued,  $\rho Y_1$ . However, in addition, the saving yields a further return in the first period when the asset is purchased. The psychic return on the asset will be termed  $\delta$ . If a dollar of saving yields interest income of  $\rho$  in the second period and the second period value of the current psychic return is  $\rho$  also, then it would be possible to convert the current psychic return into future dollars by multiplying  $\delta$  by  $(1 + \rho)$ . However, as it is not known whether this is the case or not, we cannot use  $\rho$ . The alternative is to use some other symbol to convert  $\delta$  into future dollars or, as we shall do here, attach an operator to  $\rho$ . Let  $\beta$  be an operator used to adjust the real interest rate,  $\rho$ , according to the relative values of the psychic and real returns. In the case where these returns are equal,  $\beta$  will obviously be equal to unity. Given these two components of the return to accumulation, maximum future consumption is,

$$C_2 = (1 + \rho) Y_1 + \delta(1 + \beta\rho) Y_1. \quad (4.24)$$

The price ratio in the absence of taxation is, therefore,

$$\begin{aligned} C_2/C_1 &= ((1 + \rho)Y_1 + \delta(1 + \beta\rho)Y_1)/Y_1 \\ &= (1 + \rho) + \delta(1 + \beta\rho) \end{aligned} \quad (4.25)$$

Consider, for illustrative purposes, the special case where the psychic and real rates of return are the same, the case where  $\beta$  is one. Then, equation (4.25) becomes  $(1 + \rho)(1 + \delta)$ . Essentially, such a case implies that  $\delta = \rho/(1 + \rho)$

or, in other words, that the present value of the psychic and real returns are the same. Substituting into the expression

$$(1 + \rho)(1 + \delta),$$

gives the price ratio

$$1 + 2\rho, \tag{4.26}$$

as would be expected in such a case.

This is illustrated diagrammatically for additional clarity in Figure 5. This figure depicts the retirement-consumption model being examined. On the vertical axis is current consumption, while the horizontal axis shows second-period consumption possibilities. The individual's initial labor income is  $Y_1$  which is also the maximum attainable first-period consumption level. On the other hand, if total income was saved, it would enable second-period consumption opportunities of  $(1+\rho)Y_1$ . This would be a complete exposition in the case where saving was solely for the purpose of future consumption. However, in the case considered here, if the taxpayer accumulates the total income  $Y_1$ , he is not placed at the origin in the first period but rather at the point  $\delta Y_1$  which represents the psychic return. It is not possible for the taxpayer to be located beneath this point. Consequently, the budget curve facing the taxpayer has a kink in it and is depicted in the figure as  $Y_1 Z$   $(1+\rho)Y_1$ . The choice of accumulating all income would place

the consumer at the point Z and the greater is the psychic return, the larger will be the vertical segment  $Z(1+\rho)Y_1$ .

Now consider the consumption tax by following a similar approach. The maximum feasible consumption levels are as follows:

$$C_1 = (1 - t) Y_1, \text{ and} \quad (4.27)$$

$$C_2 = (1 - t)(1 + \rho)Y_1 + \delta(1 + \beta\rho)Y_1. \quad (4.28)$$

The price ratio associated with the consumption tax is,

$$\begin{aligned} C_2/C_1 &= ((1 - t)(1 + \rho)Y_1 + \delta(1 + \beta\rho)Y_1)/(1 - t)Y_1 \\ &= 1 + \rho + \delta(1 + \beta\rho)/(1 - t) \end{aligned} \quad (4.29)$$

In this case, the distortion varies directly with the tax rate, approaching zero when the tax rate diminishes to zero. This contrasts with the labor income tax which we shall now examine. The maximum feasible consumption levels in the presence of a labor income tax are,

$$C_1 = (1 - t) Y_1, \text{ and} \quad (4.30)$$

$$C_2 = (1 - t)(1 + \rho)Y_1 + (1 - t)\delta(1 + \beta\rho)Y_1, \quad (4.31)$$

which yields the following price ratio,

$$\begin{aligned} C_2/C_1 &= ((1 - t)(1 + \rho)Y_1 + (1 - t)\delta(1 + \beta\rho)Y_1)/(1 - t)Y_1 \\ &= 1 + \rho + \delta(1 + \beta\rho) \end{aligned} \quad (4.32)$$

It is clear that the labor income tax remains neutral in contrast to the consumption tax. This is so because the labor income tax reduces the principal which is available to be accumulated, which reduces, by the rate of tax, both

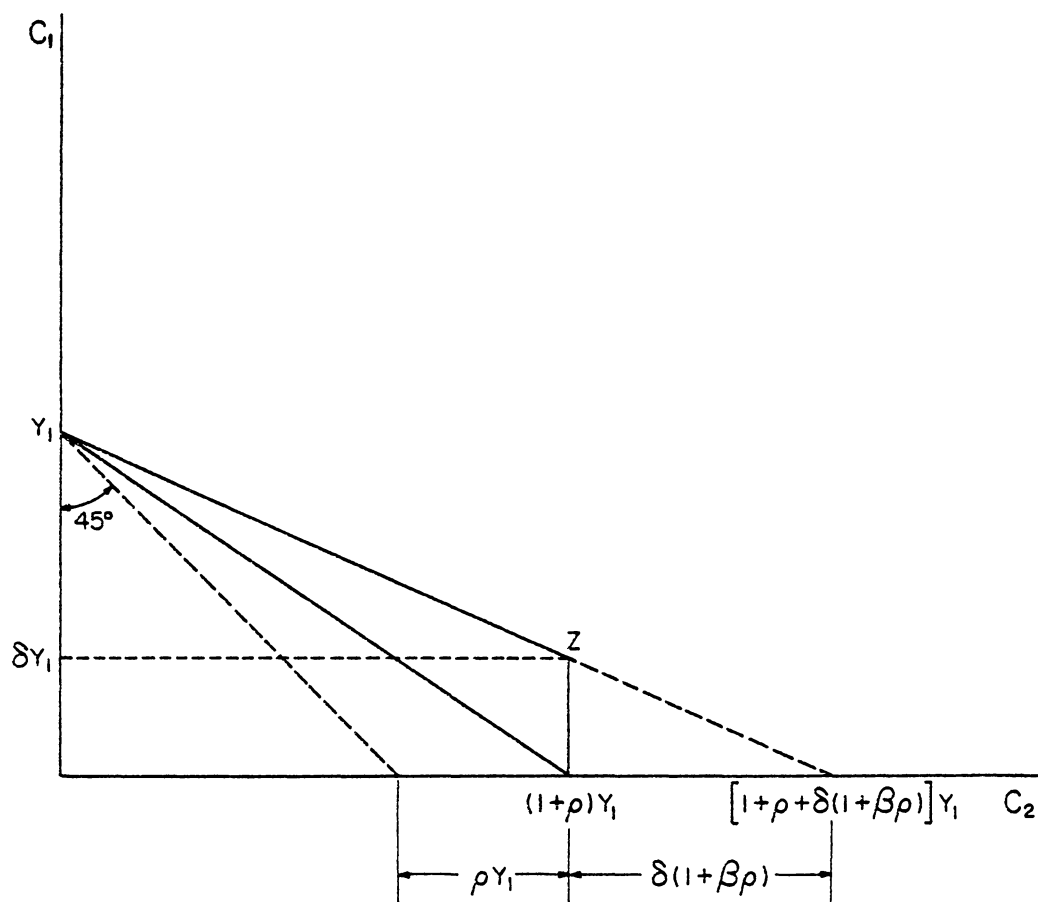


Figure 5: Saving for the purpose of accumulation

future consumption and psychic consumption deriving from asset ownership. Again, the labor income tax-consumption tax equivalence theorem is demolished by this modification, and it is broken because the consumption tax is no longer neutral, while the labor income tax remains neutral.

#### 4.4.3 Saving for the Purpose of Accumulation with Changing Tax Rates

In this section the two previous sections are combined to construct a model that is perhaps of greater empirical relevance. This will be done in a brief fashion, as it is a simple adjustment to the previous analysis. The introduction of changing tax rates leaves the pre-tax benchmark unaffected, so attention is turned directly to the consumption tax. The subscripts indicate the period to which the variable is applicable. The maximum attainable consumption levels are

$$C_1 = (1 - t_1) Y_1, \text{ and} \quad (4.33)$$

$$C_2 = (1 - t_2)(1 + \rho)Y_1 + \delta(1 + \beta\rho)Y_1. \quad (4.34)$$

The price ratio is, therefore,

$$\begin{aligned} C_2/C_1 &= ((1 - t_2)(1 + \rho)Y_1 + \delta(1 + \beta\rho)Y_1)/(1 - t_1) Y_1 \\ &= (1 + \rho)(1 - t_2)/(1 - t_1) + \delta(1 + \beta\rho)/(1 - t_1) \end{aligned} \quad (4.35)$$

There are two distortions present. First, there is that arising due to changing tax rates (the first term) and, secondly, there is that associated with the absence of the tax-

ation of accumulation (the second term). Once again, in contrast to the consumption tax, the labor income tax is non-distorting in this case. In terms of the model, the maximum attainable consumption levels are,

$$C_1 = (1 - t_1) Y_1, \quad (4.36)$$

$$C_2 = (1 - t_1)(1 + \rho)Y_1 + (1 - t_1) \delta(1 + \beta\rho)Y_1 \quad (4.37)$$

which yields the price ratio,

$$\begin{aligned} C_2/C_1 &= ((1 - t_1)(1 + \rho)Y_1 + (1 - t_1) \delta(1 + \beta\rho)Y_1)/(1 - t_1)Y_1 \\ &= 1 + \rho + \delta(1 + \beta\rho) \end{aligned} \quad (4.38)$$

By observation, the labor income tax does not induce any intertemporal substitution effect; in other words, it is neutral.

If all saving is for future consumption and taxpayers are in a world where they never expect tax rates to change and these expectations are always realized, then the labor income tax-consumption tax equivalence theorem is valid. Any modification to this setting sees the equivalence theorem breaking down; the labor income tax remains neutral while the consumption tax creates potentially large welfare losses. As the tax reform literature has proposed the consumption tax as a remedy to these welfare losses, the model underlying their analysis would appear to be of the type indicated at the beginning of this paragraph. It has been suggested that such a model is not appropriate in the light

of tax rate changes and possible motives for saving. To the extent that the alternative assumptions outlined in this section have any greater validity, they suggest that greater attention should be given to the labor income tax.<sup>20</sup>

#### 4.5 TAX REFORM

The objective of this section is to comment on some general tax reform proposals. To this point, the discussion has concentrated on the consumption and labor income taxes. In fact, while the tax reform literature has advocated the adoption of a consumption tax, it has combined the proposal with the adoption of a wealth tax. The rationale for this proposal is an equity argument. The consumption base is proposed on efficiency grounds, but it is perceived to be inequitable, as accumulation is exempt from taxation. The wealth tax would act to eliminate this concern. The major factor underlying this concern is saving for the purpose of accumulation which was examined in section 4.

The implementation of a consumption tax alone will influence the intertemporal price ratio and so be associated with a welfare loss. The first part of this section considers whether the implementation of a consumption tax/wealth tax

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<sup>20</sup>However, there are several other considerations including questions such as the transition from the case of existing accumulation.

package improves or worsens the position from a neutrality perspective. Let us examine this question in terms of the last version of the model, that where there is saving for the purpose of accumulation and tax rates can change. In that case, the price ratio associated with the consumption tax experiences a modification and becomes

$$C_2/C_1 = (1+\rho)(1-t_2)/(1-t_1) + (\delta(1+\beta\rho) - \tau)/(1-t_1) \quad (4.39)$$

where  $\tau$  is the rate of tax on wealth. For any values of  $t_1$  and  $t_2$ , it is possible to derive a rate of tax on wealth which will improve on the neutrality of a tax system relying solely on a consumption tax. Such a tax rate is derived by examining the distortion associated with the consumption tax alone and then deriving a value for the wealth tax which would eliminate that. In fact, a wealth tax of a rate smaller or equal to the following expression would improve on the efficiency of the consumption tax.<sup>21</sup>

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<sup>21</sup>The implementation of a wealth tax will result in neutrality of the tax system if the resulting price ratio is the same as that arising in the absence of taxation. Algebraically that is, when  $\tau$  is solved from the following,

$$1 + \rho + \delta(1+\beta\rho) = ((1+\rho)(1-t_2) + \delta(1+\beta\rho) - \tau)/(1-t_1), \text{ then}$$

$$\tau = (1+\rho)(t_1-t_2) + t_1 \delta(1+\beta\rho).$$

The wealth tax will improve on the efficiency of the consumption tax, if it reduces the magnitude of the distortion from the pre-tax price ratio. This value of  $\tau$  is solved for by equating the distortion of the consumption tax/wealth tax combination to that of the consumption tax. That is,



$$\tau = 2(1 + \rho)(t_1 - t_2) + 2t_1 \delta(1 + \beta\rho) \quad (4.40)$$

While it may be theoretically possible to derive such a value, its feasibility as a practical tax reform is a different issue. If tax rates increase significantly, then neutrality requires a wealth subsidy not a wealth tax. In the absence of such conditions, there may be a stronger case for a wealth tax than that which is conventionally found in the tax reform literature. As well as the equity arguments which are the usual rationale for such a tax, there may be an efficiency argument for the implementation of a consumption tax/wealth tax package.

A major conclusion of this chapter is that while the consumption tax will in most realistic cases distort intertemporally, the labor income tax remains neutral. If, however, there is an equity argument for a wealth tax in the case of a consumption tax, such a tax may also be proposed if a labor income tax were to be implemented. The impact of the introduction of a wealth tax on the price ratio associated with the labor income tax is independent of the motive for accumulation or the tax rate assumptions considered above,

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$$\begin{aligned} & 1 + \rho + \delta(1 + \beta\rho) - ((1 + \rho)(1 - t_2) + \delta(1 + \beta\rho) - \tau) / (1 - t_1) \\ & = ((1 + \rho)(1 - t_2) + \delta(1 + \beta\rho)) / (1 - t_1) - (1 + \rho + \delta(1 + \beta\rho)). \end{aligned}$$

The solution of this equality for  $\tau$  is,

$$\tau = 2(1 + \rho)(t_1 - t_2) + 2t_1 \delta(1 + \beta\rho).$$

the distortion is negative  $\tau$ . Whether this distortion will be greater or less than that associated with the consumption tax will depend on the parameter values of the model under examination.

In the model where saving is for future consumption and tax rates are constant, it will always be the case that the labor income tax/wealth tax package will be more neutral, and therefore preferable to the consumption tax/wealth tax package. The distortion in the consumption-wealth tax case is  $\tau/(1 - t)$ , which will always exceed the distortion associated with the labor income tax,  $\tau$ . In other specifications of the model, it is possible to contrive cases where the consumption/wealth tax combination is preferable. However, these results depend on special circumstances, such as tax rates falling (a circumstance counter to the general trend) and the knowledge of relative magnitudes of psychic and real rates of return. In general, it is difficult to see the introduction of the wealth tax making any significant contribution to the neutrality of the consumption tax.

Therefore, even in the modified circumstance where wealth taxes are introduced, the case for the consumption tax is difficult to resuscitate. In the labor income tax/wealth tax situation, the distortion,  $\tau$ , is known independently of the motive for the saving or the movements in tax rates.

While in the presence of a consumption tax there will be specific rates of wealth taxation which contribute to neutrality, they depend for their calculation on unmeasurable factors such as the motives for saving and the return on asset holdings. The implementation of an efficiency-generating wealth tax is therefore administratively impossible.

Most tax reform exercises have been undertaken in circumstances where the prevailing tax institutions are comprehensive income taxes. The proposed shift to the consumption base is based on efficiency considerations. As noted above, it is then suggested that there is an equity argument for a wealth tax. Consequently, the true choice is not a comprehensive income tax versus a consumption tax but rather a comprehensive income tax versus a consumption tax/wealth tax package. As with an income tax accumulation is subject to tax, there is not the same rationale for a wealth tax. The distortion associated with the income tax results from the double taxation of saving and will be  $t_p$  independently of what saving motives and tax rate assumptions are studied. It is conceivable, and in fact probable in many circumstances, that although the consumption tax is proposed as a means of eliminating intertemporal distortions, the combination of the impact of tax rate changes examined in Chapter III and the adoption of a wealth tax will mean that the

final policy proposal will result in greater intertemporal welfare losses than those it intended to eliminate.

#### 4.6 CONCLUSION

It was demonstrated that the labor income tax-consumption tax equivalence theorem could hold in the retirement-consumption model employed in this dissertation. However, to gain this result, it was necessary to make some extremely strong assumptions. If taxpayers are never to expect tax rates to change and these expectations are always realized, and, in addition, all saving is for future consumption, then the equivalence theorem is valid. It has been argued that such a setting is not empirically relevant and, as a consequence, it is an interesting question to inquire into the implications of relaxing the assumptions underlying the equivalence theorem. If we do so, it turns out that the supposedly intertemporally neutral expenditure tax is in fact intertemporally distorting. It was also demonstrated that the magnitude of the resulting intertemporal welfare loss of the expenditure tax is extremely sensitive to the particular structure of the model under consideration. The equivalence theorem was invalidated for, while the expenditure tax distorted, the labor income tax remained intertemporally neutral.

The tax reform literature has presented the expenditure tax as a means of minimizing the intertemporal distortions of the tax system. The analysis in this chapter demonstrated that such an objective could only be achieved by implementing the labor income tax. This conclusion remained when consideration of the alternative tax bases was extended to include wealth taxation, which has been proposed as a desirable adjunct to the expenditure tax.

## Chapter V

### CAPITAL ACCUMULATION: EXPENDITURE TAXATION VERSUS INCOME TAXATION

#### 5.1 INTRODUCTION

It has been asserted that capital accumulation in the United States economy is deficient. Among the alleged causes of this deficiency are the regulated ceiling on the return to personal savings accounts, the social security program and the taxation system, and, in particular, the taxation of capital income (Eisner, 1977; Feldstein, 1977; von Furstenberg and Malkiel, 1977; and Kelso, 1978). The role of this chapter is to examine the impact of the tax system on capital accumulation. The central conclusion is that while the comprehensive income tax has been the subject of criticism for discouraging saving, the proposed solution--a consumption-based tax--may, had it been implemented, have resulted in less saving than inflation adjustment of the prevailing income tax.

To the extent that the tax system is responsible for creating a "capital shortage," this must arise due to its reduction in the return to be gained from postponing current consumption.<sup>22</sup> The standard argument is directed toward the  
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<sup>22</sup>A tax on any investment activity, with the exception of one where the supply or demand is inelastic, will lead to some reduction in taxpayer investment. Consequently, as

comprehensive income tax which involves double taxation of capital income. It is a standard proposition that the resulting distortion against saving could be eliminated by replacing the income tax with an expenditure tax. Once the distortion against saving has been removed, it is suggested that the economy will respond by increasing the volume of saving. This view is, for example, evident in the U.S. Treasury's Blueprints for Basic Tax Reform,

The possible efficiency gains that would result from adopting a consumption base tax system relate closely to the frequently expressed concern about a deficient rate of capital formation in the United States. Switching from an income to a consumption base tax would remove a distortion that discourages capital formation by U.S. citizens, leading to a higher U.S. growth rate in the short run, and a permanently higher capital/output ratio in the long run (p. 51).

It has been recognized that such a tax substitution will not necessarily raise the magnitude of saving in an economy (Buchanan, 1959; Feldstein, 1978); it could either increase or decrease the magnitude of accumulation in specific circumstances, depending on the relative strengths of income and substitution effects. It will be shown that this ambiguity over the direction of change in savings, consequent on a tax substitution, rests on an assumption that the public budget is balanced in each period. If this assumption is  
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Bradford (1980) recognizes, the pressure of the so-called "capital shortage" does not imply that the taxation of capital income should necessarily be totally abandoned.

relaxed, the move to a consumption-based tax would, it will be shown, increase capital accumulation in specific circumstances. Even if the orthodox assumptions were valid, however, it is necessary to incorporate the possibility of tax rate changes and taxpayer expectations of those changes, which we found to be important in the discussion in previous chapters. The incorporation of these factors into the analysis suggests that the expenditure tax, a purported remedy to the capital shortage, would have in fact been associated with lower levels of saving than the inflation-adjusted income tax. Therefore, if the rate of capital formation is deficient, attention should perhaps be turned to factors other than the replacement of the comprehensive income tax by a consumption-based tax.

The chapter will be organized as follows. The next section will examine private accumulation in the presence of income and expenditure taxation under the assumption of constant tax rates. It will demonstrate that there is no definitive conclusion to the issue of which tax will be associated with the greatest volume of saving. It will be shown that the balanced-budget assumption is crucial in this setting, for when public (dis)saving is permitted, the expenditure tax will result in greater capital accumulation. The third section will incorporate taxpayer expectations of



changing tax rates and demonstrate how this modification to the model can reverse the conclusions of the previous section. Section 4 will consider some of the policy implications of the previous sections by reexamining the standard tax reform proposals and, secondly, by examining the labor income tax. Section 5 will provide some conclusions.

## 5.2 TAX POLICY AND CAPITAL ACCUMULATION: THE CONSTANT TAX RATE CASE

This section will inquire into the direction of change in saving when the comprehensive income tax is replaced by an expenditure tax. While the answer to this question is inconclusive if accumulation is composed of private accumulation alone, aggregate accumulation, comprising both public and private elements, will be shown to increase.<sup>23</sup>

In the retirement-consumption model, private accumulation is equal to that part of net income not consumed in the first period. By assumption, there can be no accumulation in the second period, as whatever income accrues, or wealth remains, will be consumed. Accumulation is depicted by  $A$ , and the superscript  $Y$  indicates the presence of the income tax. Private accumulation in the income tax case will be,

$$A^Y = (1 - t^Y)Y - C_1^Y, \quad (5.1)$$

<sup>23</sup>parts of the analysis of this section have been undertaken in a similar fashion by Bradford (1980).

where  $t^Y$  is the rate of income tax, and  $C_1^Y$  is the level of first period consumption undertaken when the income tax is employed. Private accumulation is therefore net of tax income less first period consumption. If, following a similar procedure,  $A^E$  is defined as the magnitude of private accumulation in the presence of an expenditure tax, the following expression describes the level of private accumulation,

$$A^E = Y - (1 + t^E) C_1^E \quad (5.2)$$

where  $t^E$  is the equal yield rate of expenditure tax and  $C_1^E$  is the magnitude of first period consumption associated with the consumption-based tax. In this instance, accumulation is equal to income less first period consumption plus the amount of tax paid on that consumption.

It is possible for private accumulation in the expenditure tax case,  $A^E$ , to be greater or less than  $A^Y$ . Consider an example where preferences are represented by a Cobb-Douglas utility function,  $U^i = C_1^\alpha C_2^\beta$ , where  $\alpha$  plus  $\beta$  equals 1. Then, the magnitude of accumulation associated with each tax can be found by deriving the demand functions for first period consumption and substituting these functions into the expressions defining accumulation, equation (5.1) or (5.2), depending on which tax is being studied. In the income tax case, the demand function for first period consumption is,

$$C_1^Y = \alpha(1 - t^Y)Y. \quad (5.3)$$

When this is substituted into equation (5.1), the expression for private accumulation becomes

$$A^Y = \beta(1 - t^Y)Y. \quad (5.4)$$

An identical exercise can be undertaken in the expenditure tax case, with the result that private accumulation in the presence of that tax will be,

$$A^E = \beta Y. \quad (5.5)$$

It is clear in this example that  $A^E$  exceeds  $A^Y$ , or that private accumulation would increase if an expenditure tax replaced an income tax. However, this result need not follow if preferences are represented by a different utility function. For example, the reverse may be true if a Stone-Geary utility function is appropriate. In that instance, the utility function is of the form  $U^i = (C_1 - \gamma_1)^\alpha (C_2 - \gamma_2)^\beta$ , where, once again,  $\alpha$  plus  $\beta$  equals 1, and  $\gamma_1$  and  $\gamma_2$  are constants. In this case, with certain parameter values, the income tax will be associated with greater capital accumulation than the expenditure tax. The magnitude of this difference will be greater the smaller is  $\beta$  and the larger is  $\gamma_1$ .<sup>24</sup>

<sup>24</sup>If accumulation is greatest with the income tax, the following expression, which is  $(A^Y - A^E)$ , must be positive. All terms are positive except the last.

$$\begin{aligned} & \gamma_1((1-\rho)(Y-C_1^Y)-C_2^Y)/((1+\rho)(C_1^Y-\gamma_1)+C_2^Y-\gamma_2) \\ & + \alpha\gamma_2\rho t^Y/(1+\rho-t_0^Y)(1+\rho) - t^Y\beta Y. \end{aligned}$$

This result can also be depicted diagrammatically. The consumption opportunities associated with the income tax have been described algebraically in Chapter III and are shown here in Figure 6 by the budget curve  $PP'$ . The consumer will, in the presence of an income tax, equilibrate at a point such as  $E^Y$ . This point must be on the equi-revenue line, which is denoted  $RR'$ . At that outcome, the present value of tax revenues is  $YR$ , although only  $YP$  of those accrue in the first period. At the point  $E^Y$ , the taxpayer consumes  $OC_1^Y$ , leaving private accumulation of  $PC_1^Y$ .

In contrast to the income tax which distorts, due to its taxation of interest income, the intertemporal price ratio associated with the expenditure tax is the same as that experienced in the absence of taxation. As a result, the budget line in the expenditure tax case will be that shown by the equi-revenue line, namely,  $RR'$ . The taxpayer will equilibrate at a point like  $E^E$  where  $OC_1^E$  will be consumed in the first period. Without loss of generality, let us assume that the taxpayer's utility function is homothetic. This implies that the income-consumption curve,  $OI$ , is linear and passes through the origin. This assumption permits us to define the level of personal saving as  $CC_1^E$ , while the first period tax revenue is  $YC$ . The values of the relevant variables are summarized for each tax in the following table (Table 2).

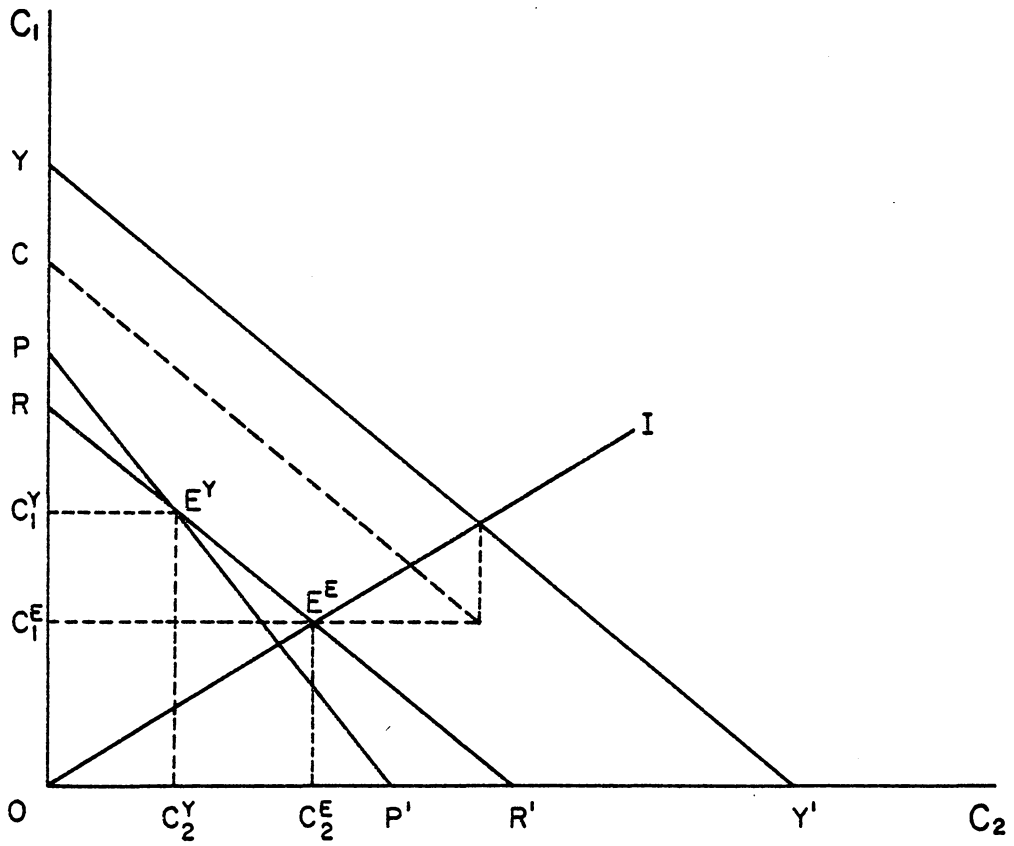


Figure 6(a): Capital accumulation under a constant tax rate regime

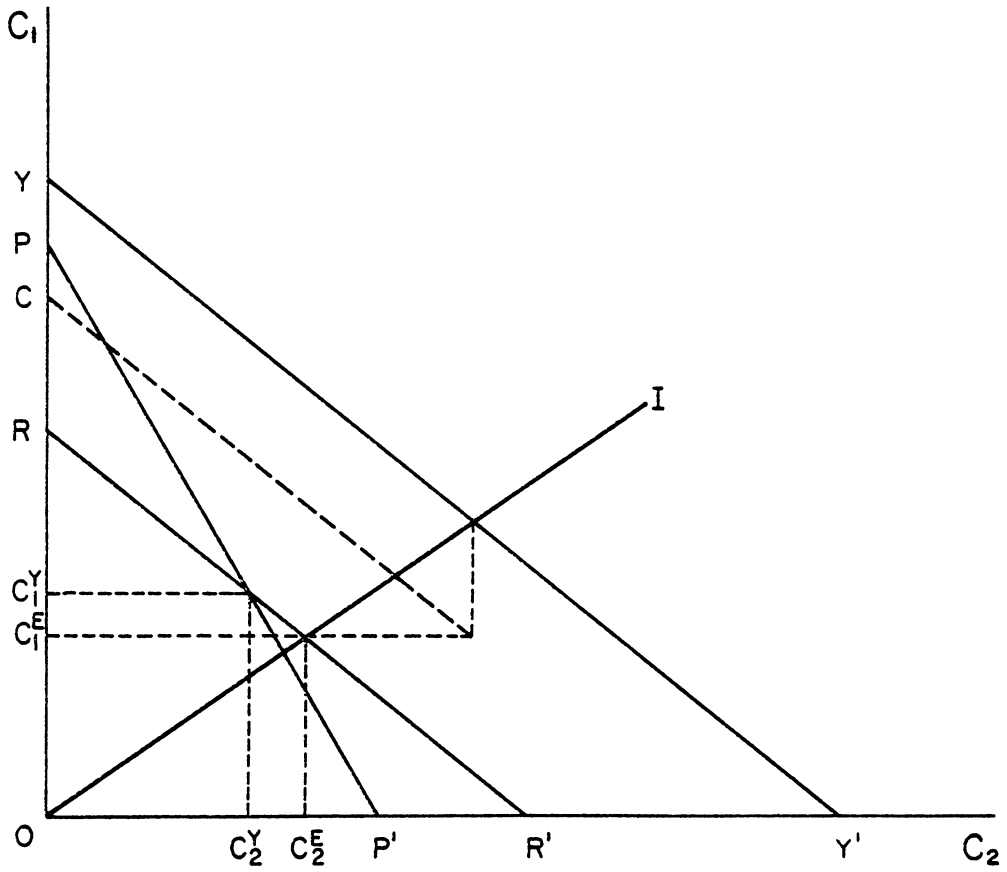


Figure 6(b): Capital accumulation under a constant tax rate regime

TABLE 2

Summary of Consumption, Saving, and Taxation Magnitudes  
Under Income and Expenditure Tax Regimes

	Period 1 Consumption	Period 1 Saving	Period 1 Taxation
Income Tax	$OC_1^Y$	$PC_1^Y$	YP
Expenditure Tax	$OC_1^E$	$CC_1^E$	YC

While the expenditure tax eliminates the distortion associated with the taxation of interest income, and as a result leads to an increase in future consumption, this does not imply that the magnitude of private saving will be greater with an expenditure tax than an income tax. In other words, while the implementation of an expenditure tax would result in neutrality of the tax system, this may induce greater or less private saving than that which arises under a tax regime which distorts against future consumption. This can be observed by a comparison of the two parts of Figure 6. First, if C lies above P on the vertical axis, as is the case in Figure 6 (a), it is unambiguously true that saving will be greater with the expenditure tax. In that instance, saving in the presence of an expenditure tax,  $CC_1^E$ , must exceed that experienced under the income tax,  $PC_1^Y$ . This is not a general case, as Figure 6 (b) illustrates. In the event that P lies above C, the relative magnitudes of saving depend on the difference between  $(P - C)$  and  $(C_1^Y - C_1^E)$ . If the former value is greater than the latter, then saving will be greater in the presence of an income tax.

As the unit price of future consumption declines when the comprehensive income tax is replaced by the consumption tax, the magnitude of future consumption must increase. This is



observed in both parts of Figure 6 by examining the relationship between the positions of  $E^E$  and  $E^Y$ . The presence of a quasi-concave utility function assures that  $C_1^E$  is less than  $C_1^Y$  and correspondingly that  $C_2^E$  exceeds  $C_2^Y$ . However, whether the level of saving--the quantity of resources currently put aside for future consumption--will increase, decrease, or remain constant after the price change will depend on the elasticity of the compensated demand for future consumption. Although the magnitude of future consumption increases, the fact that the effective rate of return has been increased by the tax substitution means that the additional future consumption does not necessarily require an increase in savings.<sup>25</sup> The more inelastic is the demand for future consumption, the more likely it is that saving will be greater with the comprehensive income tax than the consumption tax. The fact that the tax reform literature has generally concluded that saving will be greater with the expenditure tax implies specific elasticity assumptions. The general conclusion, however, must be that the direction of change in the level of saving is ambiguous.

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<sup>25</sup>The growing importance of pension funds and institutional saving has led, it has been suggested, to a larger amount of "target saving." In this case, the substitution of an expenditure tax for an income tax would reduce the magnitude of this element of saving as it would become possible to save less while still reaching the target

This result is based implicitly on the assumption that there is no public saving (positive or negative). In other words, it is assumed that the budget is balanced. However, the level of savings in an economy is composed not only of private saving but also of public saving. It is, therefore, an interesting and logical step to inquire into the level of saving when the time pattern of government receipts and expenditures are not synchronized. In examining this issue, let us assume, as is standard, that government expenditures are waste, and that if it so desires, the government can borrow internationally at the existing rate of interest.

The role of equi-revenue comparisons in standard tax analysis is to enable examination of taxes irrespective of the time streams of the revenues they imply. The question being posed in the orthodox analysis is, given the revenue requirement, how will alternative taxes impact on individual well-being in satisfying that objective. The use of the tax revenue is viewed as quite independent of the time pattern of its receipt, and, in this sense, the assumption is analogous to the separation theorem employed in individual intertemporal choice. In other words, it does not matter if all revenue is received currently or in the future, the crucial characteristic is that taxes provide equal present value revenue. Consequently, in this analysis, it must be the

case that public deficits or surpluses arise in almost all cases. Let us examine what the equi-revenue assumption implies about the magnitude of capital accumulation. While not a description of reality, the equi-revenue assumption provides a useful benchmark of comparison to examine the role of public accumulation.

For any given time pattern of public expenditures, ( $G_1$ ,  $G_2$ ) aggregate or total accumulation (private plus public) in the presence of an income tax,  $A^{YT}$ , will be

$$A^{YT} = Y - C_1^Y - G_1. \quad (5.6)$$

When aggregate accumulation is the subject of consideration, tax revenues remain "within the system" and, as such, are not subtracted from income in calculating accumulation. Rather, current expenditures, whether private or public, are subtracted from income to derive accumulation. Aggregate or total accumulation in the expenditure tax case is,

$$A^{ET} = Y - C_1^E - G_1. \quad (5.7)$$

As  $Y$  and  $G_1$  are common to both equations (5.6) and (5.7), the issue of whether accumulation is greater with the income or the expenditure tax is resolved by examining the relative magnitudes of private consumption in the first period, namely the relative values of  $C_1^Y$  and  $C_1^E$ . As pointed out in the examination of Figure 6, the difference in the intertemporal price ratios of the two taxes ensures that  $C_1^Y$  is

greater than  $C_1^E$ , and, consequently, that accumulation must be greater with the expenditure tax. The difference in accumulation is equal to the difference in first period consumption,  $(C_1^Y - C_1^E)$ . In turn, the difference in first period consumption associated with each tax institution is a function of the magnitude of the distortion in the intertemporal price ratio brought about by the income tax.

It may be useful to summarize the analysis to this point. First, nothing definitive can be said about the relative magnitude of private accumulation associated with the income and expenditure taxes in the absence of specific elasticity assumptions. Consequently, the remedy to the "capital shortage" problem provided by the expenditure tax proponents is not well based. However, if the possibility of public accumulation is incorporated into the model, the view enunciated by the U.S. Treasury, quoted in the introduction to this chapter, becomes valid. There is a direct relationship between the intertemporal efficiency attributes of a tax institution and the magnitude of capital accumulation. Consequently, the replacement of the income tax by an expenditure tax would, in the model considered here, increase the magnitude of aggregate (private plus public) accumulation.

### 5.3 TAX POLICY AND CAPITAL ACCUMULATION: THE CHANGING TAX RATE CASE

The previous chapters demonstrated that the incorporation of assumptions about the growth of government and its impact on taxpayer expectations concerning future tax rates have a significant impact on traditional conclusions about the implications of specific tax bases. To examine these issues in the context of capital accumulation, let us relax the assumption that the public sector is static and examine the implications of its growth for the magnitude of capital accumulation under alternative tax regimes. In the first part of this section, we shall extend the theoretical analysis to consider the changing tax rate case. It will be shown that whether it is the income or the expenditure tax which retards capital accumulation to the greatest degree is theoretically indeterminate. Consequently, in order to resolve this theoretical ambiguity, we shall investigate the question empirically. From this examination, we shall conclude that inflation adjustment of the income tax would do more to stimulate capital accumulation than following the proposal to implement an expenditure tax.

The expressions for aggregate accumulation were provided in equations (5.6) and (5.7), and it was demonstrated that the relative magnitude of capital accumulation depends on the magnitude of first period consumption associated with

each tax institution. The greater is first period consumption in the presence of any tax, the smaller is the magnitude of capital accumulation experienced under that tax regime. From the analysis undertaken in Chapter III, the intertemporal price ratios associated with the income tax and the expenditure tax are, respectively,

$$1 + \rho - t_2^Y \rho, \text{ and} \quad (5.8)$$

$$(1 + \rho) (1 + t_2^E) / (1 + t_1^E). \quad (5.9)$$

There are two cases to consider. If

$$(1 + \rho - t_2^Y \rho) < (1 + \rho) (1 + t_2^E) / (1 + t_1^E), \quad (5.10)$$

then it will be the case that  $C1^E < C1^Y$  and accumulation will be greatest with the expenditure tax and, conversely, if

$$(1 + \rho - t_2^Y \rho) > (1 + \rho) (1 + t_2^E) / (1 + t_1^E) \quad (5.11)$$

then accumulation will be greater with the income tax than the expenditure tax. The former case, expression (5.10), where the expenditure tax, although it distorts does so less than the income tax, is illustrated in Figure 7 (a), while the latter case, equation (5.11) is depicted in Figure 7 (b).

Initially, consider the circumstances illustrated in Figure 7 (a). The expenditure tax distorts in this instance, but it does so to a lesser degree than the income tax. If

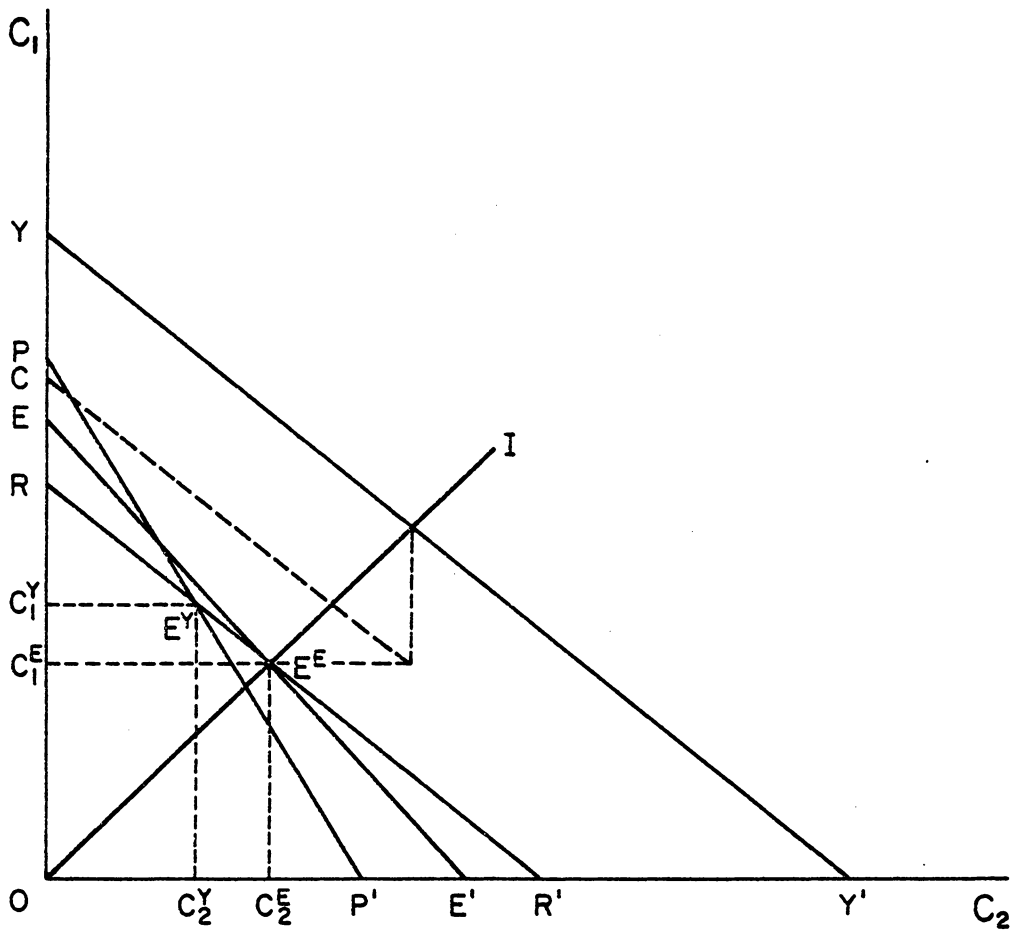


Figure 7(a): Capital accumulation under a changing tax rate regime

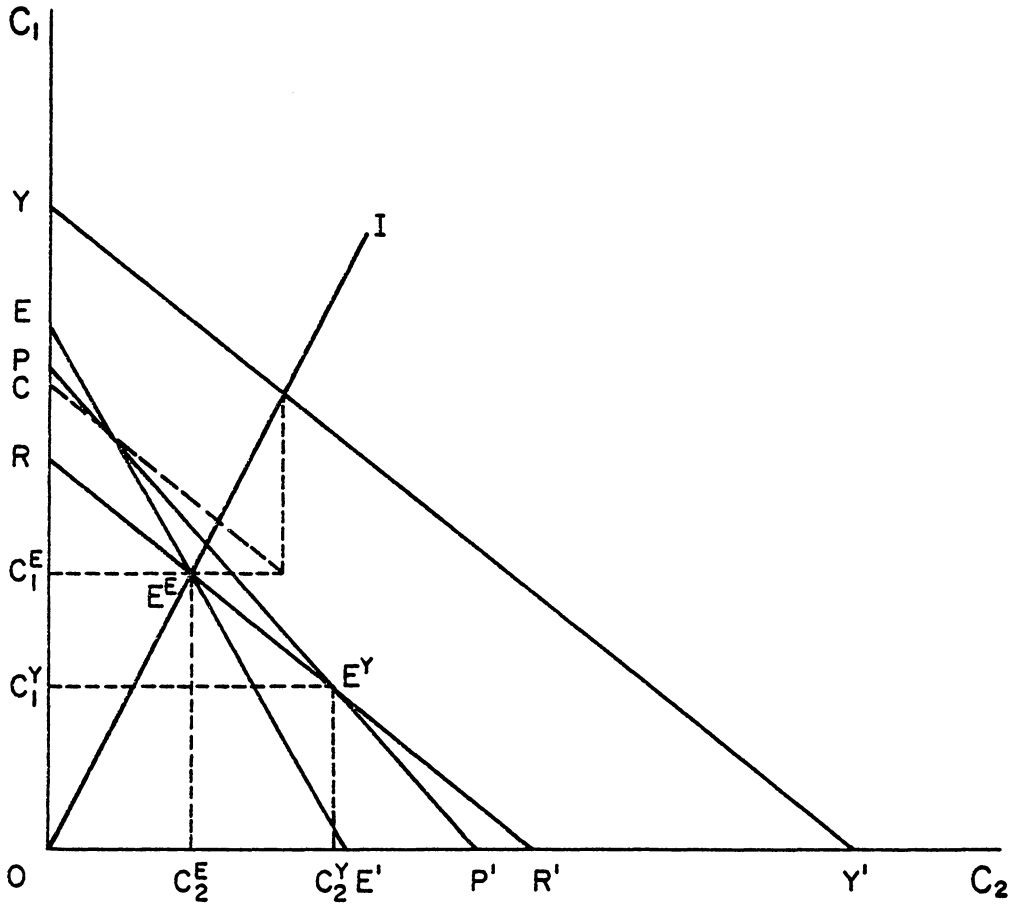


Figure 7(b): Capital accumulation under a changing tax rate regime



the private component of saving is examined in isolation, then the resolution to the issue of whether or not saving will be greater or smaller with an expenditure tax than an income tax is once again ambiguous. In contrast to the discussion in the previous section, where the expenditure tax was neutral, there is an increased likelihood that the implementation of an expenditure tax will not increase private accumulation. As the taxpayer's intertemporal consumption choice in the presence of an expenditure tax,  $E^E$ , approaches  $E^Y$ , the taxpayer equilibrium in the income tax case, there is an increased chance of point P lying above point C on the vertical axis. Then, as  $(C_1^Y - C_1^E)$  diminishes, private accumulation could be greater with the income tax. This, however, is only an increased probability relative to the constant tax rate case.

In considering aggregate accumulation, the results of the previous section apply, as is evident by examination of Figure 7 (a). As  $C_1^Y$ , first period consumption in the income tax case exceeds  $C_1^E$ , its counterpart in the expenditure tax case, accumulation will be greater with the expenditure tax. In this instance, there is once again support for the proposal to introduce the expenditure tax.

The second possibility is, as shown in Figure 7 (b), that the expenditure tax distorts more than the income tax. The

budget line associated with the income tax is again designated  $PP'$  with the taxpayer equilibrating at  $E^Y$ . The taxpayer saves an amount  $PC_1^Y$  and pays tax, in the first period, of  $YP$ . The introduction of an expenditure tax would see the taxpayer faced by a budget curve  $EE'$ , leading the taxpayer to locate at a point  $E^E$ . At that point, the quantity  $OC_1^E$  is currently consumed and  $CC_1^E$  comprises private saving. Tax revenues in the first period are  $YC$ . Again, questions of the relative magnitudes of private saving cannot be theoretically resolved. If aggregate accumulation is considered, it is clear from the equations defining accumulation that if  $C_1^E$  exceeds  $C_1^Y$ , as it does in Figure 7 (b), that accumulation will be greater with the income tax. Consequently, a movement from the income tax to the expenditure tax would see a reduction in the magnitude of accumulation.

Two cases have been isolated which yield contrary results: the first in which the expenditure tax distorts less than the income tax and the second in which it distorts more. It was concluded that, under the assumptions of the model employed, saving would only increase on the implementation of an expenditure tax in the first of the two cases cited; in the latter it would fall. Which of these sets of circumstances is the more relevant is an empirical question. It is clear from the theoretical analysis that there is a

direct relationship between the neutrality of the tax system and the magnitude of aggregate accumulation. In terms of the model employed, the issue is which of the inequalities expressed in equations (5.10) and (5.11) is appropriate. The resolution of this issue will be a function of the magnitude of the growth in tax rates.

To investigate this question, U.S. data for the period 1929-1978 (excluding a period for World War II) will be examined. The data source is various issues of the Statistical Abstract of the United States. The variables shown in Table 3 are the same as those employed in the empirical analysis undertaken in Chapter III and are defined as follows. The proportion of GNP appropriated by the public sector (column 1) is used as a proxy for the tax rate. The rate of interest employed is the corporate bond rate provided by Moody's (column 2). To this point, it has been assumed that the rate of discount,  $\rho$ , is the real rate of return. This will continue to signify the real return with the nominal interest rate being specified as  $r$ . As with the analysis in Chapter III, we will again examine a period of 20 years as the planning horizon of the taxpayer.

Similarly to the empirical study in Chapter III, it is necessary in examining the alternative tax institutions to pay specific attention to the role of inflation. When pub-

lic accumulation was incorporated into the analysis of the impact of different tax institutions on the magnitude of aggregate accumulation, it was shown that aggregate accumulation varied directly with the neutrality of the tax system. As the income tax can be levied on either nominal interest income or real interest income and that this, in turn, has significant effects on its neutrality, we shall consider each of these cases. The inequalities expressed in (5.10) and (5.11) were presented in terms of an inflation adjusted income tax, and hence which of these expressions is empirically typical will rest on the relative magnitudes of the distortions generated by tax rate changes and the double taxation of saving. It will also be necessary to consider similar expressions for an income tax imposed on nominal income. The solution in these circumstances will depend not only on the above factors but also on the additional income tax burden on interest income generated by the presence of inflation.

The price ratio for the inflation adjusted income tax is,

$$C_{j+T}/C_j = \prod_{i=j}^{j+T} e^{\rho_i(1-t_i)}. \quad (5.12)$$

In the case where the tax is levied on the nominal return,  $r$ , the price ratio becomes,

TABLE 3

## Empirical Estimates of Intertemporal Price Ratios

	1	2	3	4	5 <sup>a</sup>	6 <sup>b</sup>	7 <sup>c</sup>	8 <sup>d</sup>
	t	r	$\rho$	$1-t_{j+t}/1-t_j$	$\prod_{i=j}^{j+T} e^{\rho i}$	Eq. (5.12)	Eq. (5.13)	Eq. (5.14)
1929	0.1	0.0473	0.0473	0.8556	1.4164	1.3046	1.2059	1.2118
1930	0.122	0.0455	0.0708	0.8964	1.4009	1.2909	1.1934	1.2557
1931	0.163	0.0458	0.1338	0.9080	1.3266	1.2371	1.1322	1.2046
1932	0.182	0.0501	0.1532	0.8924	1.1034	1.0767	0.9434	0.9347
1933	0.192	0.0449	0.0962	0.8936	0.9541	0.9656	0.8178	0.8525
1934	0.198	0.04	0.0065	0.9165	0.8880	0.9158	0.7617	0.8138
1935	0.185	0.036	0.0111	0.9264	0.8843	0.9134	0.7593	0.9192
1936	0.195	0.0324	0.0227	0.9342	0.8193	0.9639	0.7032	0.7552
1937	0.165	0.0326	0.0035	0.8862	0.9015	0.9270	0.7724	0.7990
1938	0.198	0.0319	0.0505	0.8928	0.9036	0.9321	0.7742	0.8104
1939	0.194	0.0311	0.0443	0.9070	0.8722	0.9060	0.7408	0.7911
1940	0.184	0.0284	0.0188	0.8946	0.8647	0.9009	0.7301	0.7736
1941	0.231	0.0277	0.0277	0.9298	0.8728	0.9074	0.7317	0.8115
1946	0.218	0.0253	0.0600	0.9156	1.0764	1.0565	0.9016	0.9855
1947	0.182	0.0261	-.1175	0.8519	1.1629	1.1232	0.9707	0.9961
1948	0.195	0.0282	-.0495	0.8571	1.3500	1.2476	1.1074	1.1572
1949	0.23	0.0266	0.0363	0.9026	1.4470	1.3103	1.1711	1.3060
1950	0.213	0.0262	0.0164	0.8679	1.4187	1.2898	1.1313	1.2312
1951	0.24	0.0286	-.0505	0.8947	1.4255	1.2919	1.1149	1.2754
1952	0.27	0.0296	0.0077	0.9356	1.5463	1.3677	1.1899	1.4465
1953	0.278	0.0320	0.0245	0.9557	1.5956	1.3974	1.2104	1.5249
1954	0.265	0.029	0.0240	0.9298	1.5760	1.3841	1.1794	1.4496

Table 3, continued

	1	2	3	4	5 <sup>a</sup>	6 <sup>b</sup>	7 <sup>c</sup>	8 <sup>d</sup>
	t	r	$\rho$	$1-t_{j+t}/1-t_j$	$\prod_{i=j}^{j+T} e^{\rho i}$	Eq. (5.12)	Eq. (5.13)	Eq. (5.14)
1955	0.245	0.0306	0.0343	0.8636	1.5022	1.3059	1.1026	1.2973
1956	0.248	0.0336	0.0187	0.8830	1.4470	1.2983	1.0385	1.2893
1957	0.26	0.0389	0.0033	0.9054	1.4586	1.3036	1.0263	1.3206
1958	0.284	0.0379	0.0106	0.9427	1.4768	1.3132	1.0220	1.3922

\*All figures are rounded off for presentation.

<sup>a</sup>Pre-tax.      <sup>b</sup>Inflation adjusted income tax.  
<sup>c</sup>Nominal income tax.      <sup>d</sup>Expenditure tax.

$$C_{j+T}/C_j = \prod_{i=j}^{j+T} e^{(\rho_i - t_i r_i)}. \quad (5.13)$$

In the presence of an expenditure tax, the intertemporal price ratio is,

$$C_{j+T}/C_j = (1 - t_{j+T})/(1 - t_j) \prod_{i=j}^{j+T} e^{\rho_i} \quad (5.14)$$

The values of these equations for each year are shown in columns 6, 7, and 8, respectively. The pretax intertemporal price ratio, and also that of the equi-revenue locus, will be  $\prod_{i=j}^{j+T} e^{\rho_i}$  as shown in column 5. This price ratio corresponds to the slope of the lines YY' and RR' in the simple two-period model illustrated in the diagrams. In terms of the diagrams, the question being considered is whether Figure 7 (a) or 7 (b) is the most empirically relevant.

The theoretical analysis has shown that by incorporating public accumulation into the analysis, that aggregate accumulation is a function of the neutrality of the tax system. Consequently, the results in Table 3 can be examined by considering the relative neutrality of the alternative tax institutions. Column 5 presents the pre-tax intertemporal price ratios which provide the benchmark by which to con-

sider the alternative taxes. It is the case that the expenditure tax is more neutral than the nominal income tax over the period examined. This is evident by comparing columns 7 and 8 to the pre-tax case shown in column 5. However, this is primarily due to the impact of inflation on the taxation of purely nominal interest income. If the income tax had been adjusted for inflation by levying the tax on real income, rather than nominal income, the income tax would have been more neutral than the expenditure tax for slightly over 80 percent of the period under examination (see columns 6 and 8 compared with column 5). The move from an inflation adjusted income tax to an expenditure tax would, to the extent the model is appropriate, result in a reduction in the level of saving. Therefore, it is concluded that the expenditure tax would be an improvement on a nominal income tax, but is less conducive to saving than an inflation adjusted income tax. From a feasibility perspective, the implementation of inflation adjustment to the income tax is a significantly more viable proposition than the replacement of the income tax by an expenditure tax.

#### 5.4 THE CHOICE OF TAX BASE AND CAPITAL ACCUMULATION

The above analysis has demonstrated that whether or not the expenditure tax will stimulate capital accumulation, as



envisaged by some tax reform proposals, will depend on the particular circumstances of the period under consideration. As decisions on the nature of tax bases to be employed are quasi-constitutional, and hence characterized by permanency, the choice between the income and consumption bases is not straightforward. At some points in time, the expenditure tax may be preferable, while at others the income tax is superior. In this section, it will be demonstrated that the labor income tax is one means of resolving this dilemma. First, the labor income tax has important intertemporal lump-sum attributes which do not characterize the expenditure tax and, secondly, as it does not tax interest income, it avoids the "double taxation" of saving of the comprehensive income tax. Furthermore, the labor income tax will always be associated with capital accumulation equal to or greater than either of the two tax bases studied in the previous sections of this chapter.

It was demonstrated in Chapter IV that the labor income tax remains neutral in the presence of either a constant or an increasing tax rate regime. Consequently, the intertemporal price ratio will be  $(1 + \rho)$ , and the budget curve will be represented by the equi-revenue line,  $RR'$ , in the circumstances depicted by either Figure 6 or 7. In the constant tax rate case, illustrated in Figure 6, the taxpayer will

locate at  $E^E$  in the presence of a labor income tax. This is the same intertemporal consumption choice as that made in the expenditure tax case. As first period private consumption is equal in the case of both taxes, it follows, in line with the definition of aggregate accumulation, that total accumulation will be identical with a labor income tax and an expenditure tax. However, because in the labor income tax case total tax revenue accrues the first period, the public component of accumulation will be greater with a labor income tax.

When tax rates increase, this conclusion no longer remains valid. As the labor income tax remains neutral in the presence of increasing tax rates, the level of first period consumption will be lowest in the labor income tax case. Then, as shown in section 3, aggregate accumulation is equal to income less first period consumption, it follows that accumulation will be greater with the labor income tax than the expenditure or the income tax whenever tax rates increase. If, as appears to be the case, a major rationale for recent tax reform debates has been concern with the magnitude of capital accumulation, then it would seem that the focus of the debate has been misplaced. Not only has emphasis been given to the expenditure tax as resolving problems generated by the income tax, a questionable conclusion itself, the labor income tax has been overlooked.

## 5.5 CONCLUSION

It has often been asserted in the tax reform literature that capital accumulation will be greater under an expenditure tax than the income tax on the grounds of the relative neutrality of the taxes. In fact, in terms of these examinations, this answer is incorrect, as no definitive conclusion can be made. This ambiguous answer arises as aggregate capital accumulation is assumed to comprise only private accumulation. Public saving is assumed to be nonexistent. This balanced budget assumption is not only empirically unfounded but inconsistent with other aspects of orthodox taxation analysis. The standard theory contrasts the implications of alternative taxes in a setting where they all satisfy a given present value revenue requirement. It is inconsistent to assume a given spending requirement and then to conclude that public saving will be nonexistent when taxes involve different time patterns of revenue. We have examined the implications of a separation theorem in public intertemporal choice directly analogous to that employed in individual choice.

It was concluded on the basis of this assumption that if the expenditure tax was neutral, it would result in greater saving as suggested in the literature. However, I argued that the proposition that the expenditure tax was neutral

was unfounded. In fact, in the presence of changing tax rates with certain expectations assumptions, it was demonstrated on the basis of U.S. data that the expenditure tax distorted more than the inflation adjusted income tax in the majority of cases. In this setting, it was shown that the implementation of an expenditure tax in place of the income tax would actually see the level of saving fall. Consequently, if there is concern with a capital shortage, attention should not be concentrated on to the expenditure tax as a means for its resolution.

## Chapter VI

### THE TAX TREATMENT OF HUMAN AND PHYSICAL CAPITAL

#### 6.1 INTRODUCTION

There is a considerable literature discussing the form of tax treatment to be applied to the depreciation of physical assets. The aim of this literature is to find that policy which will leave the business investment decision uninfluenced by tax considerations (Brown, 1948; Samuelson, 1964; Stiglitz, 1975; and Swan, 1976). The standard conclusion is that either immediate depreciation or true economic depreciation will satisfy this criterion. From an administrative perspective, it is obvious that the former alternative is the only feasible policy. More recently, this discussion has been extended to human capital investment (Boskin, 1975; and Klein, 1977). The conclusion found in this literature is that most income tax systems will generally involve a bias in favor of human capital accumulation relative to business investment.

Boskin (1975) estimates that well over 50 percent of human capital investment is financed from forgone earnings which are tax free and consequently instantaneously depreciated. Ordinary business investment, by contrast (with the exception of R&D expenditures), is depreciated over the life

of the relevant asset.<sup>26</sup> This differential treatment is of substantial significance, as estimates place the human capital stock in the U.S. at \$997 billion compared to a business capital stock of \$1090 billion (Heckman, 1976). Further, Freeman (1977) suggests that this comparison underestimates the importance of human capital, since it ignores all human capital derived from non-school sources.<sup>27</sup>

A major rationale for the development of modern human capital theory was to examine the role of human capital in economic growth. Denison (1972) estimates education to contribute 21 percent of the growth in real national income per person from 1929 to 1969. This contribution was as important, or more important, than that of physical capital. It is interesting to inquire, therefore, if the tax system stimulated, or in fact was an impediment to, the accumulation of human capital, and, more generally, what neutral treatment of human capital would require.

In the previous chapter it was demonstrated that the introduction of tax rate changes into the standard model had implications for the magnitude of aggregate accumulation. It is the object of this chapter to examine one means by

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<sup>26</sup>It is possible that a combination of depreciation allowances and interest deductibility actually bias in favor of business investment. See King (1975).

<sup>27</sup>For example, lower wages in exchange for on-the-job training.

which such changes might affect the form of capital accumulation. It will be suggested that the conventional results depend, for their validity, on the same timing and expectations assumptions which have been questioned in the previous chapters. It will be demonstrated that instantaneous depreciation is only neutral in the special case in which tax rates are constant.

The relevance of this discussion is two-fold. First, consider the implications for the income tax. If there is differential tax treatment of physical and human capital, then there will be a deadweight loss resulting from the misallocation of any given amount of investment. According to the prevailing view, there will be relative overinvestment in human capital. Second, the discussion makes a contribution to the debate over the relative advantages of the income and consumption bases. With an expenditure tax, all forms of accumulation are exempt from current taxation, so the tax policy is equivalent to immediate expensing. Although this implies that both forms of accumulation are treated uniformly, immediate expensing is not neutral when tax rates change.

The structure of the chapter will be as follows. The second section will set out the standard results of the examination of depreciation policies. The third section

will demonstrate how changing tax rates destroy the neutrality of traditional depreciation policies. Finally, some conclusions will be presented.

## 6.2 THE STANDARD APPROACH

Instantaneous depreciation of an asset for tax purposes does not, in the standard model, alter the optimizing decision of an economic agent because it leaves the rate of return on an investment unaffected. The intuitive rationale for this result is that immediate deductability reduces the cost to the investor by an amount given by the tax rate. The fisc, therefore, finances a share of the investment. As a result, while the government taxes the return on investment, that part of the return it takes is in proportion to its implicit share of the initial investment outlay.

Consider a simple discrete example where the initial investment cost is  $I$  and the investment yields a rate of return,  $\rho$ . For simplicity, assume the life of the investment is only one period. The profitability of the investment is simply the return less the cost,  $(1 + \rho)I - I$ , or  $\rho I$ . Dividing through by the initial investment cost,  $I$ , gives the rate of return,  $\rho$ . The issue is whether this rate of return persists once taxes are introduced.



Assume that taxes are employed with a constant marginal rate,  $t$ . If an equivalent investment were undertaken in the presence of a policy of instantaneous depreciation, the net investment cost would be reduced to  $(1 - t)I$ . The value of the depreciation allowance is  $tI$ . The gross return to the investment, as in the previous no-tax case, will be  $(1 + \rho)I$ . However, this amount is now subject to a tax of  $t(1 + \rho)I$  which leaves a net of tax return  $(1 - t)(1 + \rho)I$ . The net of tax profit is the net return less the net cost of the investment. In other words,  $(1 - t)(1 + \rho)I - (1 - t)I$  which is equal to  $\rho(1 - t)I$ . Dividing through by the investment cost,  $(1 - t)I$ , gives the post-tax rate of return,  $\rho$ . The rate of return is the same as that earned in the absence of taxation and, consequently, the depreciation policy is neutral. These results can be summarized by noting that the individual taxpayer makes a net outlay of  $(1 - t)I$  and receives  $\rho(1 - t)I$ , while the government implicitly outlays  $tI$  and in return receives  $\rho tI$ .

In contrast to this, consider a delayed depreciation policy. For the purpose of example, assume that there is no deduction for investment undertaken in the current period, rather the asset is depreciated in the second period. In this case, the investment cost remains the same as in the absence of taxation, that is, the investment is  $I$  and again

yields a gross return of  $(1 + \rho)I$ . In the second period, the asset is depreciated in calculating the net tax burden. The tax is levied on  $(1 + \rho)I - I$  or  $\rho I$ . This implies a tax burden of  $t\rho I$  which leaves a net of tax profit of  $(1 - t)\rho I$ . The post-tax rate of return is therefore  $(1 - t)\rho$ . This is necessarily less than  $\rho$ , the rate of return earned both in the absence of taxation and in the circumstances where a policy of instantaneous depreciation is employed.

The general rule for the neutrality of a depreciation policy is that the sum of interest deductibility and depreciation allowance provisions must yield a deduction whose present value is equal to the investment cost (Stiglitz, 1975). In the model presented here, where the issue of interest deductibility is not canvassed, it is clear that a policy of delayed depreciation (deducting  $I$  in the second period) leaves the present value of depreciation allowance less than the initial investment cost. This illustration is summarized in Table 4. The table shows the steps set out in the discussion of each of the depreciation policies and the pre-tax case. Column 6 indicates the impact of each policy on the rate of return received on the investment. On the one hand it shows the neutrality of immediate expensing and on the other the distortion associated with delayed depreciation.

TABLE 3

Impact of Depreciation Policies on Rates of Return: The  
Constant Tax Rate Case

	1	2	3	4	5 (= 4 - 2)	6 (= 5/2)
Pre-Tax	I	I	(1+ρ)I	(1+ρ)I	$\frac{(1+\rho)I - I}{I}$	$\rho I / I = \rho$
Immediate Expensing	I	(1-t)I	(1+ρ)I	(1-t)(1+ρ)I	$\frac{(1-t)(1+\rho)I - (1-t)I}{I}$ = ρ(1-t)I	$\frac{\rho(1-t)I}{(1-t)I}$ =
Delayed Depreciation	I	I	(1+ρ)I	$\frac{(1+\rho)I - t\rho I}{= I(1+(1-t)\rho)}$	$\frac{I(1+(1-t)\rho) - I}{= I(1-t)\rho}$	$\frac{I(1-t)\rho}{I}$ = (1-t)ρ

NOTE: 1 = Initial Investment Cost; 2 = Investment Cost Net of Period 1  
Depreciation; 3 = Gross Return on Investment; 4 = Net of Tax Return;  
5 = Net of Tax Profit; 6 = Post Tax Rate of Return.

These simple analytics form the foundation for the claim that current income tax systems bias in favor of human capital vis-a-vis business capital. The bulk of human capital investment is financed from tax-free forgone earnings which, for tax purposes, is equivalent to the policy of instantaneous depreciation outlined above. Since investment in business capital is subject to delayed depreciation for tax purposes, it is most likely the case, as illustrated above, that the income tax reduces the rate of return to physical capital relative to human capital. Secondly, in the cash-flow form of the consumption tax presented, for example, by Andrews (1974) and the U.S. Treasury's Blueprints (1977), the implicit form of depreciation of capital is instantaneous. Consequently, the above illustration leads to the conclusion that an expenditure tax treats all forms of accumulation uniformly and that this treatment is neutral. This appears a priori to be a significant advantage of the expenditure tax.

### 6.3 DEPRECIATION AND CHANGING TAX RATES

It is not the objective here to argue with the logic of these conclusions, but rather with the appropriateness of the assumptions on which they are based. It will be argued that the conclusions drawn in the previous section are valid

only in the unlikely case that tax rates are constant (or, more accurately, expected to be constant) over the life of the investment.

As argued in previous chapters, the typical circumstance over the period of history relevant to policy discussion is one where tax rates increase over time. We shall continue to assume that individuals perfectly anticipate future tax rates. The aim of this section is, therefore, to inquire into the implications for the tax treatment of depreciation of human and physical capital when this modification is made to the standard model. It is obvious that the pre-tax benchmark rate of return remains unaffected. To take account of tax rates changing over time, the tax rates,  $t$ , will have subscripts indicating the period to which they apply.

As a point of departure, let us consider the case of instantaneous depreciation. The investment cost net of tax is, in this instance,  $(1 - t_1)I$ . The value of the depreciation is  $t_1I$ . The gross return to the investment will be  $(1 + \rho)I$ . In this case, the return is subject to tax at the second period tax rate,  $t_2$ . The net of tax return is, therefore  $(1 - t_2)(1 + \rho)I$ . By subtracting the investment cost from this, the net of tax profit is derived. In the changing tax rate model, this is  $((1 - t_2)(1 + \rho) - (1 -$

$t_1$ ) $I$ . Dividing through by the initial investment cost,  $(1 - t_1)I$ , gives the post tax rate of return,  $((1 - t_2)\rho - t_2 + t_1)/(1 - t_1)$ . The first point to note is that this expression cannot equal  $\rho$  unless there is an equality between the tax rates applicable in each period. In other words, a policy of instantaneous depreciation will not be neutral whenever tax rates change over time. Consider the empirically relevant case, one where tax rates are rising over time. This implies that  $t_2$  is greater than  $t_1$ , which means that the post-tax rate of return will be less than the pre-tax rate of return. The required condition for neutrality is that the present value of depreciation allowances be equal to the present value of tax liabilities. The impact of rising tax rates is to reduce the relative value of depreciation allowances, making the investments concerned less profitable.

Let us now examine the implications of the modified model for a delayed depreciation policy. Again, assume that the asset is totally depreciated for tax purposes in the second period. The investment cost remains equal to  $I$ . The investment yields a gross return of  $(1 + \rho)I$  in the second period, implying a net tax base of  $\rho I$  after allowing for depreciation. The tax is calculated at the second period tax rate and leaves a net profit of  $(1 - t_2)\rho I$ . The post-

tax rate of return derived by dividing through by the initial investment cost is  $(1 - t_2)\rho$ . Again, this is necessarily less than the rate of return achieved in the absence of taxation. Once again, the results have been summarized and are shown in Table 5 which corresponds to Table 4. In this case, however, a policy of immediate expensing is not neutral. Furthermore, in contrast to the constant tax rate case, delayed depreciation is not necessarily inferior to a policy of instantaneous depreciation.

The larger the change in tax rates, the greater is the likelihood that a policy of instantaneous depreciation will be more distorting than some form of delayed depreciation policy. To gain some understanding of the impact of the alternative, depreciation policies consider what tax rate change is required such that each policy reduces the pre-tax rate of return,  $\rho$ , by an equivalent amount. To derive this condition, we follow precisely the same steps as those undertaken in Chapter III. Consider a relationship between the tax rates described by  $\alpha$ , where  $\alpha = t_1/t_2$ . We are interested in finding a particular value of  $\alpha$ , say,  $\alpha^*$ , at which  $(1 - t_2)\rho = ((1 - t_2)\rho - t_2 + t_1)/(1 - t_1)$ . Then, whenever  $\alpha$  is less than  $\alpha^*$ , the change of tax rates is sufficient to justify the superiority of delayed depreciation. Solving for  $\alpha^*$  gives  $1/(1 + \rho - \rho t_2)$ , which is the same

TABLE 4

Impact of Depreciation Policies on Rates of Return: The Changing Tax Rate Case

	1	2	3	4	5 (= 4 - 2)	6 (= 5/2)
Pre-Tax	I	I	(1+ρ)I	(1+ρ)I	(1+ρ)I - I = ρI	ρI/I = ρ
Immediate Expensing	I	(1-t <sub>1</sub> )I	(1+ρ)I	(1-t <sub>2</sub> )(1+ρ)I	(1-t <sub>2</sub> )(1+ρ)I - (1-t <sub>1</sub> )I = I((1-t <sub>2</sub> )ρ - t <sub>2</sub> + t <sub>1</sub> )	((1-t <sub>2</sub> )ρ - t <sub>2</sub> + t <sub>1</sub> ) / (1-t <sub>1</sub> )
Delayed Depreciation	I	I	(1+ρ)I	(1+ρ)I - t <sub>2</sub> ρI = I(1+(1-t <sub>2</sub> )ρ)	I(1+(1-t <sub>2</sub> )ρ) - I = I(1-t <sub>2</sub> )ρ	I(1-t <sub>2</sub> )ρ / I = (1-t <sub>2</sub> )ρ

NOTE: 1 = Initial Investment Cost; 2 = Investment Cost Net of Period 1 Depreciation; 3 = Gross Return on Investment; 4 = Net of Tax Return; 5 = Net of Tax Profit; 6 = Post Tax Rate of Return.



expression as derived in Chapter III. As for most reasonable values of  $\rho$  and  $t_2$ , this expression will not be significantly different from one; it indicates that comparatively minor differences between  $t_1$  and  $t_2$  are required before it can be concluded that a delayed depreciation policy is in fact more neutral than instantaneous depreciation.

#### 6.4 CONCLUSION

This chapter leads to several significant conclusions. First, in direct contrast to the view enunciated at the beginning of this chapter, the income tax may have favored physical rather than human capital accumulation. Secondly, it has been demonstrated that contrary to the standard view, the consumption tax is not neutral with respect to either human or physical capital accumulation. Finally, a move from the income tax toward the expenditure tax may, depending on elasticity assumptions, see a fall in the magnitude of physical capital accumulation relative to human capital investment, for such a move may see a fall in the rate of return to business investment.

## Chapter VII

### TAX REFORM AND THE TIMING OF ANNOUNCEMENT

#### 7.1 INTRODUCTION

The discussion in the preceding chapters has examined a specific aspect of taxation under a given form of taxpayer expectations. The objective of this chapter is to commence generalizing some of the elements in previous chapters and to relax the assumptions about taxpayer expectations. In the preceding discussion, the issue of the timing of announcement was implicitly assumed away by endowing taxpayers with perfect foresight. The assumption of perfect foresight, by definition, means that individuals always act in full knowledge of the state of future tax arrangements and, consequently, the timing of the announcement of tax reform is irrelevant to individual behavior. In the absence of this assumption, however, the issue of the timing of announcement of tax reform becomes crucial for individual choice and its implications.

In this chapter, we shall examine two dimensions of this issue: first, the implications of the timing of announcement for the welfare cost of the tax system, and, second, the implications of timing for the equity of tax reform. In the second section of this chapter, we shall review the

orthodox assumption about taxpayer expectations by examining the implications of unanticipated changes in tax rates. The third section will extend this analysis by examining the implications of retrospective announcement of tax rules. It will be demonstrated that in certain circumstances, retrospectivity may be a desirable feature of fiscal arrangements. In the fourth section, we shall consider the equity implications of the timing of announcement of tax reforms. There is a suggestion in the literature that any tax reform will violate horizontal equity precepts. It will be argued that this view is based upon an unrealistic understanding of taxpayer expectations. When an alternative view of taxpayer expectations is considered, it is concluded that horizontal inequities may be unavoidable whether the tax system is reformed or not. Finally, section 5 will present the conclusions generated by the analysis in this chapter.

## 7.2 THE ORTHODOXY AND TAX RATE CHANGES

The standard approach to the issue of taxpayer expectations, as outlined in Chapter II, is that tax rate changes are not anticipated. Taxpayers behave as if they expect the current tax institutions to continue indefinitely. To the extent that tax rate changes are considered, they are examined in a setting which ignores the issues of transition.

Such an approach may be acceptable in a world where changes to tax institutions are more or less of a "once and for all" nature; however, the adjustment of tax rates cannot be viewed in this light. Tax rate changes have historically been the norm rather than the exception.

In this section, we shall adopt the orthodox assumption that taxpayers expect current tax institutions to remain indefinitely. In Chapter III it was demonstrated that the supposedly neutral consumption tax distorted in the presence of variation in tax rates. In this section, it will be shown that in addition to the welfare cost deriving from this source, an additional cost can be isolated which derives from the fact that taxpayer expectations are incorrect. For the purpose of illustration, let us assume that the current tax regime is an expenditure tax. The setting to be considered is illustrated in Figure 8. The pre-tax budget line is PF, while the budget line expected to characterize the expenditure tax under the orthodox expectations assumptions is P'F'. This budget curve, which is parallel to the pre-tax budget curve, forms the basis on which taxpayers make their consumption-saving plans. The representative taxpayer examined in Figure 8 plans to consume the combination  $C_1^{Pl} C_2^{Pl}$  and pursues this objective by undertaking first period consumption of  $C_1^{Act} (=C_1^{Pl})$  and saving the

remaining income which is equal to  $P - (1 + t)C_1^{\text{Act}}$ . In the second period, tax rates unexpectedly increase, with the result that the intertemporal price ratio changes. Consequently, the actual budget curve facing the taxpayer tilts from  $P'F'$  to  $P'F''$ .

By the choice of  $C_1^{\text{Act}}$  as the first period consumption level, the taxpayer, unknowingly, has committed him or herself to second period consumption of  $C_2^{\text{Act}}$ . The taxpayer had anticipated that the accumulation decision made in the first period would enable second period consumption of  $C_2^{\text{Pl}}$ . However, a feature of the decision to accumulate, ignored by the orthodox approach to modeling intertemporal choice, is that the rate of taxation to be levied on the product of accumulation is almost inevitably announced after the decision on the magnitude of accumulation has been made. In this illustration, the taxpayer, given his first period decision, has restricted consumption in the second period to  $C_2^{\text{Act}}$ . The consumption choice,  $C_1^{\text{Act}}, C_2^{\text{Act}}$ , places the consumer on the indifference curve  $i''$  at the equilibrium denoted  $E''$ . If the taxpayer had correctly anticipated the movement in tax rates, he would have chosen to locate at  $E'$  on indifference curve  $i'$ , consuming less in the first period and more in the second.

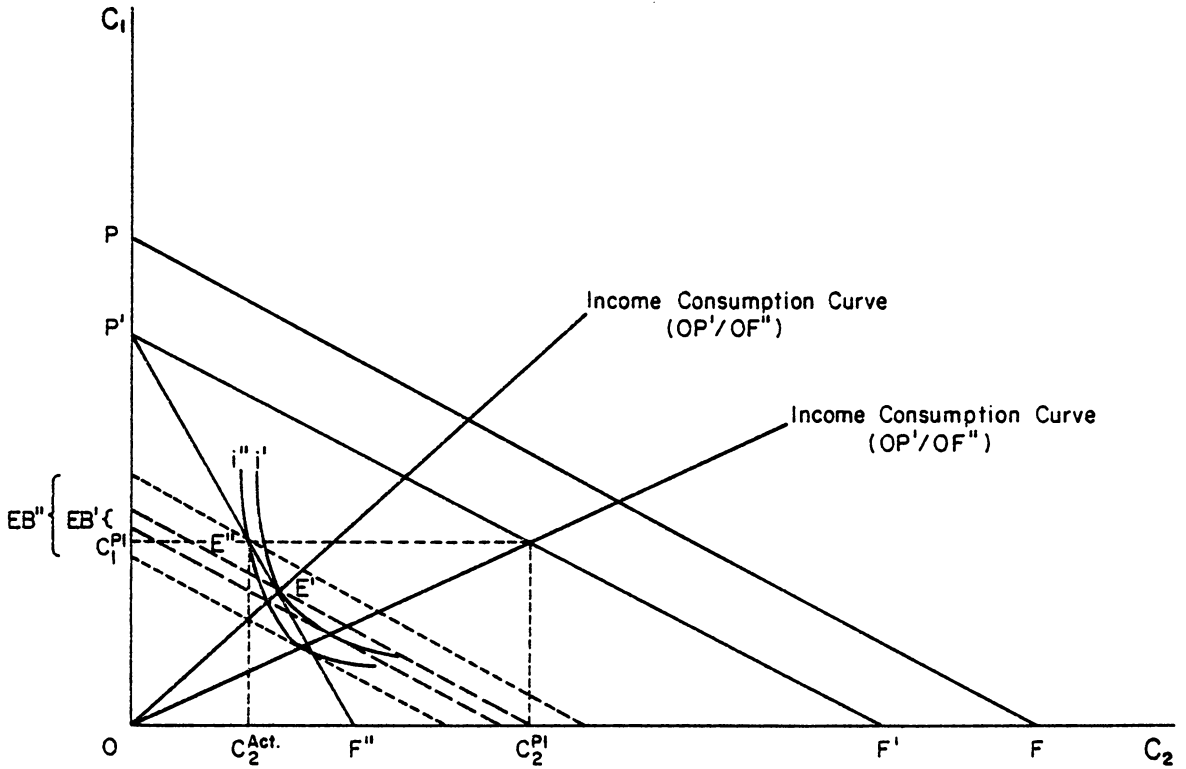


Figure 8: The welfare cost of unanticipated tax rate change

It is now possible to isolate two elements of the welfare cost of taxation. First, assume that taxpayers correctly anticipated the increase in the rate of the expenditure tax. In this case, the taxpayer would have chosen to locate at  $E'$ , and it can be seen by constructing hypothetical budget lines parallel to the pre-tax budget curve that the distance shown as  $EB'$  is the measure of the excess burden associated with that choice. It is this measure which was examined in greater detail in Chapter III. One interpretation of this excess burden measure is that it shows the additional dollars of revenue that could have been raised, without making the taxpayer worse off, had a neutral tax been employed. As is clear from the analysis in Chapter III, neutrality would have been achieved by maintaining constant tax rates. In fact, as the taxpayer had failed to anticipate the future rate of taxation, he chose to equilibrate at  $E''$  on indifference curve  $i''$ . The excess burden associated with this choice can, once again, be derived by drawing hypothetical budget curves parallel to the pre-tax budget curve through the point  $E''$  and tangent to the indifference curve designated  $i''$ . In this case, the excess burden is  $EB''$ . Given that  $E''$  lies above  $E'$  and also the relative positions of the indifference curves associated with each of these points, it necessarily follows that this excess burden is larger than

that experienced when taxpayers correctly anticipate changes in tax rates.

While this illustration has shown the welfare cost implications of unanticipated tax rate changes, it has ignored the fact that each solution shown in Figure 3 (E' and E'') is associated with different levels of revenue. If concern is with measures such as the welfare cost of the tax regime per dollar of revenue, for example, this omission is not acceptable. One dimension of this question, the revenue implications of fluctuating tax rates, has received some attention. A literature including Sjaastad (1976), Johnson (1977), and Brennan and Buchanan (1980b) has examined the implications of varying the rate of growth of the money supply, and, hence, the inflation tax. The particular focus of those discussions was on the ability of a revenue-maximizing government to gain further resources by varying inflation rates rather than by stabilizing them. This analysis is different from that undertaken here in the sense that its emphasis is solely on the implications for revenue maximization rather than combining an interest in this with concern for the direction of change in the welfare cost of taxation. On the other hand, the Johnson model is particularly applicable to the discussion here as the expectations attributed to consumers are precisely those of the orthodox public finance



theory being considered in this section. As a result, the Johnson model provides a useful vehicle for extending the examination of orthodox expectations assumptions to consider both revenue and welfare cost factors.

The case we shall examine is illustrated in Figure 9. It presents the demand curve of a representative taxpayer for some income-earning activity. Income is shown on the horizontal axis and the opportunity cost of this activity is defined to be constant and equal to unity. The tax rates,  $t$ , can then be simultaneously specified as rates and absolute values. As noted above, the assumption to be made with respect to taxpayer expectations is the orthodox assumption, namely, that next periods rate of taxation will be the same as the current period's rate of taxation. This is a special case of the adaptive formation of expectations, where a weight of one is placed on the current tax rate. Given this assumption, the objective is to contrast a constant tax regime case,  $\bar{t}$ , with a case of alternating tax rates, or a movement back and forth from tax rate  $t'$  to  $t''$ . The constant tax rate,  $\bar{t}$ , is the average of  $t'$  and  $t''$ .

In the constant tax rate case, revenue is equal to the rectangle  $\bar{t}ABC$ , while the welfare loss is  $BCD$ . If we consider the alternating tax rate case and impose the expectations assumptions, the expectation of  $t'$  results in effort

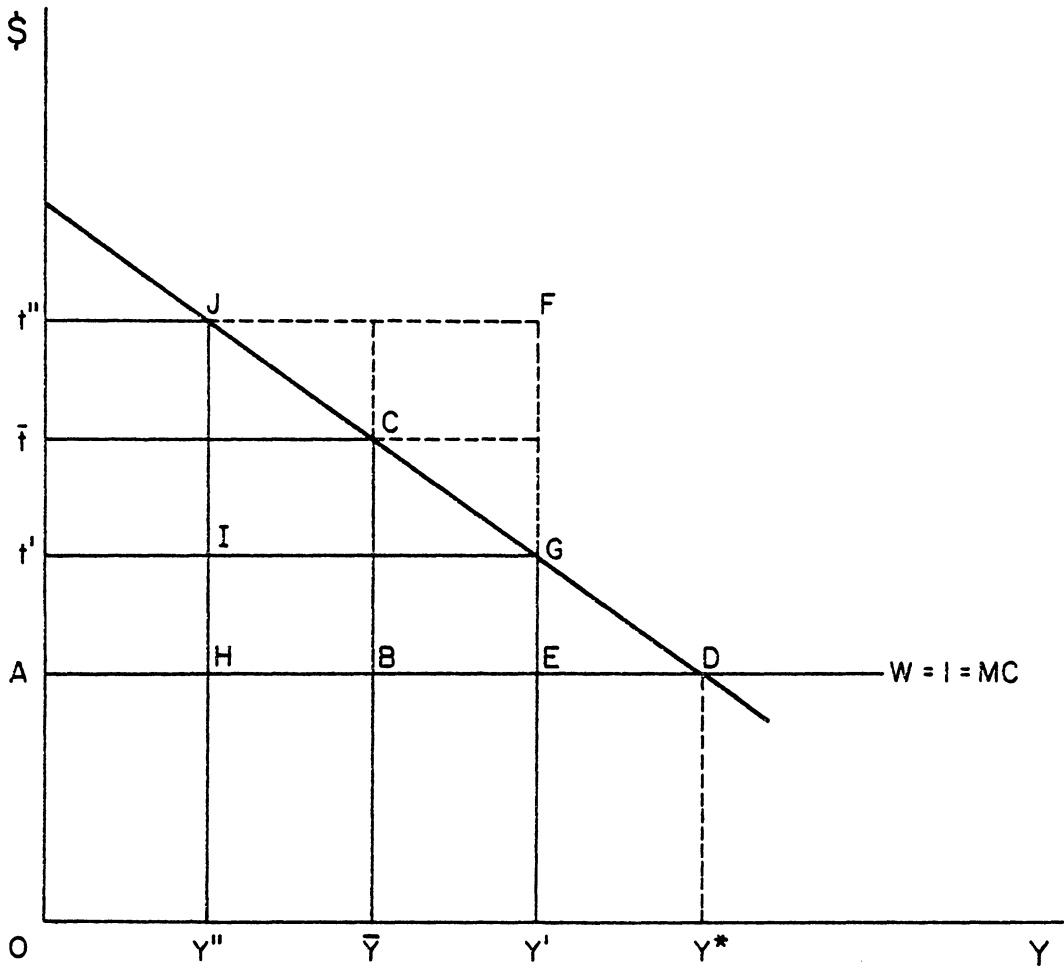


Figure 9: Fluctuating tax rates and adaptive expectations

of  $Y'$  but the actual tax rate is  $t''$ , leading to revenue of  $t''AEF$  and a welfare loss of  $GED$ . In the obverse case,  $t''$  is expected to be the tax rate which has the effect of inducing work of  $Y''$ . With the actual rate of tax being  $t'$ , revenue is  $t'AHJ$  and the welfare loss is  $HJD$ .

First, revenue will be greater if tax rates fluctuate than if they remain constant. This is demonstrated algebraically in the appendix to this chapter, equation (7.1'); but it is also evident by observing Figure 9 and summing the areas referred to in the previous paragraph to derive the revenue accrued over two periods. In other words, the sum of the rectangles  $t''AEF$  and  $t'AHJ$  exceeds twice  $\bar{t}ABC$ . While revenue increases, it can similarly be demonstrated that the welfare cost of taxation increases, a conclusion previously derived from the analysis of Figure 8. This is shown algebraically in the appendix, equations (7.2') through (7.4'), while in terms of Figure 9 it means that the sum of the triangles  $CED$  and  $JHD$  exceeds twice  $GBD$ .

The relevant comparison is then to determine whether the proportional increase in revenue is greater or less than the proportional increase in the welfare cost of taxation. The proportional increase in revenue is  $(t'' - t')(\bar{Y} - Y'')/(t' + t'')\bar{Y}$ , while the proportional increase in the welfare cost of taxation is  $1/4(Y' - Y'')(t'' - t')/\bar{t}(Y^* - \bar{Y})$ . By subtracting

this latter value from the former, it can be deduced that the proportional increase in tax revenue will exceed that of the welfare cost if,  $(Y^* - 2\bar{Y}) > 0$  (see the appendix to this chapter, equations (7.5') through (7.7')). Whether this condition will be satisfied or not will depend on the tax rate.

Some indication of the likelihood that this condition will be satisfied can be gained by examining a simple linear demand curve case and assuming, for simplicity, that marginal cost is constant. The revenue maximizing constant tax rate is to be found where the curve marginal to the demand curve intersects the marginal cost curve, and finding the demand price associated with that quantity. The tax will equal this price less marginal cost. At this point,  $(Y^* - 2\bar{Y})$  will equal zero. This must occur as the curve marginal to the demand curve intersects the marginal cost curve (point  $\bar{Y}$ ) at half the horizontal distance between the abscissa and the intersection of the demand curve and the marginal cost curve (point  $Y^*$ ). Generalizing to cases where marginal cost is increasing, it follows that the expression derived above must become negative in the revenue maximizing instance. Therefore, in these cases there is no net advantage, and in fact a loss, to be gained from fluctuating tax rates. It would therefore appear, if it can reasonably be argued that no political institution will lead to a tax rate

in excess of the revenue maximizing level, that the welfare cost per dollar of revenue will increase if tax rates are fluctuated. Furthermore, it is interesting to note that the variance of the tax rates (the magnitude of  $t'$  and  $t''$ ) is of no consequence in reaching a conclusion, rather the solution depends on the magnitude of the constant tax rate, denoted as  $\bar{t}$  in the above illustration.

The analysis in this section examined the orthodox assumption that taxpayers expect that the current tax system will remain indefinitely. This discussion resulted in two conclusions. First, a change in the tax rate, which had been shown in Chapter III to induce a welfare loss in the expenditure tax case, was associated with a larger welfare loss where taxpayers failed to anticipate the change in the rate of taxation. Consequently, in circumstances where taxpayer expectations are incorrect, tax reforms may well result in larger welfare losses than those captured by standard measures. Second, a comparison of a constant tax rate regime with one of varying tax rates showed that while revenue increased in the varying tax rate case, it did not necessarily follow that the welfare cost per dollar of revenue would decline under orthodox assumptions about taxpayer expectations.

### 7.3 RETROSPECTIVE ANNOUNCEMENT OF RATES OF TAXATION

The illustration in the previous section demonstrated that incorrect expectations on the part of taxpayers added to the magnitude of the welfare cost of taxation. This conclusion seems counter-intuitive because the welfare cost of taxation arises due to the behavioral adjustment of taxpayers as they attempt to minimize their tax burdens. If taxes were not anticipated, this adjustment would not occur and, consequently, it would seem that the welfare cost of taxation should be minimized. In this section, we shall examine this question in more detail by considering the impact on both revenue and welfare cost of particular tax institutions and taxpayer expectations.

In the example outlined in the previous section, we examined a situation where taxpayer expectations of current, but yet to be announced, tax rates were based on the rate of taxation applying in the previous period. This was contrasted with a case where the average of the alternating tax rates,  $\bar{t}$ , was maintained and consistently expected. In those circumstances, it was possible that more revenue could be gained by varying tax rates and thus deceiving taxpayers. Let us now examine the case of alternating tax rates once again, but in this case we shall ignore the standard of comparison provided by the constant tax rate case and examine a

different form of the adaptive expectations rule. Let us assume that the expectation of current tax rates is an average of the tax rates applicable in the previous time periods. In other words, the tax rate could be either  $t'$  or  $t''$  in Figure 9, so on average the taxpayer expects the rate of tax to be  $\bar{t}$ . We shall contrast the implications of retrospective announcement with pre-announcement of tax rates.

When tax rates are announced retrospectively, the taxpayer, given the assumed decision rule, always expects tax rate  $\bar{t}$ , and consequently earns  $\bar{Y}$  of income in each period. With actual tax rates alternating, the tax revenues accruing over two periods are  $(t'\bar{Y} + t''\bar{Y})$  which is equal to  $2\bar{t}\bar{Y}$ . This amount is greater than the revenue accruing when tax rates are pre-announced. In that case, taxpayers, knowing the tax rate to be applied to their income, adjust their supply of effort with the result that revenue is  $(t'Y' + t''Y'')$ . It is shown in the appendix, equation (7.8'), that revenue is larger in the case of retrospective announcement.

If the welfare cost associated with the alternative announcement rules is examined, it is the case, as anticipated at the beginning of this section, that the welfare cost of the tax will be minimized by retrospective announcement. Where tax rates are announced retrospectively, the taxpayer, expecting tax rate  $\bar{t}$ , always earns  $\bar{Y}$  irrespective

of what tax rate eventuates. The welfare loss for any single period will consequently be  $1/2 \bar{t}(Y^* - \bar{Y})$ . On the other hand, the average welfare cost per period where tax rates are pre-announced is  $1/2(1/2t''(Y^* - Y'') + 1/2t'(Y^* - Y'))$ . In the appendix to this chapter, equations (7.9') and (7.10'), it is demonstrated that the welfare cost of taxation is minimized by retrospective announcement. Therefore, in this example revenue is maximized and welfare cost is minimized by retrospective announcement of tax rates. A similar result is gained if, continuing to make the same assumptions about taxpayer expectations, tax rates are consistently increasing, although the reverse conclusion would hold if rates were declining, the welfare cost per dollar of revenue would be minimized by preannouncing tax rates.

The crucial issues in examining the question of announcement are, therefore, to delineate the appropriate assumptions to make with respect to taxpayer expectations and, also, to explain why retrospectivity of announcement has typically been viewed as violating fiscal constitutions. It might seem from the above analysis that it is only on the introduction of public choice arguments about the conceivable maximand of government, and the potency or effectiveness of nonfiscal constitutional rules in constraining political behavior, that arguments against the employment of retro-



spective taxation appear to have validity (Brennan and Buchanan, 1980b, Ch. 5). In a world where, for example, electoral constraints were effective, there does not seem to be a strong case for ruling out the ability to levy taxation retrospectively--the "discipline of continuous dealings" should prevail in political markets. In fact, as the preceding analysis illustrates, retrospective announcement of tax rules may be preferable. In Chapter VIII, however, some arguments will be presented suggesting that even in a world where concern with Leviathan-type outcomes could be ignored, as other constraints were effective, the unbridled use of fiscal power might be constitutionally outlawed on grounds of uncertainty and the costs of change.

#### 7.4 TAX REFORM AND EQUITY

The equity implications of tax reform have recently received considerable attention. Feldstein (1976a) has argued that there is no equity rationale for tax reform--a proposition inconsistent with the raison d'etre of a significant portion of the tax reform literature. In fact, tax reform is likely to create inequities by treating similiarly-placed individuals differently and thereby leaving them unequal in the post-tax setting. This outcome violates the principle of horizontal equity, the proposition stating that

equals should be treated equally.<sup>28</sup> In this section, we shall evaluate Feldstein's hypothesis, and suggest that it lacks general applicability. The question of its validity comes, once again, to the relationship between the timing of announcement of tax reforms and the assumed nature of taxpayer expectations.

Feldstein argues that tax reforms directed toward removing tax subsidies, perhaps on efficiency grounds, will create horizontal inequities. They will, he argues, modify rates of return to various activities which were otherwise equalized by market forces. In other words, it is suggested that net of tax rewards will be equalized as the prices of favored activities increase to compensate for their specific tax treatment. After the new equilibrium has been reached, any changes to the tax system will create windfall gains and losses because individuals have made commitments on the basis of existing tax laws and the relative prices they have generated. A similar argument will apply to the case of tax rate changes to the extent that there are activities which are exempted from taxation. Then, tax rate changes alter the relative rates of return to various activities and just as with reforms eliminating tax exemptions there should, if

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<sup>28</sup> Equals in Feldstein's (1976a) discussion are equals measured in utility terms. Others, and perhaps the more standard approach, use income (ideally lifetime income) as the measure of equality.

this viewpoint is correct, be horizontal inequities, as there are gains and losses accruing to previously equally situated individuals. To state the argument, Feldstein (1976a, pp. 94-95) says,

With the assumption of equal tastes and a single source of income (i.e., type of ability), any permanent existing tax structure will not violate horizontal equity if individuals are free to choose their activities and expenditures. . . . All horizontal inequities arise from changes in tax laws.

Feldstein's hypothesis depends, in his own words, on the existence of a "permanent existing tax structure." In this same context, however, he also claims to be discussing the implications of tax reform. It is logically impossible to discuss the implications of tax reform while arguing that the existing tax structure is permanent. An examination of the hypothesis indicates that the underlying assumptions made about taxpayer expectations are the now-familiar orthodox assumptions that taxpayers expect the current tax institution to remain indefinitely. If tax reform is feasible, there seems no logical reason for this assumption to be correct. In fact, it might be argued that if the conditions hold for Feldstein's hypothesis to be valid (namely, the existence of a permanent tax regime which no taxpayer expects to be changed), then a discussion of tax reform is not relevant because by assumption the government is so con-

strained that it cannot modify tax institutions. If, on the other hand, taxes can be reformed, then the Feldstein position does not seem reasonable; in this setting it is questionable to assume, as he does, that taxpayers expect the current tax regime to apply indefinitely. In other words, the ability to undertake tax reform suggests that taxpayers will associate some non-zero probability with the possibility of tax reform.

In the remaining part of this section, let us examine some alternative assumptions with the objective of determining the generality of the proposition that tax reform will violate equity criteria. From Feldstein's analysis, it is known that if all individuals have the same expectation that there will be no change in tax institutions, then current tax subsidies will reflect in the prices of favored activities and subsequent removal of those subsidies (or the creation of new ones) will violate horizontal equity. However, consider the reverse assumption where all taxpayers have perfect foresight, in this case Feldstein's argument does not apply. Taxpayers, anticipating the removal of the tax subsidy, would only capitalize the benefits for the period over which the favorable tax treatment will apply and not for an infinite period. In this case, the tax reform will not violate horizontal equity. These two examples provide extreme cases yielding opposite conclusions.

Consider a case, perhaps more realistically, where there is a tax subsidy but there is some likelihood that it could be changed. Then, if it is not removed there will be horizontal inequity, or if it is maintained there will be horizontal inequity. This can be demonstrated by means of an example. Assume a particular activity receives a tax subsidy worth \$10 per period. If it continues forever and the interest rate is 5 percent, the present value of the tax benefit is \$200. If Feldstein is correct, the price of the activity will increase by \$200 to equalize the post-tax rate of return. In this example, however, there is perceived to be a 50 percent chance that the tax benefit will be removed. Consequently, the expected value of the tax benefit is \$100 rather than \$200. Again, the expected post-tax rates of return will be equalized, but the introduction of the risk element means that the price of the favored activity will rise by \$100 rather than \$200. Then, if the tax reform is not introduced, the investor in the tax favored activity makes a net gain of \$100 due to the tax benefits.<sup>29</sup> The tax system treats him favorably relative to his equal in another activity. If the tax reform is undertaken the investor

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<sup>29</sup>In fact, if, for example, it was announced that there would be no further tax reform undertaken, this may change individuals' probability distributions of tax reforms, and hence lead to a modification of relative prices and resulting horizontal inequities.

loses the \$100 he invested into the once-favored activity. In this instance, he loses relative to his equals in other activities. Consequently, in this case, consistently with Feldstein, tax reform will create an inequity, but, contrary to Feldstein, so will the failure to reform taxes. Should taxpayers have different expectations of the likelihood of tax change, the same conclusion would follow; whatever action is followed there will be horizontal inequities. The one exception to this is a set of circumstances where there is no means by which tax institutions can be changed; they are immutable. However, if there were to be such a restrictive fiscal constitution, a discussion of tax reform would be irrelevant!

## 7.5 CONCLUSION

In this chapter, we considered some alternative constructions of taxpayer expectations. In the previous chapters, where taxpayers were assumed to possess perfect foresight, the issue of the announcement of tax rules or reforms was implicitly assumed away. When taxpayers are fully aware of all future tax arrangements, it is irrelevant when those tax rules are actually announced, though not, of course, when they are implemented. However, when taxpayers do not have this ability to foresee, the timing of announcement becomes

crucial in analyzing both efficiency and equity dimensions of tax institutions and tax reforms. As a first step in generalizing the issues discussed in previous chapters, it was therefore necessary to examine issues of the timing of announcement.

If taxpayers, consistently with orthodox assumptions, expect no changes in current tax institutions, then tax reforms resulting in the inaccuracy of those expectations can add to the standard excess burden measure of the particular tax base being employed. The extension of the orthodox assumption about taxpayer expectations over several periods can be modeled as a specific form of adaptive expectations. While each new set of tax rules which comes into being is unanticipated, once implemented they are expected to continue indefinitely. This structure of expectations was examined by Johnson (1977) in his study of a revenue maximizing government's ability to gain added revenue by fluctuations in inflation rates. The extension of this analysis, to encompass a concern for excess burden as well as revenue, demonstrated that while the welfare cost per dollar of tax revenue could fall, it is most likely to rise in contrast with a case where the rate of taxation is stabilized.

The welfare cost of taxation arises as individuals are induced to modify their behavior by the implementation of

the tax institution. Consequently, if taxation is announced retrospectively, and is not completely anticipated, it might be expected that the welfare cost of the tax system would be minimized, since potential behavioral adjustment is limited if not impossible. By assuming a given form of adaptive expectations, the welfare cost of taxation for any level of revenue is minimized by retrospective announcement of taxes rather than pre-announcement. While there are efficiency reasons for retrospective announcement there are other factors which require examination prior to considering this form of fiscal behavior.

Feldstein's (1976a) hypothesis on tax equity suggests that rather than removing horizontal inequities, the plugging of tax loopholes will create horizontal inequity by creating windfall gains and losses through tax induced changes in relative prices. The validity of this argument depends on both the orthodox assumptions about taxpayer expectations and the existence of a permanent tax structure. However, both of these premises are inconsistent with a discussion of tax reform which, by definition, implies change and therefore some expectation that change may occur. It is then the case that both the act of change and the failure to change taxes violate horizontal equity criteria--horizontal inequity cannot be avoided when the fiscal constitution grants the power to reform.



APPENDIX: WELFARE COST AND REVENUE IMPLICATIONS OF  
ALTERNATIVE EXPECTATIONS AND ANNOUNCEMENT RULES

The expectation of the tax rate to be applicable in period  $j$  is that it will be the same as in period  $j - 1$ . Revenues are greater if tax rates fluctuate than if they remain constant. Tax revenue for two periods, if tax rates are constant, is

$$\begin{aligned} 2\bar{t} \bar{Y} &= (t' + t'')\bar{Y} \\ &= t'\bar{Y} + t''\bar{Y} \\ &= t'Y'' + t'(\bar{Y} - Y'') + t''Y' - t''(Y' - \bar{Y}) \end{aligned}$$

And, as  $(\bar{Y} - Y'') = (Y' - \bar{Y})$

$$2\bar{t} \bar{Y} = t'Y'' + t''Y' - (t'' - t')(\bar{Y} - Y'') \quad (7.1')$$

As  $t'' > t'$  and  $\bar{Y} > Y'$ , this is less than  $(t'Y'' + t''Y')$ , the revenues accruing over two periods when tax rates fluctuate.

The welfare loss is greater if tax rates fluctuate than if they remain constant. The general formula for the measurement of welfare loss is  $1/2 t \Delta Q$ . The welfare loss for two periods when rates are constant is,

$$2(1/2\bar{t}(Y^* - \bar{Y})) = \bar{t}(Y^* - \bar{Y})$$

Note  $\bar{t} = 1/2(t' + t'')$  and therefore:

$$\bar{t}(Y^* - \bar{Y}) = 1/2 t'(Y^* - \bar{Y}) + 1/2 t''(Y^* - \bar{Y}) \quad (7.2')$$

The welfare loss arising over two periods when tax rates are changing is:

$$1/2 t'(Y^* - Y') + 1/2 t''(Y^* - Y'') \quad (7.3')$$

To contrast the two sets of circumstances, subtract the welfare loss associated with constant tax rates from this expression.

$$\begin{aligned}
 & 1/2t'(Y^*-Y') + 1/2t''(Y^*-Y'') - 1/2t'(\overline{Y^*}-\overline{Y}) - 1/2t''(\overline{Y^*}-\overline{Y}) \\
 &= -1/2t'Y' - 1/2t''Y'' + 1/2t'\overline{Y} + 1/2t''\overline{Y} \\
 &= -1/2t'Y' - 1/2t''Y'' + 1/4t'(Y' + Y'') + 1/4t''(Y' + Y'') \\
 &= -1/4t'Y' - 1/4t''Y'' + 1/4t'Y'' + 1/4t''Y' \\
 &= -1/4t'(Y' - Y'') + 1/4t''(Y' - Y'') \\
 &= 1/4(Y' - Y'')(t'' - t') \qquad (7.4')
 \end{aligned}$$

As  $Y' > Y''$  and  $t'' > t'$ , this is positive, implying that fluctuating tax rates add to the welfare cost of taxation.

The proportional increase in revenue achieved through fluctuating as opposed to constant tax rates is,

$$\begin{aligned}
 & (t'Y'' + t''Y' - t'Y'' - t''Y' + (t'' - t')(\overline{Y} - Y'')) / (t' + t'')\overline{Y} \\
 &= (t'' - t')(\overline{Y} - Y'') / (t' + t'')\overline{Y} \qquad (7.5')
 \end{aligned}$$

The proportional increase in welfare cost induced by fluctuating as opposed to constant tax rates is,

$$\begin{aligned}
 & (1/2t'(Y^*-Y') + 1/2t''(Y^*-Y'') - 1/2t'(\overline{Y^*}-\overline{Y}) - 1/2t''(\overline{Y^*}-\overline{Y})) / t(Y^*-\overline{Y}) \\
 &= 1/4(Y' - Y'')(t'' - t') / \overline{t}(Y^* - \overline{Y}) \qquad (7.6')
 \end{aligned}$$

Subtract the proportional increase in welfare cost from the proportional increase in revenue.

$$\begin{aligned}
 & (t'' - t')(\overline{Y} - Y'') / (t' + t'')\overline{Y} - (1/4(Y' - Y'')(t'' - t') / \overline{t}(Y^* - \overline{Y})) \\
 &= (t'' - t')(\overline{Y} - Y'') / 2\overline{t}\overline{Y} - 1/4(Y' - Y'')(t'' - t') / \overline{t}(Y^* - \overline{Y})
 \end{aligned}$$

Multiply by  $\overline{t} / (t'' - t')$  and make a common denominator.

$$= ((\overline{Y} - Y'')(Y^* - \overline{Y}) - 1/2(Y' - Y'')\overline{Y}) / 2\overline{Y}(Y^* - \overline{Y})$$

As  $Y^* > \bar{Y}$ , the denominator is positive and can be ignored.

Expanding the numerator,

$$\begin{aligned} & (1/2 Y' + 1/2 Y'' - Y^*) (Y^* - 1/2 Y' - 1/2 Y'') - 1/4 (Y' - Y'') (Y' + Y'') \\ & = 1/2 (Y' - Y'') Y^* + 1/4 (Y' - Y'') (-Y' - Y'') - 1/4 (Y' - Y'') (Y' + Y''). \end{aligned}$$

Multiply by  $4/(Y' - Y'')$

$$\begin{aligned} & = 2 Y^* - (Y' + Y'') - (Y' + Y'') \\ & = 2 Y^* - 2(Y' + Y'') \\ & = Y^* - (Y' + Y'') \\ & = Y^* - 2 \bar{Y}. \end{aligned} \tag{7.7'}$$

The expectation of the tax rate to be applicable in period  $j + 1$  is that it will be the average of the tax rates applicable in period  $j$  and  $j - 1$ .

Revenues when tax rates are announced retrospectively exceed those in the case of preannouncement. That is, the following expression is positive,

$$\begin{aligned} & 2 \bar{t} Y - t' Y' - t'' Y'' \\ & = 1/2 (t' + t'') (Y' + Y'') - t' Y' - t'' Y'' \\ & = 1/2 t' Y' + 1/2 t' Y'' + 1/2 t'' Y' + 1/2 t'' Y'' - t' Y' - t'' Y'' \\ & = -1/2 t' Y' + 1/2 t' Y'' + 1/2 t'' Y' - 1/2 t'' Y'' \\ & = 1/2 Y' (t'' - t') - 1/2 Y'' (t'' - t') \\ & = 1/2 (t'' - t') (Y' - Y''), \end{aligned} \tag{7.8'}$$

which is positive, as  $t'' > t'$  and  $Y' > Y''$ .

The average welfare loss per period, if tax rates are preannounced, is,

$$1/2 (1/2 t'' (Y^* - Y'')) + 1/2 (1/2 t' (Y^* - Y'))$$

$$\begin{aligned}
&= 1/2(1/2t''(Y^*-Y') + 1/2 t''(Y'-Y'') + 1/2 t'(Y^*-Y')) \\
&= 1/2(1/2(Y^*-Y')(t'+t'') + 1/2 t''(Y'-Y'')) \\
&= 1/2 \bar{t}(Y^*-Y') + 1/4 t''(Y'-Y''). \qquad (7.9')
\end{aligned}$$

The welfare cost in the case of preannounced tax rates exceeds that in the case of retrospective announcement.

$$\begin{aligned}
&1/2 \bar{t}(Y^*-Y') + 1/4 t''(Y'-Y'') - 1/2 \bar{t}(Y^*-\bar{Y}) \\
&= 1/2 \bar{t}(Y^*-Y') + 1/4 t''(Y'-Y'') - 1/2 \bar{t}(Y^*-Y') - 1/2 \bar{t}(Y'-\bar{Y}) \\
&= 1/4 t''(Y'-Y'') - 1/2 \bar{t}(Y'-\bar{Y}).
\end{aligned}$$

By construction,  $(Y' - Y'') = 2(Y' - \bar{Y})$ ; therefore, the difference in welfare cost can be expressed as,

$$\begin{aligned}
&= 1/2 t''(Y' - \bar{Y}) - 1/2 \bar{t}(Y' - \bar{Y}) \\
&= 1/2 (Y' - \bar{Y})(t'' - \bar{t}). \qquad (7.10')
\end{aligned}$$

As  $Y' > \bar{Y}$  and  $t'' > \bar{t}$ , this expression is positive.

Chapter VIII  
THE POWER TO REFORM

8.1 INTRODUCTION

The previous chapters have illustrated that the inclusion of taxpayer expectations in the theory of taxation places considerable doubt on standard tax reform propositions. More specifically, in the discussion of equity, it was indicated that the ability to reform the tax system may create unavoidable costs, as taxpayers attempt to anticipate reforms. A debate on the nature of tax reform and the timing of announcement would therefore seem to be logically preceded by a decision as to whether, and if so to what extent, political institutions should be able to reform existing tax regimes. The objective of this chapter is to inquire into the implications of the possession of the power to reform taxes when it is recognized that taxpayers are not myopic. Consequently, potential constitutional fiscal rules and procedures will be central to the discussion.

This question is intrinsic to the issue of taxpayer expectations. On the one hand, if there is no power to reform the tax system, the discussion of expectations becomes irrelevant because the current (and original) system of taxation will continue forever; should reform be permit-

ted, on the other hand, the nature of the fiscal constitution will be a significant factor in forming taxpayer expectations. In other words, the composition of the fiscal constitution will largely govern the nature of potential tax reforms and hence the nature of taxpayer expectations with respect to future adjustments to the tax system. In turn, this means that the design of the fiscal constitution will govern the nature of the costs imposed by the tax system. If expectations are such that the tax system is never expected to change, individuals' plans are made on this premise. However, when this assumption is relaxed, the power to reform taxes injects both a degree of risk into individual choice and also diverts otherwise productive resources into seeking specific modifications of the tax system. For somewhat similar reasons, Goetz (1978) notes that the questions of tax design and tax reform are related. The power to reform the tax system implies that the fiscal constitution can be characterized as an on-going or administered contract where future obligations are not fully defined.<sup>30</sup>

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<sup>30</sup>Goldberg (1976) distinguishes between a discrete contract in which all duties and obligations are specified and an administered contract which permits, according to some rule, obligations to be defined during the period of contract.

While the benefits of a flexible tax system have often been presented, the power to reform tax institutions implies costs which have not received comparable attention. It is the aim of this chapter to illustrate these costs and to briefly note the nature of constitutional choices which an individual choosing fiscal rules might consider. The general conclusion is that the power to reform the tax system will be limited in order to minimize the costs imposed on taxpayers. It should be emphasized that while other discussions of the welfare cost (Brennan and McGuire, 1975) or the equity cost (Feldstein, 1976a) of tax reforms have concluded that tax reform should be constrained, they rely for their arguments on tax reforms actually occurring and so are related to the the post-constitutional setting of the previous chapter. The discussion presented in this chapter relates solely to the potentiality of change or reform to create costs which a taxpayer choosing fiscal rules might wish to minimize. The reason this occurs is, of course, that taxpayer expectations can induce behavioral modifications, irrespective of what tax reforms are actually undertaken.

The chapter will be organized in the following manner. In the next section, we shall discuss the implications of the power to reform taxes from the perspective of rent-seeking activities. In the third section, we shall examine the

role of risk and use that as one reason why retrospective announcement of tax rules, discussed in the previous chapter, may be outlawed in fiscal constitutions. Finally, section 4 will present some conclusions.

## 8.2 THE POWER TO REFORM AND RENT SEEKING

Rent seeking is an entrepreneurial activity involving the investment of resources in seeking the right to receive a return in excess of a normal return.<sup>31</sup> The tax saving generated by the existence of a tax preference is an example of a rent-generating restriction. The rent-seeking hypothesis suggests that individuals or groups, perceiving the possibility of earning these rents, will invest resources in seeking to have these preferential tax reforms implemented (or preferential tax treatment maintained). This resource use is a social cost, since the resources employed to seek a transfer (an activity of no productive value) have an opportunity cost measured by their value in some alternative productive employment. In other words, the employment of resources in rent seeking is socially wasteful because it is directed toward redistributing the existing national income rather than toward the production of socially valued output.

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<sup>31</sup>For a representative sample of the literature on rent seeking, see Buchanan, Tollison, and Tullock (1980).



This section will be composed of three parts. First, the nature of rent seeking and tax preferences will be illustrated, and then, in the next subsection, the discussion will suggest why the issue of taxpayer expectations is related to this question. Finally, the relationship between the magnitude of rent seeking and the design of the fiscal constitution will be discussed.

### 8.2.1 Rent Seeking and Tax Preferences

Surrey's (1973) term tax expenditures is illustrative of the fact that tax preferences are a transfer from one group of taxpayers, employing the government as the transfer mechanism, to some other recipient group. Applying the general definition of rent seeking presented above, it is clear that the use of resources to either create, destroy, increase, or moderate tax expenditures can be considered a social cost.

Goetz (1978) has illustrated this social cost by adopting the compensating variation measure of the gain to an individual consequent on a relative price reduction experienced by a consumer. This is illustrated in Figure 10, which depicts a consumer's choice between two consumption activities,  $X_1$  and  $X_2$ . The consumer is faced with a budget constraint,  $YY'$ , the slope of which is given by the relative prices of  $X_1$  and  $X_2$ , where these prices include the current

taxes on each of these commodities. If the taxpayer gains a tax preference with respect to good  $X_1$ , the budget curve pivots around the point  $Y$ , as the price  $X_1$  falls, and becomes the line  $YY''$ . The consumer had previously been located at point  $E_1$ , but with the reduction in price can now locate on the higher indifference curve,  $i''$ , at the point  $E_2$ .

The theory of rent seeking argues that taxpayers, perceiving the possibility of such gains, will be willing to invest resources in pursuing these benefits. More precisely, they will invest resources, in order to have a tax preference implemented, to the point where the expected marginal benefit of the tax preference is equal to the marginal cost of the resources employed. In Figure 10, the line  $ZZ'$  is drawn parallel to the budget curve,  $YY'$ , such that it is just tangent to the indifference curve  $i'$  on which the taxpayer was initially located. The distance  $YZ$  therefore indicates the maximum amount which the taxpayer would be willing to expend in order to gain the tax preference illustrated. In the limit, if that amount of resources was expended, the taxpayer would finally be located at the point  $E_3$  on indifference curve  $i'$ , and, consequently, would not receive any net return by the implementation of the tax preference. Nevertheless, the resource use illustrated by

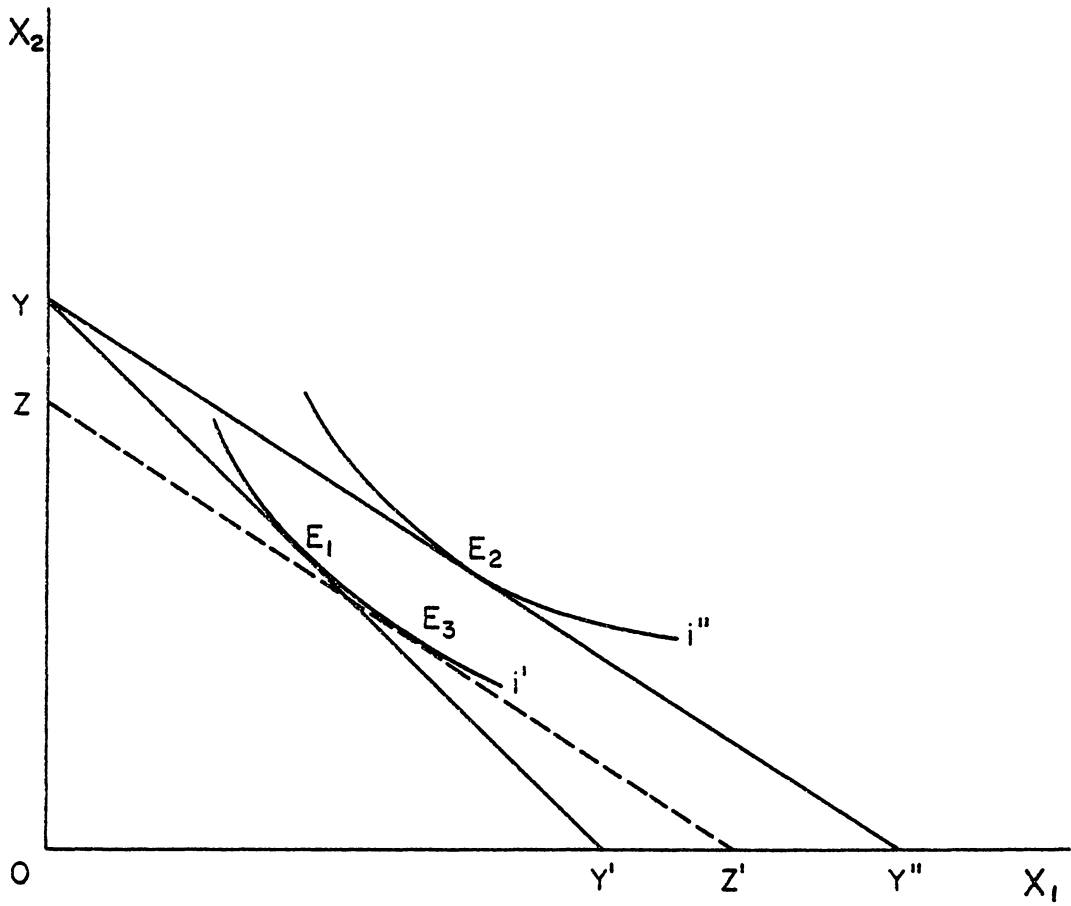


Figure 10: Tax expenditures and rent seeking

the distance YZ is a net social cost of the rent-seeking behavior.<sup>32</sup>

### 8.2.2 Rent Seeking and Taxpayer Expectations

In the orthodox world, where taxpayers never expect tax institutions to be reformed, it is contradictory to discuss rent-seeking behavior in the creation of tax preferences. If individuals do not expect current tax institutions to be changed, there is no benefit anticipated from the investment of resources in an effort to gain rents through the creation of tax preferences. It must be the expectation of the potential for change that induces the investment of resources in rent seeking.

The decision process of the taxpayer in canvassing the possibility of rent seeking is to invest resources to the point where the expected marginal benefit of the proposed tax expenditure is equal to the marginal cost of the resources employed. The expected marginal benefit of rent seeking is equal to the value of the proposed tax expenditure multiplied by the probability of the reform being implemented. There are a number of factors which will impinge on the taxpayer's expectation of change. First, the  
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<sup>32</sup>This modeling of the rent-seeking process assumes a deterministic world. If, for example, uncertainty was introduced, the resource use in rent seeking could either exceed or fall short of this amount (see Tullock, 1980).

nature of the fiscal constitution is crucial. Clearly, the number of possible tax reforms which can be undertaken will be determined by the constitution, but also of importance is the mechanism by which tax reforms are to be proposed and implemented. In other words, there are both specific fiscal rules and procedural rules. Other issues, such as the assumed maximand of the government, will also be relevant. The essential proposition, however, is that the magnitude of rent seeking (and hence the social cost of the tax system) will be linked to taxpayer expectations, which are in turn influenced by the design of the fiscal constitution.

### 8.2.3 Rent Seeking and the Fiscal Constitution

By prescribing the nature of conceivable tax reforms, the fiscal constitution will influence taxpayer expectations and, consequently, the magnitude of rent seeking with respect to the tax system. Consider one extreme where tax rules are nonexistent. In each period, the tax institution, including the shares of taxation, applicable to any group or individual is the subject of potential current reform. This situation could, in the absence of rent seeking, be approximated by a zero-sum game; a reduction in one individual's tax burden could be accommodated by an increase in another's. However, the introduction of rent seeking converts it into a

negative-sum game because individuals invest resources in seeking or preventing such transfers. If each individual's tax share is negligible in relation to the marginal cost of providing the public good (so income effects through the expenditure side of the budget can be ignored), each individual will be willing, in the limit, to spend up to \$1 in order to gain a \$1 reduction in their tax burden. This implies, once again in the limit, an expenditure on rent seeking equal to his/her tax burden.

Fiscal rules can either take the form of specific constraints removing from consideration specific changes to the tax system, or procedural rules which define the means by which tax reforms are to be decided upon and implemented. There is a general distinction between the effectiveness of these two forms of constitutional rules in the presence of rent seeking. A specific fiscal rule forbidding the use of a given tax base, for example, will remove the incentive to invest resources in seeking to have that base implemented. On the other hand, the effectiveness of a procedural rule in minimizing the cost of rent-seeking may be ambiguous. If, for example, tax reforms require 75 percent majority vote in the legislature rather than a simple majority, there is a demand and supply effect on rent seekers. While it is true that the cost of successful rent seeking will most likely

increase, it will also be more difficult, once a reform has been implemented, for it to be revoked. Consequently, the present value of a successful reform will be greater to the recipients of its benefits. It is possible that supposedly more stringent procedural rules will increase rent seeking. In this instance, specific fiscal rules appear to have an advantage over at least some procedural rules.

The presence of specific tax rules in the fiscal constitution, which are viewed as permanent, will reduce the magnitude of rent seeking in the tax system. Hayek (1960, 1979) has discussed some particular attributes of what he views as a desirable fiscal constitution. We shall briefly consider these as they relate to the issues discussed in this section. First, he states that all taxpayers should be treated uniformly. This concept encompasses the proposition that equally situated individuals should be treated equally. Consequently, a government would be unable to grant a tax preference to one individual without simultaneously providing it to others. The cost to government revenue of responding positively to rent-seeking taxpayers is increased, and therefore it would be anticipated that rent seeking might diminish. Similarly, the more general is the prescribed tax base and the less the government is able to manipulate the base to favor one group or another, the more

costly it will become to gain a tax preference. In each instance, the expected return to be gained from rent seeking is reduced and, as a result, so will the magnitude of rent seeking and the social cost of the tax system. Analogous arguments can be made with respect to Hayek's preference for proportionality of the rate structure. Such a restriction on possible tax rate reforms would prevent the granting of gains to one group at the expense of some other. A similar result could be brought about, however, at the cost of added complexity, by any constitutionally-determined liability progression rule.

The rules discussed above have all been specific fiscal constraints. Despite what was said about procedural constraints earlier in this section, let us consider one particular procedural rule. Feldstein (1976a) has argued in favor of delayed enactment of currently legislated tax reforms for the equity reasons pointed out in the exposition of his argument in the previous chapter. Essentially, the proposal of delayed enactment is intended to prevent windfall losses to individuals who, Feldstein assumed, make decisions on the basis of current tax institutions rather than on those which are expected to apply. In Chapter VII, it was suggested that Feldstein's hypothesis was not applicable, and consequently we did not consider any of his suggested remedies.



However, when the rent-seeking behavior considered in this chapter is incorporated into an analysis of tax reform, the delayed enactment of tax reforms does seem to have merit.

This is evident from two perspectives. First, the further ahead in time is the expected receipt of any benefit of a tax preference, the lower will be its present value, and, consequently, applying rational investment criteria, it would be predicted that there would be a lower commitment of resources in rent seeking. From a second perspective, it would seem that the closer tax reforms resemble the construction of constitutional tax rules, the less will be the magnitude of rent seeking. By delaying the enactment of any tax reform, there is a degree to which current participants in the political process are placing themselves in positions of uncertainty, if not ignorance, about their future positions with respect to the tax system. It is by developing such a "veil of ignorance" that the negative, if not the zero, sum elements of tax reform debates can be avoided.

An individual's behavior depends on his or her expectations of the nature of future tax institutions. In previous chapters, we examined the implications for various parameters when tax institutions are changed or reformed, and, more specifically, how taxpayer expectations impinged on those results. In this section, it is recognized that tax-

payers, perceiving the possibility of tax reform, might not be passive but rather will seek specific changes most beneficial to themselves. In this context, as in the previous one, expectations are crucial; they determine the magnitude of the social cost of the tax system arising through rent seeking. Taxpayer expectations could, it is suggested, be influenced by fiscal rules which either raise the expected costs or reduce the expected benefits of rent seeking.

### 8.3 THE POWER TO REFORM AND UNCERTAINTY

If restrictions on the nature of tax institutions and tax shares are totally absent from the fiscal constitution, the the tax regime to apply to current and past economic activity is necessarily uncertain. Taxpayers must take account of the various possible modifications to the tax system, and in turn this will necessarily impinge on their behavior. For example, if a tax preference on the investment in plant and equipment is anticipated to apply in some future period, it will be the case that some portion of that investment will be postponed in expectation of that tax advantage. On the other hand, if it is expected that such a tax preference is to be removed, the investment in plant and equipment may be brought forward. The essential problem in this environment is the individual's ability to plan when there is a

probability that the environment will change. It is true that markets will, in adjusting, impact on entrepreneurs plans, and it is perhaps a distinguishing characteristic of the successful entrepreneur that he or she is able to either predict or adjust most effectively when the uncertain future becomes a current state of the world. However, the continual adjustment and reform of the tax system absorbs resources by commanding the efforts of entrepreneurs in predicting its movements. This resource use is diverted from its productive use in market activity. To the extent that a fiscal constitution restricts the power to reform the tax system, it stabilizes the environment which, in turn, is of economic value.

The general nature of these issues has been raised elsewhere, although their implications for the system of taxation have not been examined. The development of a literature known as "the microfoundations of macroeconomics" has as its major impetus the issue of how individuals respond in markets where information is costly to obtain and how resources are employed to mitigate against uncertainty (Phelps, 1970). In this macroeconomic literature, the source of uncertainty is not the political mechanism as in the case of taxation, but other exogenous factors. More generally, however, this analysis of these issues was pre-

ceded by Knight's classic contribution, Risk, Uncertainty, and Profit. A central concern of that discussion was how entrepreneurs would respond in the presence of uncertainty. Many issues, raised in Knight's examination, such as the cost of resources employed in prediction, are also applicable in the taxation context. However, Knight also considers an issue which makes uncertainty deriving from potential tax reform crucially different from uncertainty which arises solely through the market. Knight notes that from the point of view of the efficiency criterion,

free enterprise must be justified if at all on the ground that men make decisions, exercise control, more effectively if they are made responsible for the results of the correctness, or the opposite, of those decisions (p. 358).

If the tax system is stable and consistent, this condition can be met, but if it is not, there is no guarantee that it will be applicable. Where the tax system is subject to continual adjustment, the returns to entrepreneurs are not only a function of their entrepreneurial skills in private markets but also of the outcomes of the political process. Consequently, the impact on entrepreneurial activity is a further cost of permitting flexibility in the system of taxation.

In some areas of research, solutions to these problems have been presented. For example, Friedman's (1969) "mone-

tary rule" proposition can be viewed as an attempt to introduce certainty into entrepreneurs' expectations of crucial economic variables. In the field of taxation, the rules noted in the previous section of this chapter contribute to certainty and thus counter the costs of uncertainty generated by a completely flexible system of taxation. For example, if there is a constitutionally-determined liability progression rule, the implications for an individual's tax burden of raising an additional dollar of tax revenue are determinant. However, where the rate structure is not prescribed, there are an infinite number of combinations of tax rates (each implying different marginal cost shares) which will raise a dollar of revenue. A fiscal rule with respect to the rate structure would therefore not only reduce rent seeking, but it would also contribute to certainty.

In the previous chapter, there was discussion of the efficacy of retrospective announcement of tax rules. It was concluded that from the standard efficiency perspective, retrospective announcement of rates of taxation could be desirable. However, in the context of the discussion in this chapter, arguments in favor of retrospectivity are diminished if not destroyed. Retrospectivity removes the ability of the entrepreneur to be responsible for the actions he undertakes and is therefore counter to the effec-

tive operation of the market system. Profitability is directly a function of the political mechanism. Consequently, the value of resources used in market activity will fall and therefore so also will the production of economic value.

#### 8.4 CONCLUSION

In previous chapters, we examined the implications of tax reform under a range of assumptions made about taxpayer expectations. It became evident through this examination that the combination of tax reform and taxpayer expectations of these reforms could result in costs of the tax system not traditionally recognized. Therefore, it seemed important to go back a step and examine what it means to permit the tax system to be amended by the political mechanism--in other words, to consider elements of a theory of tax reform. This chapter attempted to demonstrate that the fiscal constitution (and hence the power to reform), taxpayer expectations, and taxpayer behavior are all linked to one another.

At one extreme, a tax system which is completely flexible in the hands of the political process will be associated with the costs of rent seeking and uncertainty. The question which therefore must be answered in the choice of fiscal rules is how much flexibility does the taxpayer wish to

sacrifice in order to reduce these costs. While the maximand attributed to government by the citizen-voter will be a crucial determinant in the answer to this question, it would seem that whatever the form of the political system, there remains a case for minimizing the power to reform taxes for the reasons enunciated in this chapter.

## Chapter IX

### CONCLUSION

The analysis in this dissertation is intended to provide an initial examination of the role of taxpayer expectations with respect to the operation of tax institutions and tax reform. It seeks to determine what the implications of taxpayer expectations are for intertemporal choice and its consequences. The dissertation is composed of two general parts. In the first place, the role of expectations and timing in the choice of tax base is examined. This discussion demonstrates that the incorporation of taxpayer expectations into the analysis will mean that otherwise desirable tax reforms will impose costs not taken into account in tax reform discussions. As the discussion in this first section is limited to a specific element of the theory of taxation, the second section considers some broader dimensions of the role of taxpayer expectations by examining the implications for tax reform more generally. It suggests that as taxpayer behavior is likely to be influenced by expected tax changes, that the design of the fiscal constitution is important, for that will determine the domain of potential tax reform. This will, in turn, influence taxpayer behavior and consequently the costs imposed by the tax system.



Individuals make choices currently which will determine their future consumption possibilities. These choices will not only be influenced by the prevailing tax regime but also by the tax arrangements anticipated to apply in the future. It is the expectation of these future tax arrangements which is the central element of discussion in this dissertation. Orthodox tax theory implicitly assumes that taxpayers expect the current tax system to remain indefinitely. However, the empirical evidence suggests that the more typical environment in which taxpayers find themselves is one of changing tax institutions. Perhaps the major change in the period of history relevant to discussion is the growth in tax rates commensurate with the government's appropriation of a growing proportion of the national product.

The issue of the choice of tax base is at the core of standard tax theory. The conclusion of that analysis is that the consumption base is preferable to the income base, as it is intertemporally neutral, while the income tax distorts in that dimension. Taxpayer expectations of the growth in tax rates, noted in the previous paragraph, mean that the supposedly intertemporally neutral consumption-based tax in fact distorts as changing tax rates will induce intertemporal substitutions by taxpayers. While the income tax also distorts, the consumption or expenditure tax can no

longer be shown as preferable to the income base on theoretical grounds alone. An examination of United States data for the period 1929-1978 indicates that while a nominal income tax was inferior to a consumption tax, had one been employed, the consumption tax was in turn inferior to an inflation-adjusted income tax. A similar contrast can be made between a labor income tax and the consumption tax. Although these taxes are, in standard tax theory, equivalent, the incorporation of taxpayer expectations of tax rate changes into the analysis demonstrates that the labor income tax alone remains neutral.

A major stimulus to recent tax reform debates is the perceived "capital shortage." It is suggested, in tax reform discussions, that a move from the current income-based tax system to a consumption base would result in an increase in capital accumulation. The validity of this proposition is theoretically unverifiable. Two cases can be considered, however: one where private accumulation is examined, and a second where aggregate accumulation comprising both public and private elements is studied. In this latter instance, the move to a tax institution which increases the intertemporal neutrality of the tax system will induce greater capital accumulation. However, as the empirical examination of United States data for the 1929-1978 period illustrates, a

greater degree of neutrality would have been achieved by inflation adjustment of the existing income tax system rather than by a move to the consumption base.

However, not only will the magnitude of capital accumulation be influenced by taxpayer expectations of tax rate changes, so also will the form of capital accumulation. Due to the different depreciation policies associated with investment in human capital and business investment, it has been suggested that the income tax biases investment toward human capital investment. This ignores taxpayer expectations of tax rate changes which increase the value of depreciation allowances to business investment relative to that part of human capital investment financed from forgone earnings. The income tax system may have in fact imposed a relative bias against human capital investment. Furthermore, this same analysis illustrates that the move to a consumption-based tax could see a fall in business investment relative to human capital investment.

The examination of the choice of tax base can be viewed as a case study of the way in which taxpayer expectations have a significant impact on one aspect of the theory of taxation. Other more general issues of tax reform are raised by the examination of taxpayer expectations. The timing of announcement of tax reforms becomes important

whenever taxpayers do not possess perfect foresight, for in those circumstances, although the timing of implementation is relevant, the timing of announcement is of no concern. However, the absence of perfect foresight on the part of taxpayers suggests that with certain constructions of taxpayer expectations, the retrospective announcement of tax rules has certain efficiency properties.

Similarly, alternative constructions of taxpayer expectations demonstrate that the proposition presented by Feldstein (1976a) that tax reform will create horizontal inequity is invalid. The validity of the Feldstein hypothesis rests on the assumption that the tax system is permanent and expected by taxpayers to remain so. However, given this premise, it is then logically inconsistent to proceed to discuss the implications of tax reform. In the case where taxpayers are endowed with perfect foresight, tax reform does not create horizontal inequities as envisaged by Feldstein. Where expectations are inaccurate, it is the case that tax reforms will generate horizontal inequity, but it is equally true, contrary to Feldstein's hypothesis, that the failure to undertake reform will result in horizontal inequities. Whenever the tax system can be reformed by the political mechanism, horizontal inequity may be unavoidable, although certain fiscal rules will minimize it.

The examination of taxpayer expectations demonstrates that the power to reform the tax system induces costly behavior on the part of taxpayers. On the one hand, the ability to reform the tax system through the political mechanism withdraws resources from productive use and diverts them into seeking specific modifications to the tax system. Furthermore, the possibility of change absorbs resources, as entrepreneurs seek to predict movements in tax arrangements. These resource costs can be minimized by the design of the fiscal constitution because this will be a crucial determinant of taxpayer expectations.

This dissertation examined individual intertemporal choice and how tax institutions and taxpayer expectations of the employment of those tax institutions affect intertemporal choice. While the analytical setting employed in the first part of this study is within the orthodox framework and is consequently subject to the drawbacks noted in Chapter I, this approach did have an advantage. The incorporation of taxpayer expectations in tax analysis demonstrates, even within the orthodox framework, that the policy prescriptions generated by current tax reform debates are open to serious question. While this was one task of the dissertation, its more general objective was to present one element of the positive analysis required by the voter-taxpayer in

his choice of tax institutions and fiscal rules, specifically, to provide an analysis of the implications of taxpayer expectations for the operation of the tax system.

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TIMING AND EXPECTATIONS IN THE THEORY OF TAXATION

by

David C. L. Nellor

(ABSTRACT)

This dissertation is a study of individual intertemporal choice, and how alternative tax institutions and taxpayer expectations about the employment of tax institutions can affect those choices.

This examination differs from standard tax analysis by explicitly incorporating into the analysis taxpayer expectations of reforms to the prevailing tax arrangements. To demonstrate the significant implications of taxpayer expectations, the issue of the choice of tax base is reexamined in a setting where tax rates are changing through time. The comprehensive income base, the consumption base, and the labor income tax base are each considered in terms of their efficiency attributes and their implications for both the magnitude and form of capital accumulation.

This analysis illustrates that the labor income tax is superior to the other tax bases in terms of the standard

criteria noted. Furthermore, the consumption tax, which is supposedly intertemporally neutral, in fact distorts intertemporal choices. An examination of United States data for the 1929-1978 period suggests that inflation adjustment of the prevailing income tax system is, contrary to several tax reform proposals, preferable to the implementation of an expenditure tax.

Taxpayer expectations will be influenced by both the nature of possible tax reform and the means by which tax reform is implemented. The role of the timing of announcement and the equity implications of tax reform are investigated under different taxpayer perceptions of the likelihood of reform. Finally, it is demonstrated that, as individuals behave in accordance with expected change, the power to reform the tax system involves costs through rent seeking and uncertainty. Citizen-taxpayers will take these costs into account in their choice of fiscal rules.