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The Economic and Political Foundations of Tax Structure

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THE ECONOMIC AND POLITICAL FOUNDATIONS
OF TAX STRUCTURE

by

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THE UNIVERSITY OF WESTERN ONTARIO
THE ECONOMIC AND POLITICAL FOUNDATIONS OF TAX STRUCTURE

Walter Hettich* and Stanley Winer**

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I. Introduction

The theoretical literature on taxation has flourished in the past fifteen years. Work on optimal taxation has greatly increased our understanding of how individuals and private markets respond to tax policy. In addition, the development of general equilibrium models has provided a new perspective for the analysis of tax incidence and efficiency.

Despite these advances, some basic theoretical problems remain unsolved. Among them is the question of why existing tax systems have the structure and characteristics that we observe. Economists have written much about how particular taxes should be designed in order to satisfy criteria such as efficiency and equity. Yet it is a well-known fact that actual tax systems continue to diverge widely from proposed blueprints.

When reference is made to the observed pattern of taxation, economists will often point to political factors that lie outside of their models or of normative theory. Others, such as Musgrave, have emphasized administration costs as a major determinant of tax structure. From a theoretical point of view, such explanations must remain unsatisfactory, however, because of their ad hoc nature or because of the partial analysis on which they are based.

We show in this paper that the essential facts of observed tax systems can be explained as the outcome of self-interested behavior by economic and political agents. The argument integrates economic responses, emphasized in the traditional literature on taxation, political responses and administration costs into the analysis. In addition, it introduces a fourth element by explicitly considering the heterogeneous nature of economic and political behavior of taxpayers.

Actual tax systems are complicated and often elaborate. Underneath their rather baroque appearance lies a simple skeleton, however, consisting of a limited number of parts or components. The main elements in all tax systems are tax
bases, rate structures and special provisions, such as exemptions and deductions. A theoretical analysis of tax structure must show how these elements arise as the outcome of rational choices and what determines their definition, design and their importance within the system as a whole.

The paper starts with the presentation of a basic model in which a government maximizing expected votes sets tax rates for N individuals who have different economic and political responses but who engage in the same type of economic activity. The resulting equilibrium serves as a reference solution for later parts of the paper. However, tax structure in this simple world consists merely of a set of N unique rates imposed on a single type of activity. When the analysis is generalized to allow individuals to engage in multiple activities, a more complicated pattern emerges. The government now taxes each individual separately on each of his activities.

Actual tax systems have tax basis and rate structures applying to groups of individuals; they do not treat each taxpayer uniquely. Section Four demonstrates how administration costs lead to such grouping and shows formally how heterogeneity among taxpayers influences the solution to the grouping problem. The next section completes the explanation of the "skeleton" by demonstrating that the adoption of special provisions is a further logical response by the government to heterogeneity and positive administration costs.

The paper concludes by examining the implications of the theoretical framework for two well-known questions in the theory of taxation. Section Six explains why a rational government may tax certain individuals at rates that place them on the backward-bending portion of their rate-revenue relationship as part of the solution to the grouping problem. A seventh section briefly examines the meaning of economic efficiency in an extended theoretical framework such as the one proposed here. The paper ends with a set of brief concluding remarks.
2. A Basic Model

The general approach to political economy adopted here involves the modelling of political equilibrium, not the political process. The underlying assumptions in this approach are that, first, that political competition is sufficiently strong to force convergence to an optimal political strategy. There is some evidence that suggests this is a reasonable research methodology (e.g. Romer and Rosenthal, 1984). Secondly, following Shepsle (1979), we assume that vote cycling is prevented by institutional structure and hence that the optimal political strategy is a stable equilibrium.

In the basic model, the probability of voting for the government is influenced positively by the services received from a pure public good $G$ and negatively by the loss in full income (including deadweight loss) from taxation. Since the government provides a pure public good consumed equally by all $N$ taxpayers, an individual taxpayer sees no connection between the level of services provided and their own tax burden. This separation of benefit and tax sides of the budget allows us to represent the $i^{th}$ voters unique probability of voting for the government as

$$b_i (G) - c_i (T_i + d_i)$$  \hspace{1cm} (1)

where

$G$ = a pure public good

$T_i$ = tax payment made by $i^{th}$ voter

and

$d_i$ = deadweight loss born by $i^{th}$ voter.
In (l), opposition to taxation $C_i$, ie, the reduction in the probability of voting for the
government as a result of taxation, depends on the loss in full income $T_i + d_i$. It
is important to note that (l) implicitly assumes that voters base their decision only
on benefits and taxes influencing them directly, and are not influenced by how
others are treated.

Furthermore, we assume that taxation of the $i^{th}$ voter is proportional at rate
t$_i$, that taxable activity of the $i^{th}$ voter depends negatively on the rate $t_i$, and that
the welfare loss $d_i$ depends negatively on the actual size of taxable activity $B_i$.*
Hence for $i=1,2,...N$,

$$T_i = t_i \cdot B_i$$  \hspace{1cm} (la)

$$B_i = B_i(t_i) ; \; \partial B_i/ \partial t_i < 0$$ \hspace{1cm} (lb)

and

$$d_i = d_i(B_i,) ; \; \partial d_i/ \partial B_i < 0.$$ \hspace{1cm} (lc)

Equations (lb) and (lc) reflect the voter's utility maximizing response to taxation.
For simplicity it is assumed that all taxpayers engage in the same type of activity
and that their economic and political responses to taxation are known to the
government without cost.

* The assumption of proportional rates rules out lump sum taxation.
Since we want to model the government's choice of tax rates, it is convenient to rewrite (1) to include the tax rate using (1a) and (1b). While it would also be possible to eliminate $d_i$ from (1) using (1c), such a formulation would obscure an important aspect of the analysis. Taxpayers respond to taxation in two different but related ways. A taxpayer will adjust the pattern of his economic activity so as to lower his tax payment. We shall call this response economic exit. The taxpayer's ability to adjust his activity in response to taxation also influences his political behavior. In order to capture this effect of economic exit on political opposition, we include $d_i$ in the following reformulation of (1):

$$\mathcal{b}_i(G) = \mathcal{c}_i(t_i, d_i).$$

(1')

This formulation allows us to discriminate between the two crucial influences of taxation on political behavior. The partial of $\mathcal{c}_i$ with respect to $d_i$ reflects the effect of economic exit on political opposition. It should be noted that $\partial \mathcal{c}_i / \partial d_i < 0$. While a taxpayer will offer more opposition (is less likely to vote for the government) if a larger deadweight loss is associated with a given total tax payment, he will oppose the government less if a larger $d_i$ is combined with a given $t_i$. In the latter case, a larger deadweight loss means that he was able to escape more effectively and that his full income has decreased less as a result.
The partial derivative \( \partial c_t / \partial t \) reflects the direct influence on opposition of a change in the tax rate, holding economic exit constant. We shall call this effect political voice. This partial is negative since a higher tax rate with exit held constant implies a lower full income.

The government chooses the level of \( G \) and tax rates \( t_1, t_2, \ldots, t_n \) to maximize expected votes

\[
\sum_{i=1}^{N} \left[ b_i (G) - c_i(t_i, d_i) \right]
\]

subject to the government budget restraint

\[
G - \sum_{i=1}^{N} t_i B_i = 0
\]

and subject to taxpayers' responses to taxation reflected by equations (1b) and (1c). Maximization of expected votes is a concise way to capture the motivation of government which is unsure of the identity or characteristics of its opponents (Denzau and Munger 1983, Mayhew 1974).

The first order conditions for a solution to the government's problem consist of (2a) and equations (3a) and (3b) for each \( i \):

\[
\sum_i \partial b_i / \partial G + \lambda = 0
\]
\[- \left( \frac{\partial c_i}{\partial t_i} + \frac{\partial c_i}{\partial d_i} \cdot \frac{\partial d_i}{\partial B_i} \cdot \frac{\partial B_i}{\partial t_i} \right) \right] \\
- \lambda (B_i + t_i \cdot \frac{\partial B_i}{\partial t_i}) = 0 \to (3b)

The first order conditions can be restated for each \( i \) as

\[
\frac{\partial c_i}{\partial t_i} + e_i = \lambda^* \\
B_i (1 + e_i)
\]

where \( e_i = \frac{\partial c_i}{\partial d_i} \cdot \frac{\partial d_i}{\partial B_i} \cdot \frac{\partial B_i}{\partial t_i} \), \( e_i < 0 \); \( \lambda^* = \sum_{i=1}^{N} \frac{\partial b_i}{\partial G} \),

and \( e_i = \frac{\partial B_i}{\partial t_i} \cdot \frac{t_i}{B_i} \).

In (4), \( \frac{\partial c_i}{\partial t_i} \) represents political voice, \( e_i \) is the effect of economic exit on opposition and \( e_i \) is the elasticity of the \( i \)th taxpayer's activity with respect to his tax rate. As shown in the Appendix, sufficient second order conditions are that the effect of exit on opposition for taxpayer \( i \) increases in absolute value as \( t_i \) rises but at a slower rate than political voice, and that \( \frac{\partial B_i}{\partial t_i} \), the sensitivity of the base of the \( i \)th taxpayer, increases in absolute value as \( t_i \) increases.

While the solution to the first order conditions integrates economic and political behavior, it yields only a very simple tax structure which misses most essential elements of observed tax systems. Tax structure in (4) consists of \( N \) rates on one activity, with each taxpayer being taxed at a unique rate. As yet, voters are not grouped into rate brackets, activities are not grouped into bases and there are no special provisions. In subsequent sections we extend the basic
model to account for these basic elements of tax structure.

We are interested primarily in establishing a set of sufficient conditions for the existence of a stylized tax structure. Since we can accomplish this without relaxing the assumption of independence among voters' net political benefit functions (I and I') or the assumption that voters' economic and political responses to taxation are known without cost, we shall maintain both assumptions throughout the paper. Some further discussion on the significance of these assumptions is contained in the conclusion.

3. Taxation of Many Activities

The basic model contains only one type of taxable activity. In the real world governments will tax many different activities. The taxation of many activities is a natural outcome of the government's objective of maximizing expected votes and the assumption in (I) that opposition to taxation depends on the loss in full income.

Assume that a particular taxpayer engages in several activities rather than only in a single one. Economic exit is possible in each case, but the change in the deadweight loss and therefore in political opposition in response to a change in the tax rate differs among activities. In its attempt to minimize opposition for any given amount of revenues raised from a particular taxpayer (a necessary condition for maximizing expected votes), the government will generally tax all his activities since this will result in a lower loss in full income, and will set tax rates in such a way that the resulting marginal political opposition per dollar of revenue is equalized across activities conducted by that taxpayer.
The justification for taxing many activities can be understood by simply looking at differences in marginal deadweight losses associated with various activities. However there is a further factor in the model which also influences the choice of taxed activities. Taxpayers' political reactions to a dollar of revenue raised may be different depending on the activity on which the tax is levied.

The function $c_i$ in (1') representing political opposition to taxation can be generalized to $c_i(t_{ii}, t_{i2}, \ldots, t_{ij}, d_{i2}, \ldots, d_{ij})$ in the case in which each taxpayer conducts $J$ activities. In this case, the government budget restraint (2a) becomes

$$G - \sum_{i=1}^{N} \sum_{j=1}^{J} t_{ij} \cdot B_{ij} = 0, \quad (2a')$$

and the first order conditions for the government's problem (4) becomes

$$\frac{\partial c_i}{\partial t_{ij}} + e_{ij} + \sum_{h \neq j} f_{ih} \frac{\partial B_{ij}}{\partial t_{ij}} = \lambda$$

$$B_{ij} \left(1 + e_{ij}\right) + \sum_{h \neq j} t_{ij} \cdot \frac{\partial B_{ij}}{\partial t_{ij}} \quad (4')$$

where

$$e_{ij} = \frac{\partial c_i}{\partial d_{ij}} \cdot \frac{\partial d_{ij}}{\partial B_{ij}} \cdot \frac{\partial B_{ij}}{\partial t_{ij}} \cdot f_{ih} = \frac{\partial c_i}{\partial d_{ih}} \cdot \frac{\partial d_{ih}}{\partial B_{ih}} \cdot \frac{\partial B_{ih}}{\partial t_{ij}}$$

and

$$e_{ij} = \frac{\partial B_{ij}}{\partial t_{ij}} \cdot t_{ij} / B_{ij}.$$
The third term in the numerator on the left side of (4') and the second term in the denominator represent the effect of taxing activity \( j \) on other activities conducted by a given taxpayer.\(^1\) Activities of different taxpayers are, however, assumed to be independent in this formulation.\(^2\)

Equation (4') generalizes the conditions stated in (4) and implies that marginal political opposition per dollar of tax revenue must be equal across taxable activities for each taxpayer as well as equal across taxpayers for each activity.

4. Grouping and the Choice of Rate Structures and Bases

In the solution to the government's problem in section 3 we have \( N \) taxpayers and \( J \) activities and hence \( J \times N \) tax rates since each taxpayer is treated uniquely on each activity. This is unrealistic in two important respects. First, activities are generally grouped into 'bases' which consist of similar or related activities. In addition, taxpayers are sorted or grouped into rate brackets where despite interpersonal differences they pay the same rate. In this section we develop an analysis to explain these two phenomena. For convenience we take each problem separately. However, we show that the two problems have essentially the same structure, and that the same technique can be used to solve both.

The essential problem in both cases is the following. It is clear that deviations from the solution involving either unique treatment of activities or of taxpayers causes a loss in political support. What is to be explained is why the

---

1. If taxpayer \( i \) engages in \( J \) activities, equation (1b) must be reformulated as \( B_{ij} = B_{ij}(t_{i1}, t_{i2}, \ldots, t_{ij}) \).

2. This last assumption is consistent with the simplification introduced earlier that net political benefit functions \((l')\) are independent across taxpayers.
government decides to accept this loss. In other words, what it gains in exchange for grouping taxpayers into rate brackets and activities into bases.

Since we developed the basic model using a framework with N taxpayers and one activity, it is convenient to begin by considering the sorting of taxpayers into rate brackets on one activity. We shall indicate later how the solution can be interpreted as the rationale for combining different activities into bases.

Introduction of rate brackets will mean that groups of individuals with differing levels of the economic activity will be subject to the same tax rate. The government's problem is (i) to establish the politically optimal number of brackets and (ii) to assign individuals to those brackets in a manner that is consistent with its political objective.

Consider the second part of this problem. For purposes of analysis, let the number of rate brackets initially be fixed at $K < N$, where $N$ is the number of individuals. Let $t_{ik}$ be the rate on the $i$th person in the $k$th rate bracket or group, where $k=1,2,\ldots,K$, and let $n_k$ be the number of taxpayers in the $k$th tax bracket, where $\sum K n_k = N$.

To simplify the analysis, assume that both numerator and denominator of the left side of (4) can be written as a linear function of tax rates, and that the marginal political benefit of another dollar is constant. Equation (4) can then be rewritten as

$$a_{ik} + m \cdot t_{ik} = g_{ik} - h \cdot t_{ik}$$

$$i=1,2,\ldots,n_k$$

$$k=1,2,\ldots,K$$

---

3 This formulation abstracts from the induced change in revenue that may occur with the sorting of taxpayers into groups. A more general treatment is contained in the Appendix.
The left hand side represents the marginal political opposition \( \frac{\partial c_{ik}}{\partial t_{ik}} + e_{ik} \) of person \( i \) in group \( k \), while the right side stands for \( \lambda \). \( B_{ik}(1 + \epsilon_{ik}) \), the marginal benefits of raising \( t_{ik} \) and spending the additional revenue.

In (5), heterogeneity among taxpayers is captured by differences in the constant terms \( a_{ik} \) and \( g_{ik} \). The left and right hand sides of (5) are represented as curves \( aa \) and \( gg \) in Figure 1 with the intersection giving the politically optimal rate \( t_{ik} \). Failure to impose that rate must result in a reduction in expected support from the voter. If, for example, the government chooses \( t_{ik} \) instead of \( t_{ik}^* \), the net loss in support can be shown by the area \( ABD = ABC + ACD \). Since \( ABC = m/2(t_{ik} - t_{ik}^*)^2 \) and \( ACD = h/2(t_{ik} - t_{ik}^*)^2 \), \( ABD \) is equal to \( m'(t_{ik} - t_{ik}^*)^2 \), where \( m' = (m + h)/2 \).

More generally, the vote loss from grouping \( N \) individuals into \( K \) rate brackets is

\[
\sum_{k=1}^{K} \sum_{i=1}^{L_k} m'(t_{ik} - t_{ik}^*)^2 .
\]

(6)

The government's problem is to assign individuals to brackets so as to minimize this sum.

To see the solution, imagine the outcome if only one rate \( t \) were used for all \( i \) and \( k \). In this case the vote loss from grouping (i.e., taxing everyone at the same rate) would be

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4 The area \( t_{ik}^* \) AB \( t_{ik} \) represents the increase in political opposition from taxing at rate \( t_{ik} \), while \( t_{ik}^* \) AD \( t_{ik} \) represents the gain in support from spending the additional revenue raised with the higher rate. The difference between the two areas is the net loss in expected political support.
Marginal Gain or Loss in Expected Votes

Optimal versus Actual Tax Rates For Taxpayer i in Group k.
\[ \sum_{k} \sum_{i=1}^{m'} (t - t_{ik*})^2. \]

The rate that minimizes this vote loss is the least squares solution
\[ t_{..} = \frac{1}{N} \sum_{k} \sum_{i=1}^{n_k} t_{ik*}. \]

Using the sum of squares identity, the minimum vote loss using this single rate can be written as
\[
m' \left\{ \frac{1}{N} \sum_{k} \sum_{i=1}^{n_k} (t - t_{ik})^2 \right\} \sum_{k} \left( t_{ik} - t_{ik*} \right)^2 \right\} = m'(S_1 + S_2) \tag{7}
\]

where
\[ t_{..k} = \frac{1}{n_k} \sum_{i=1}^{n_k} t_{ik*}. \]

If \( K \) brackets are used instead of one, the optimal rate for each group is the mean of the \( t_{ik*} \) for that group, \( t_{ik} \). This is because \( t_{ik} \) is the least squares solution to the choice of the rate \( t \) that minimizes the loss \[ \sum_{i=1}^{m'} (t - t_{ik*})^2 \] from treating all members of group \( k \) alike. Thus if \( K \) brackets are used, the vote loss from grouping can be reduced to \( m' S_2 \). And in order to minimize \( S_2 \), (7) indicates that the government must assign taxpayers among groups so as to minimize the variation of the \( t_{ik*} \)'s within each group or equivalently, to maximize between group variation.

If we consider solutions of the sorting problem for different \( K \) we can construct the 'marginal tax discrimination' curve AA in Figure 2. For each \( K \), this curve shows the maximum reduction in the vote loss from grouping when \( K+1 \)
FIGURE 2

Marginal Gain or Loss in Expected Votes

Tax Discrimination Curve

Tax Handles Curve

K*

The Politically Optimal Number of Rate Brackets
rather than K groups are used. AA intersects the horizontal axis at K = N (when all taxpayers are treated uniquely). It is shown to decline continuously as K approaches N on the assumption that each additional tax instrument is used to eliminate the difference between actual and politically optimal tax rates for at least one taxpayer.

At the beginning of this section, we raised the question of what government has to gain from grouping taxpayers in this manner. Since grouping involves a loss of political support there must be an offsetting advantage. The government gains by saving administrative resources if it can deal with groups of taxpayers rather than taxing each individual uniquely. These resources can be used to provide more public goods and therefore to gain increased support. The government's problem is to balance the marginal loss in support from grouping with the marginal gain in support from saving in administration cost.

The optimal number of rate brackets K* is shown in Figure 2 as the intersection of AA with the 'marginal tax handles curve' BB. BB increases monotonically as K approaches N on the assumption that administration cost declines continuously as K is reduced.

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5 Administration cost includes: (i) the cost of processing tax payments and taxpayers, (ii) the cost of monitoring compliance and enforcing tax codes, (iii) the costs of coordinating administrative personnel and (iv) the costs of acquiring knowledge about taxpayers' characteristics. The last type of cost is not generally incorporated into the analysis in this paper except that lump-sum taxation is considered infeasible.

6 It is possible that administration costs depend also on the nature of the tax instruments employed, as well as their number, as in Heller and Shell (1974). We do not explore that possibility in this paper.
The general solution to the sorting problem when each taxpayer is taxed on all of his J activities involves four elements; the marginal gain in support from increasing the number of rate brackets on any activity \( \partial S / \partial k_j \), the resulting increases in administration cost \( \partial A / \partial k_j \) and in total revenue \( \partial R / \partial k_j \), and the additional support from spending one more dollar on public goods \( \lambda^* \). In equilibrium, as is shown in the Appendix,

\[
\frac{\partial S / \partial k_j}{(\partial A / \partial k_j - \partial R / \partial k_j)} = \lambda^* \tag{3}
\]

where \( j=1,2,\ldots,J \)

i.e. the marginal reduction in opposition per 'net' dollar of administration cost must be equal across activities.

As we pointed out at the beginning of the section, the analysis has a second important application. In grouping activities into tax bases, the government faces a sorting problem analogous to the one just discussed. Consider a model with one representative taxpayer who engages in J different activities. The government can save on administration cost by combining related activities into a limited number of bases, such as occurs when incomes from different labour activities are included in the same tax base. Grouping leads to an increase in political opposition in this case since it will increase a taxpayer's deadweight loss associated with any given tax payment. On the other hand, the government receives additional support from spending resources saved in administration on the provision of public goods. The solution illustrated in Figure 2 again describes the nature of the equilibrium where \( K^* \) refers to the number of bases for each individual rather than to rate brackets.
This view of the formation of tax systems for the first time formally integrates administration cost into political optimization. There is a literature which has argued that administration cost, or in Musgrave's words, tax handles, are crucial for explaining the formation and evolution of tax bases. However, this literature does not contain a theory of political demand, but relies exclusively on differences in administration cost in explaining differences in tax systems at a point in time across economies or over time. Our analysis shows that tax structure must be explained as the joint outcome of political responses and administration cost. Economic exit, political voice, heterogeneity in behavior and administration cost are all elements that contribute to the evolution of tax structure.

5. Special Provisions

So far we have shown that political optimization in the face of administration costs and known heterogeneity in behavior will result in a tax structure consisting of rate structures on multiple bases. The final feature of the skeleton that remains to be explained is the existence of special provisions such as exemptions, deductions, tax credits and so on. An extension of the grouping argument applied to the formation of bases can account for the appearance of such provisions in tax systems. With known characteristics, special provisions will arise as a way of coping with heterogeneity in political and economic behavior that is administratively less costly than increasing the number of tax bases.  

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7 See Yitzhaki (1979) for a consideration of administration cost in an optimal tax setting. Yitzhaki does not explore the implications of heterogeneity.

8 An additional base generally requires a new set of collection points and separate administrative department.
Consider the generalization of the grouping of activities into tax bases to the case of \( N \) taxpayers, each of whom engages in \( J \) activities. The implication of the analysis is that the government will create bases for each taxpayer, but that the groups of activities forming such bases will differ among taxpayers, unless there is an additional cost, not considered so far, in administering different bases for each individual. Such costs introduce an additional constraint on the grouping process which will result in bases that coincide for large numbers of individuals and in rate structures that are defined on bases rather than on separate activities.

The argument is illustrated in Figure 3 which is drawn for two taxpayers, each of whom engages in four activities. When there are no additional costs in having separate bases for each taxpayer, the grouping process results in person 1 being taxed on two bases consisting of activities 1 and 2 and activities 3 and 4 respectively. For person 2, the two bases will consist of a combination of the first 3 activities and of activity 4. When there are costs to having separate bases for each individual, it may be preferable to define the first base for both individuals to include activities 1, 2 and 3 while making activity 4 into a second base. However, it will be politically undesirable to tax activity 3 in the same way for both taxpayers. A special provision in one of the two bases such as an exemption or a deduction will allow the government to differentiate tax treatment of activity 3 depending on the taxpayer involved. Assume for example that taxpayer 1 benefits from an exemption on activity 3, while taxpayer 2 does not. He will then face a lower average tax rate on base 1, with the difference in treatment being related specifically to activity 3.

The argument can also be approached from a second angle. The general solution in (8) specifies a different rate structure for each activity. This, no doubt, would be administratively costly. It may be preferable to define rate structures across bases comprising several activities, but to introduce some differentiation in
Special Provisions in Tax Structure
the tax treatment of each activity in any base by having special provisions that are specific to particular activities.

We have now shown that the governments' optimizing behavior generates all essential elements of tax structure. The skeleton is complete. The analysis also demonstrates that all the parts are interdependent. This is an important point since tax policy or tax reform often focuses only on one aspect of the system without taking account of the repercussions that must follow intervention in other parts. Rate structures, bases and special provisions are all determined jointly. The government will furthermore try to reestablish a politically optimal equilibrium if there are shocks to the system such as changes in the nature of heterogeneity among taxpayers. The analysis strongly suggests that tax systems should be studied as integrated systems of essential elements and not merely as collections of unrelated or ill-designed components.

6. The Relationship Between Tax Rates and Tax Revenues

The model developed in this paper throws new light on the much discussed relationship between tax rates and tax revenues. In the basic model of section 2, this relationship will differ for each individual. Or putting it in another way, every voter will have his own 'Laffer curve'. While each curve may have a backward bending portion, political optimization in the basic model precludes tax rates which push taxpayers onto that portion, provided that political opposition increases continuously with tax rates and that \( \sum b_i / \sum G > 0.9 \). Choice of a tax rate

---

9 In this case, the first order conditions (4) require that \( B_i (1 + \varepsilon_i) > 0 \) for all \( i \), and hence that \( \varepsilon_i < -1 \).
placing a voter on his backward bending portion would imply that the government is foregoing revenues which could be used to generate further support and that the affected voter is opposing the government more strongly than he would at lower rates.\textsuperscript{10}

In a model of heterogeneous taxpayers and positive administration costs, this conclusion may no longer hold. Figure 4 shows the revenue-rate relationship for the \(N\)th taxpayer. In the absence of administration costs, his politically optimal rate is \(t^*_N\) which has to lie on the increasing part of the function. Assume now that the government groups taxpayers as described in section 4. The two group rates closest to \(t^*_N\) are \(t^*_K\) and \(t^*_K{-}1\). If \(N\) is assigned to the \(K\)th group, the government faces increased opposition from him and reduced revenue. If he is assigned to group \(K{-}1\), his opposition decreases and revenues will decline by \(T^*_N{-}K < T^*_N{-}K{-}1\). He will be placed in the \(K\)th, and therefore on the backward bending portion, if loss of revenue \(T^*_N{-}K < T^*_N{-}K{-}1\) results in a greater reduction in support than does his assignment to the \(K\)th group.\textsuperscript{11} Note that points such as B are not feasible outcomes since they do not represent rates generated by the politically optimal grouping process.

\textsuperscript{10} It should be pointed out that there is no difference in the time horizon of voters and the government in the model. For a discussion of the Laffer curve that focusses on such a difference, see Buchanan and Lee (1983).

\textsuperscript{11} The argument is intuitive. Strictly speaking the placement of taxpayer \(N\) and the choice of \(t^*_K\) and \(t^*_K{-}1\) will occur simultaneously.
Revenue - Rate Relationship for the Nth Taxpayer
The argument shows that we may expect to observe some voters whose tax payments would increase if they alone faced lower tax rates. This does not imply irrational political behavior or the desire to punish particular individuals. Rather, it can be understood as an attempt to cope with heterogeneity in political and economic behavior in the presence of administration cost.

7. The Economic Efficiency of the Tax System

The effect of taxation on economic efficiency has been a constant subject of analysis throughout the history of economics. It has received new emphasis in the past decade by writers on optimal taxation, who have devoted much attention to the loss in economic welfare caused by different types of taxes and who have derived well-known rules for efficient taxation. In this section we examine the efficiency of the politically optimal tax structure.

Since political opposition by any individual \( i \) depends on the loss in his full income, a vote-maximizing government in the basic model has an incentive to minimize \( d_i \) for a given \( T_i \). This does not mean, however, that the sum of deadweight losses across individuals will be minimized except under special circumstances.

Political opposition has two components, voice and exit. Marginal political voice, \( \partial c_i / \partial t_i \) in the basic model, varies across individuals. The relationship between \( d_i \) and \( t_i \) as well as the political consequences of exit, \( e_i \), also vary across taxpayers. The sum of deadweight losses will be minimized in the basic model only in the special instance where voice and the effect of exit on opposition are the same for all voters. In this case, the only relevant characteristic distinguishing voters is their ability to make economic adjustments to taxation, while
opposition will be the same function of deadweight loss across all taxpayers. Clearly, the government will then choose tax structure so as to minimize the aggregate welfare loss since this will result in minimum political opposition for any level of total revenue.

It is instructive to illustrate this argument by considering the relationship between politically optimal tax structure in the basic model and the well-known inverse elasticity rule derived in the literature in optimal taxation. Let the first order condition in (4) be written as

\[ \frac{a_i + m_i \cdot t_i}{B_i (1 + \varepsilon_i)} = \lambda \quad i = 1, 2, \ldots, N \]  \hspace{1cm} (9)

where the numerator in (4) has been linearized as a function of \( t_i \). This implies that the politically optimal rates on any two taxpayers \( i \) and \( j \) must be

\[ \frac{t_i}{t_j} = \frac{B_i (1 + \varepsilon_i) \Sigma \partial b_i / \partial G - a_i}{B_j (1 + \varepsilon_j) \Sigma \partial b_j / \partial G - a_j} \cdot \frac{m_j}{m_i} \quad \text{if} \quad i \neq j. \]

When voice and the political consequences of exit are identical across taxpayers i.e., when \( a_i = a_j \) and \( m_i = m_j \) for all \( i \neq j \), (10) reduces to

\[ \frac{t_i}{t_j} = \frac{B_i (1 + \varepsilon_i)}{B_j (1 + \varepsilon_j)} \quad \text{if} \quad i \neq j, \]

a result corresponding to the inverse elasticity rule. The analysis shows that such a
rule must be considered a special case in a world where politics matters because political behavior varies across individuals. In particular, since exit is a 'substitute' for voice i.e., $\frac{\partial c_i}{\partial d_i} < 0$, it could be the case that tax rates are higher on those bases which are relatively elastic.

The sorting problem facing government is another source of departure from the pareto-efficient tax structure in the absence of administration cost. Even if political opposition functions are identical across taxpayers, it may not be optimal for the government to lower tax rates for those individuals with the most tax-elastic bases. This may be so for the same reason that some individuals can be left on the backward bending portion of their Laffer curve. If the cost of tax discrimination is high and heterogeneity in exit is substantial, departures from the optimal tax structure (without administration cost) for any given level of revenues may be pronounced.

The analysis still leaves open the question of whether a tax system of the kind described in the paper can be considered globally efficient. It should be recalled that the resulting tax structure must be interpreted as the long run equilibrium of a competitive political system in which political opposition depends on the loss in full income. Given this perspective, it is clear that no political party pursuing the same objective as the government could offer an alternative tax system generating the same political support with a lower welfare loss for any individual. Tax structure is therefore efficient for the existing set of political institutions. This does not mean that an alternative set of institutions could not yield a better tax system. The argument does, however, direct debate on tax reform towards the redesign of political institutions.
8. Concluding Remarks

Existing tax systems are composed of a limited number of basic elements which have been combined to form complicated structures. To understand why tax systems have the appearance and characteristics that we observe, we must explain why the basic elements are used as building blocks and why they are combined in particular ways.

The paper demonstrates that the essential facts of observed tax systems can be viewed as the outcome of optimizing political and economic behavior. It further shows that the way in which the essential elements are combined into different structures depends on administration costs and on the nature of heterogeneity in political and economic responses to taxation among individuals.

The paper adopts as set of simple theoretical assumptions sufficient to yield all essential aspects of tax structure. This means a framework where the government has full knowledge of economic and political responses, where political reactions of individual taxpayers depend only on how they themselves are treated, and where administration cost depends directly on the number of tax instruments. Relaxation of these assumptions can give rise to screening problems, equity norms, special interest politics, and more complex administrative problems, which remain to be explored in the context of the framework developed here. Further work should consider how the increased complexity affects the use and definition of rate structures, bases and special provisions. The nature of the problem facing government remains the same in this more complex world, however. The government must still cope with heterogeneity of political and economic behavior in the face of positive administration cost.

The theoretical approach adopted in this paper combines elements from different traditions while also adding heterogeneity as an important new factor.
As a result, it has implications for existing normative analysis as well as for the positive study of tax structure. The analysis of grouping, for example, can be viewed as a generalization of related work in the theory of optimal taxation (although it is important to keep the difference in assumptions about individual and governmental behavior in mind). And as argued in Section Six, the inclusion of self-interested behavior in the government sector raises fundamental questions concerning the definition of economic efficiency.

Regarding positive analysis, the proposed approach points toward a new direction for research. The paper demonstrates that tax structure should be seen as a system of related elements in equilibrium, and not merely as a collection of separate and ill-designed components. Moreover, while administration costs are an important determinant of differences in tax systems or of changes in tax systems over time, they are not the sole element, and perhaps not the most significant one.

Future empirical work must be based on more inclusive models taking account of economic and political responses and the nature of heterogeneity as well as administrative constraints.12

12 For an initial attempt in this direction, see Hettich and Winer (1984).
APPENDIX

A. Second Order Conditions for the Basic Model

The government's problem is to choose \( G \) and \( t_1, t_2, \ldots, t_N \) to maximize

\[
V = \sum_{i=1}^{N} \left( b_i(G) - c_i(t_i, d_i) \right)
\]

subject to

\[
W = G - \sum_{i=1}^{N} t_i B_i = 0
\]

Sufficient second order conditions for the existence of a unique maximum are that \( V \) be strictly concave and that \( W \) be strictly convex.

Assume all cross partial derivatives of \( V \) are zero i.e., taxpayers care only how they themselves are treated by the fiscal system, and they see no connection between taxation and public services. Then \( V \) is strictly concave if all second partial derivatives with respect to each fiscal instrument are negative. This requires that for all \( i \),

\[
\sum_{i} b_i^{GG} < 0 \quad \text{(A1)}
\]
and

\[
(c_i t_i^i + e_i t_i) > 0 \quad \text{(A2)}
\]

where a superscript denotes a partial derivative with respect to the indicated instrument.

(A1) is satisfied if \( b_i^{GG} < 0 \), i.e., if the marginal vote productivity of public services declines with \( G \).

Since \( c_i t_i^i > 0 \) and \( e_i < 0 \), (A2) is satisfied if voice increases with \( t_i \), \( c_i t_i^i > 0 \), if exit becomes a stronger (negative) influence on political opposition, \( e_i t_i < 0 \), and if voice increases faster than exit in absolute value \* (A2) ensures that marginal political opposition to taxation \( c_i t_i^i + e_i \) increases continually with tax rates.

Assume further that taxable activities are independently across taxpayers so that \( W_{t_i t_j} = 0, i \neq j \). Then the constraint \( W \) is strictly concave if

\[
t_i B_i t_i^i + 2B_i t_i < 0 \quad \text{(A3)}
\]

Since \( B_i t_i^i < 0 \), (A3) is satisfied if \( B_i t_i^i < 0 \), that is, if the response of taxable activity to increases in tax rates is increasing with tax rates. Note that this last condition suggests that \( e_i t_i < 0 \).

\*Recall that \( e_i = c_i d_i B_i B_i t_i \leq 0 \)
B. First Order Conditions With Grouping on Each of J Activities.

Let \( s(k_1, k_2, \ldots, k_J; t^*) \) be the minimum loss in votes from grouping taxpayers into \( k_j \) rate brackets for each of \( J \) activities, where \( s \) is decreasing in each \( k_j \). \( t^* \) is a \( 1 \times NJ \) vector of the politically optimal rates \( t_{ij}^* \), \( i = 1,2,\ldots,N \), defined in the absence of administration cost.

The government's problem is to choose \( G \) and the \( k_j \)'s to minimize the loss of votes from grouping when total administration costs \( A(k_1, k_2, \ldots, k_J) \) increase more rapidly than total revenues \( R(k_1, k_2, \ldots, k_J) \) with increases in each \( k_j \):

\[
\text{Min } \sum_{i=1}^{N} \left\{ b_i(G^*) - b_i(G) \right\} + s(k_1, k_2, \ldots, k_J; t^*)
\]

subject to

\[
R(k_1, k_2, \ldots, k_J) = G + A(k_1, k_2, \ldots, k_J).
\]

Here \( G^* \) represents the optimal level of public services corresponding to \( t^* \), so that the first term in the above objective function is the loss in votes, relative to the \((G^*, t^*) \) solution, that results from the revenue implications of grouping. Note that \( R(\cdot) = G^* \) when \( k_j = N \) for all \( j \).

The first order conditions are

\[
- \sum_{i=1}^{N} \frac{\partial b_i}{\partial G} + \lambda = 0
\]

and

\[
\frac{\partial s}{\partial k_j} + \lambda \left( \frac{\partial A}{\partial k_j} \right) = 0
\]

\[
\text{for } j = 1, 2, \ldots, J.
\]

that is, for each \( j \),

\[
\frac{\partial s}{\partial k_j} = \lambda \left( \frac{\partial A}{\partial k_j} - \frac{\partial R}{\partial k_j} \right)
\]

(A5)

The left side of (A5) is the gain in votes from increasing the number of groups for the \( j \)th activity, \( \partial S/\partial k_j \) in equation (8). This is the analogue to the marginal tax discrimination curve in Figure 2. The right side is the loss in votes from the revenue implications of increasing \( k_j \), the marginal tax handles curve in Figure 2.
References


