Economic and Political Foundations of Tax Structure

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The paper derives the essential elements of tax systems as the outcome of rational behavior in a model where government maximizes expected support and where opposition to taxation depends on the loss in full income. The analysis treats the level of expenditures as endogenous and integrates the influence of administration costs with that of political and economic factors. Tax structure is shown to be a system of related components in equilibrium.

While the theoretical literature on taxation has flourished in the past fifteen years, tax theory continues to suffer from important limitations. Perhaps the most serious shortcoming is a dichotomy in assumptions on what motivates public and private decisions. While private behavior is modeled as self-interested in the way common in other areas of economics, public decision makers are assumed in much of the tax literature to choose and implement policies according to general social criteria such as efficiency and equity. The conflicting treatment of private and public choices restricts the ability of economists to understand the operation of actual tax systems and to explain why they have the characteristics and structure that we commonly observe.

We show in this paper that the essential facts of tax systems can be explained as the natural outcome of self-interested decision making if such behavior is assumed in both the private and public sectors. 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 a result of private and public choices and what determines their design and their importance within the system as a whole.

The emphasis in the paper is on the reasons for the emergence of the tax skeleton with a given set of political institutions. An alternative approach to positive tax theory is to assume the existence of one particular aspect of tax structure and to allow voters to choose relevant parameters through majority rule (Thomas Romer, 1975; K. W. S. Roberts, 1977; A. H. Meltzer and S. F. Richard, 1981, 1983). While focusing on one feature permits more detailed analysis of that component, it avoids the broader question of why tax structure as a whole exists and how different parts of the tax skeleton are related. A similar limitation also affects work which emphasizes particular determinants, such as administration costs and opportunities to tax (Richard Musgrave, 1969).[1]

The paper starts with the presentation of a basic model in which a government maximizing expected support sets tax rates for N

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[1]Musgrave refers to tax handles, a term which appears to include the changing opportunities to levy taxes as well as tax administration costs. Some authors, such as Harley Hinrichs (1966) also rely on exogenous cultural and political factors. For an attempt to base the explanation of tax structure primarily on political factors, see Susan Hansen (1983).

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 where the analysis is generalized to include many activities by taxpayers and to account for the creation of bases, rate structures, and special provisions. The paper also contains a discussion of the relationship of tax rates and tax revenues and a comparison with two well-known alternative approaches, optimal taxation and the Leviathan model.

I. A Basic Model

The approach to political economy adopted here relies on the modeling of political equilibrium rather than of the political process. There is a successful literature that uses models of this type, including work by George Stigler (1971), Sam Peltzman (1976), and Gary Becker (1983), and having its roots in the writings of Joseph Schumpeter (1950) and Anthony Downs (1957). This literature has focused on the implications of different equilibrium outcomes for government policy while bypassing questions concerning the existence and stability of political equilibrium and the explicit derivation of government objective functions in a game-theoretic context. Political equilibria are interpreted as the outcome of a competitive process and no independent role is assigned to bureaucracy.[2] Our paper can be viewed as a further formalization and extension of this literature.

A second important tradition of analysis has taken a quite different direction, emphasizing theoretical questions of existence and stability (see for example, Peter Ordeshook, 1986, ch. 4). This tradition has not been concerned with developing institutional implications, perhaps because problems of existence and stability are sufficiently difficult in their own right. While we see no general solution emerging as yet from this literature which could serve as a basis for modeling tax structure, we will suggest briefly how our objective function could be derived from the solution to a particular electoral game described in a recent paper by Peter Coughlin (1986).

We assume that the government's objective in designing a tax structure is to maximize expected support, a term which can be interpreted in both a narrow and broad manner. In the "narrow" version, individual support for the government depends (*i*) on the benefits from public goods and the loss in full income resulting from taxation and (*ii*) on characteristics which determine how a particular individual's net economic benefit from the fiscal system is translated into a probability of voting for the government. Examples of relevant such characteristics include the cost of voting, age, and the taste for civic duty. The government's objective in this model can be interpreted as the maximization of expected votes, an objective often used in the literature since Downs. Maximization of expected votes can be regarded as a simple way of capturing the motivation of a government which is unsure of the identity or characteristics of its opponents in future elections (Arthur Denzau and Michael Munger, 1986; David Mayhew, 1974).

A broader interpretation of the term support which we have found useful in empirical research (Walter Hettich and Stanley Winer, 1984; Winer and Hettich, 1987) is also possible. In this view, support has a third component in addition to those already mentioned. As seen by the government, effective support depends not only on the likelihood that an individual will cast a favorable vote in the next election but also on the individual's relative political influence in a world where equality of franchise differs from equality of influence. As a result, the government maximizes the weighted sum of expected votes where weights depend on voter characteristics such as interest group membership and strength and on individual attributes such as personal wealth.

In the model presented below, the probability of any individual's voting for the

[2]The underlying assumptions for this approach are that political competition is sufficiently strong to force convergence to an optimal strategy and that the ensuing equilibrium is stable.

government is influenced positively by the services received from a pure public good G and negatively by his loss in full income v (including deadweight loss) from taxation. Voters base their decision on whether to support the government on how they are affected by benefits and taxes and are not influenced by how others are treated. Moreover, individual taxpayers see no connection between the level of services provided and their own tax burden. This implies that there is no direct link between expenditure structure and tax structure, even though the level of expenditures is endogenous and affects tax structure indirectly through the government's budget constraint. The separation of taxes and expenditures is an important characteristic of modern fiscal systems, and for this reason, a good starting point in constructing a positive theory of tax structure. One may also note that assuming such separation helps to simplify a rather complex theoretical problem and has proven useful in empirical research.

Given the above assumptions, we can represent the ith voter's support for the government as:

$$(1) \quad \{b_i(G) - c_i(v_i)\} \quad i = 1,2,\ldots,N$$

where N is the number of taxpayers and where $\partial b_i/\partial G > 0$ and $\partial c_i/\partial v_i > 0$. In the narrow view, (1) normalized appropriately represents the probability of voting for the government, while in the broader interpretation it is that probability weighted by additional factors determining effective political influence.[3] The term b_i in (1) represents benefits for individual i while c_i can be interpreted as effective opposition to taxation by the rational voter. The greater is c_i, the smaller is the expected support from the ith voter. Opposition depends positively on the loss in full income v_i which may be written as

$$(1a) \qquad v_i = T_i + d_i,$$

where T_i is the tax payment and d_i is the deadweight loss or welfare cost of taxation for the ith voter.

We shall also assume that taxation of the ith voter is proportional at rate t_i, that B_i, the level of the taxable activity of the ith voter, is related negatively to t_i, while the welfare loss d_i depends positively on t_i and on exogenous factors x_i that determine the nature of the supply function for the taxable activity. (If the taxable activity is work, for example, an important component of x_i will be the taste for leisure.) Hence for $i = 1,2,\ldots,N$,

$$(1b) \qquad T_i = t_i \cdot B_i,$$

$$(1c) \qquad B_i = B_i(t_i, x_i); \partial B_i/\partial t_i < 0$$

and

$$(1d) \qquad d_i = d_i(t_i, x_i); \partial d_i/\partial t_i > 0$$

with $d_i = 0$ and $v_i = T_i$ if taxes did not disturb behavior.[4] Equations (1c) and (1d) reflect the voter's utility-maximizing response to taxation. For simplicity it is assumed that all taxpayers engage in the same type of activity (but that they are otherwise unique) and that their economic and political responses to taxation are known to the government without cost.

The government chooses the level of public expenditure G and tax rates $t_1, t_2, \ldots, t_n$ so as to maximize expected support

$$(2) \qquad \sum_{i=1}^{N} \{b_i(G) - c_i(v_i)\},$$

[3]One approach to the narrow interpretation of (1) is to define an index of support $I_i = b_i(G) - c_i(v_i)$. Then let p_i be an increasing function of I_i which translates the support index into a voting probability, $0 \le p_i(I_i) \le 1$. The standard logit or probit model could be used to define p_i.

[4]Putting deadweight costs (1d) explicitly into the model is a convenient method of incorporating the full consequences of taxation for individual welfare. See Becker (1983) for a similar construction.

subject to the government budget restraint

$$(2a) \qquad G - \sum_{i=1}^{N} t_i \cdot B_i = 0,$$

and subject to taxpayers' responses to taxation reflected by equations (1c) and (1d).

While we shall not further develop this aspect of the analysis, it is of interest to note that maximization of (2) can be viewed as describing the outcome of a particular two-candidate game. Coughlin (1986) has constructed such a game where every voter has a finite probability of voting for any one of the two candidates. Equilibrium can be represented by the maximization of any candidate's expected vote over the policy space available to him.[5] Candidates use a binomial logit model to determine the probabilities that they will receive the support of particular voters. These probabilities and hence the candidate's expected vote are related positively to the net effect of government policy on the welfare of voters. Since we can write (2) more generally as

$$(2') \qquad \sum_{i=1}^{N} p_i\{f_i(G, \underline{t})\},$$

where p_i is the ith voter's probability of voting for the government and f_i represents the effect of fiscal policy on his welfare (f depends positively on public services G and negatively on tax rates $\underline{t}$), maximization of (2) or (2') and the equilibrium of the voting game characterize the same policy choices.[6]

In the basic model, the first-order conditions for a solution to the government's problem consist of equations (2a), (3a), and (3b):

$$(3a) \qquad \sum_i \partial b_i/\partial G - \lambda = 0,$$

$$(3b) \qquad -(\partial c_i/\partial v_i \cdot \partial v_i/\partial t_i) + \lambda(B_i + t_i \cdot \partial B_i/\partial t_i) = 0 \qquad i = 1, 2, \ldots, N.$$

The first term in brackets in (3b) is the growth in opposition that results from increasing t_i. The second term in brackets represents $\partial T_i/\partial t_i$, the additional revenue raised by this rate increase. The meaning of these results can be understood more easily if we restate the first-order conditions (3) for each i as

$$(4) \qquad \frac{\partial c_i/\partial v_i \cdot \partial v_i/\partial t_i}{B_i \cdot (1 + \varepsilon_i)} = \lambda,$$

where $\varepsilon_i = \partial B_i/\partial t_i \cdot t_i/B_i$ is the elasticity of the ith taxpayer's activity with respect to his tax rate.[7] Thus the politically optimal tax structure in the basic model requires a choice of tax rates that equalizes marginal political costs per dollar of additional revenue across all taxpayers. This tax structure will finance a total expenditure such that the marginal political benefit of another dollar of expenditure λ is equal to the common marginal political cost per dollar of additional revenue.[8]

[5]Coughlin states his results in terms of the maximization of expected plurality. However, his assumptions about candidates' beliefs concerning voter behavior imply that the maximization of expected plurality and of expected votes are equivalent objectives. One should note that in Coughlin's game, candidates propose after-tax incomes subject to a constraint on the sum of their incomes. This can also be viewed as the proposing of tax payments subject to a government budget constraint.

[6]We can think of f as the voter's post-fisc utility relative to his pre-fisc utility, the level of which is assumed given. (2') could also be written as $\Sigma p_i\{U_i(G, \underline{t}) - \hat{U}_i\}$, where $\hat{U}_i$ is pre-fisc welfare.

[7]We only consider interior solutions where everybody's support is solicited to some extent. This is consistent with the type of equilibrium considered in the probabilistic voting literature referred to above, where in equilibrium every voter has a positive probability of voting for each candidate.

[8]Second-order conditions for a unique solution to the government's problem include, in addition to assumptions about derivatives made above, (*i*) $b_i^{GG} < 0$, (*ii*) $v_i^t i^t i > 0$, (*iii*) $c_i^v i^t i > 0$, and (*iv*) $B_i^t i^t i < 0$. Superscripts denote partial derivatives. Note that the separation of expenditures and taxes and the independence of taxpayers assumed in the text implies that cross-partial derivatives of the objective function with respect to

While the first-order conditions above integrate economic and political behavior, they yield only a very simple tax structure which still misses several 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 additional elements.

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 endogenizing interest group formation and without relaxing the assumption of independence among net political benefit functions of voters, or the assumption that their economic and political responses to taxation are known to the government without cost, we shall maintain all three assumptions throughout the paper.

II. Taxation of Many Activities

In this section we demonstrate that the taxation of many activities is a natural outcome of expected support maximization. The loss in full income given by (1a) can be generalized to $v_i = v_i(T_{i1}, T_{i2}, \ldots, T_{iJ}, d_i)$ in the case in which each taxpayer conducts J activities and faces tax rates $t_{i1}, t_{i2}, \ldots, t_{iJ}$. Equations (1c) and (1d) may also be similarly generalized. In this case, the government budget restraint (2a) becomes

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

and the first-order conditions for the government's problem (4s) change to

$$(4') \qquad \frac{\partial c_i / \partial v_i \cdot \partial v_i / \partial t_{ij}}{B_{ij} \cdot (1 + \varepsilon_{ij}) \sum_{h \neq j} t_{ih} \cdot \partial B_{ih} / \partial t_{ij}} = \lambda$$

$$i = 1, 2, \ldots, N; \; j, h = 1, 2, \ldots, J$$

where $\varepsilon_{ij} = \partial B_{ij} / \partial t_{ij} \cdot t_{ij} / B_{ij}$. The second term in the denominator on the left side of (4′) represents the effect of taxing activity j on other activities conducted by a given taxpayer.[9] Activities of different taxpayers are, however, assumed to be independent in this formulation.[10]

Equation (4′) generalizes the conditions stated in (4). It implies that the politically optimal tax structure requires marginal political opposition per dollar of tax revenue to be equalized across taxable activities for each taxpayer, as well as to be equalized across taxpayers for each activity.

The above argument indicates that the evolution of tax structure is closely related to economic change and development. Minimization of opposition to taxation requires the adjustment of tax structure whenever the broad nature of activities conducted by taxpayers changes. The same argument also explains why tax structure is complex—disregarding differences in the welfare consequences of taxation across activities conducted by any taxpayer or across all taxpayers increases opposition to taxation because such disregard makes voters worse off. This may be the reason why tax simplification remains elusive although it appears to be universally endorsed as a good idea.

Equation (4′) indicates that complexity in tax structure is politically rational. In fact, it implies even greater complexity than is usually observed. The task is thus not only to justify the existence of complexity, but also to delineate its limits.

policy instruments are zero. It is also assumed that taxable activities are independent across taxpayers. Conditions (*ii*) and (*iii*) imply that marginal opposition to taxation increases with tax rates. Conditions (*i*) to (*iii*) ensure the objective function (2) is strictly concave, while (*iv*) ensures that the constraint (2a) is strictly convex.

[9] If taxpayer i engages in J activities, equation (1c) must be reformulated as $B_{ij} = B_{ij}(t_{i1}, t_{i2}, \ldots, t_{iJ}, x_i)$.

[10] This last assumption is consistent with the simplification introduced earlier that net political benefit functions (1) are independent across taxpayers.

III. Grouping and the Choice of Rate Structures and Bases

In the solution to the government's problem in Section II we have N taxpayers, J activities, and $N \times J$ tax rates. This is unrealistic in two 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 tax rates.

Deviations from unique treatment of activities or of taxpayers will cause a loss in political support. What must be explained is why the government decides to accept such losses, that is, what offsetting advantage can be gained in exchange for the grouping. The answer lies in reduced administration costs. Resources released in this way can then be used to provide more public goods and therefore to obtain increased support. The government's problem is to balance the marginal loss in support from grouping with the marginal gain in support from spending resources not used in administration.

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

Creation of rate brackets will mean that groups of individuals with differing levels of 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 these brackets in a manner that is consistent with its political objective.

The second part of the problem, that is, the assignment problem, is considered at length in the Appendix. We let the number of rate brackets or groups be fixed at some number $K < N$, the number of individuals. Levying the same rate on all members of a given group rather than taxing them at their unique politically optimal rates defined by first-order conditions analogous to (4) must result in a loss in expected support. If we linearize the N first-order conditions in the absence of grouping, we can show that the loss from grouping N unique individuals into K-rate brackets is minimized when taxpayers are assigned to brackets so as to minimize the within group variation in politically optimal rates.

By considering solutions of the sorting problem for different values of K, we can construct the "marginal tax discrimination" curve AA in Figure 1. For each K, this curve shows the maximum reduction in opposition possible from increasing the number of groups by one while simultaneously resorting individuals among the $K+1$ groups in the manner described above. AA lies above the horizontal axis when $K < N$ and intersects the horizontal axis at $K = N$, where all taxpayers are treated uniquely. It is assumed to decline continuously as K approaches N.

The optimal number of rate brackets K^* is shown in Figure 1 where AA intersects BB, the "marginal tax administration curve," reflecting the opportunity cost to the government of treating individuals differently when this creates administration costs.[11] For each K, BB shows the fall in political support resulting from an increase in the number of rate brackets from K to $K+1$ and a reduction in public services by an amount equal to the corresponding growth in administration costs. When λ in (4) is constant, BB will slope upward as long as the increase in administration costs rises with K when another tax instrument is added.[12]

The general solution when each taxpayer is taxed on all of his J activities involves four elements: the reduction in votes lost

[11]Administration costs include: (*i*) the cost of processing tax payments, (*ii*) the cost of monitoring compliance and enforcing tax codes, (*iii*) the cost 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.

[12]It is possible that administration costs depend on the nature of the tax instruments employed, as well as on their number, as in W. P. Heller and Karl Shell (1974). We do not explore that possibility in this paper. We also rule out possible discontinuities and nonconvexities introduced by administration costs.

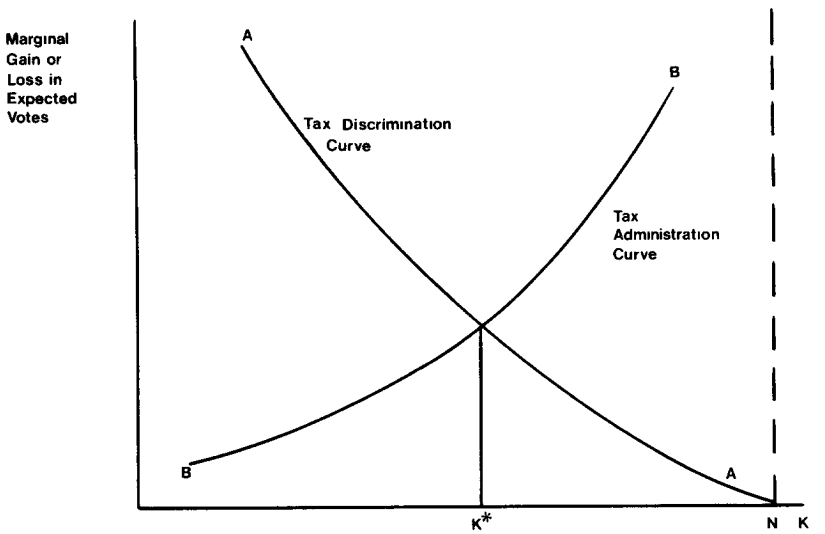

FIGURE 1. THE POLITICALLY OPTIMAL NUMBER OF RATE BRACKETS

(i.e., the marginal gain in support) when the number of rate brackets k_j on any activity is increased $\partial S/\partial k_j$, the resulting increase in administration costs $\partial A/\partial k_j$ and in total revenue $\partial R/\partial k_j$, and the additional support from spending one more dollar on public goods λ. In equilibrium,

$$(5) \qquad \frac{\partial S/\partial k_j}{(\partial A/\partial k_j - \partial R/\partial k_j)} = -\lambda \qquad j = 1,2,\ldots,J$$

that is, the marginal reduction in opposition per "net" dollar of administration costs must be equal across activities.[13]

As pointed out, the analysis has a second important application to the grouping of activities into tax bases. Consider a model with one representative taxpayer who engages in J different activities. The government can save on administration costs by combining related activities into a limited number of bases, such as occurs when incomes from different labor activities are included in the same tax base. Grouping leads to an increase in political opposition in this case since it will raise a taxpayer's deadweight loss associated with any given tax payment. On the other hand, the government receives additional support by spending resources saved in administration on the provision of public goods. The solution illustrated in Figure 1 again describes the nature of the equilibrium where K^* now refers to the number of bases for each individual rather than to rate brackets.

The preceding analysis for the first time formally integrates administration costs into

[13] First-order conditions (5) can be derived by choosing G and $(k_1, k_2,\ldots,k_J)$ to minimize the loss in support from grouping N taxpayers into k_j rate brackets for each of J activities, that is, min $\Sigma_i\{b_i(G^*) - b_i(G)\} + S(k_1, k_2,\ldots,k_J;\underline{t}^*)$, subject to $R(k_1,\ldots,k_J) = G + A(k_1,\ldots,k_J)$, where S is decreasing in each k_j and $(G^*,\underline{t}^*)$ represent the optimal G and the vector of $N \times J$ tax rates defined in the absence of administration costs. The first term in the objective function is the loss in support from the revenue implications of grouping relative to the $(G^*\underline{t}^*)$ solution. $S(\cdot)$ represents the minimum increase in opposition to taxation from (optimally) grouping taxpayers into rate brackets, as discussed in the Appendix.

political optimization.[14] In doing so, it provides a new basis for understanding the evolution of tax systems. In his pioneering work on fiscal systems, Musgrave (1969) argues that tax handles are crucial for explaining the formation and growth of tax structure. If we conceive of the term "tax handles" in a broad sense that includes opportunities to tax and to escape taxation as well as administration costs, the theory presented here formalizes what so far has mainly been implicit. In an analysis over time, changes in economic activities and in the conditions under which they are carried out will be of crucial importance together with administration costs since the nature of such activities and conditions determines the characteristics according to which the government sorts taxpayers to create bases, rate structures, and (as argued below) special provisions. The development of tax structure results therefore from an interaction between the changing ways in which people work, transact, and consume on the one hand, and the cost of administering the collection of revenues on the other. To this is added a third element, namely the influence of those factors that determine how benefits from public goods and losses in full income from taxation are translated into political action.

IV. Special Provisions

The final feature of the skeleton that remains to be explained is the existence of special provisions such as exemptions, deductions, and tax credits. Consider the grouping of activities into tax bases in the case with N taxpayers, each of whom engages in J activities. According to the preceding analysis, the government will create separate bases for each of the N taxpayers. The composition of bases will differ among taxpayers unless there is an additional cost, not considered so far, in administering different bases for each individual. Such costs

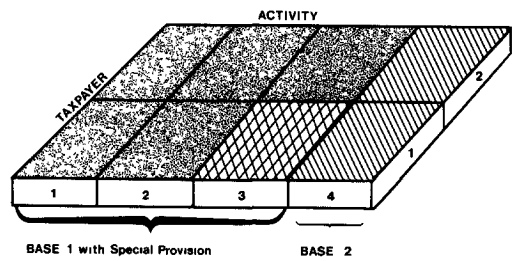

FIGURE 2. SPECIAL PROVISIONS IN TAX STRUCTURE

introduce a further constraint on the grouping process leading to 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 2 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's 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 three 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 1, 2, and 3 while making activity 4 into a second base.[15] However, it will be politically undesirable to tax activity 3 in the same way for both taxpayers. A special provision such as an exemption or a deduction in the first base will allow the government to differentiate tax treatment of activity 3 depending on the taxpayer involved.

The argument can also be approached from a second angle. The general solution in (5) 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 compris-

[14]See Shlomo Yitzhaki (1979) for a consideration of administration costs in an optimal tax setting. Yitzhaki does not explore the implications of heterogeneity.

[15]An additional base generally requires a new set of collection points and separate administrative arrangements.

ing several activities, but to introduce some differentiation in the tax treatment of each activity in any base by having special provisions that are specific to particular activities.[16]

We have now shown that the government's 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 establish a new political equilibrium each time there are shocks to the system such as changes in the factors (x_t) determining the supply of taxable activities, or 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.

V. 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 II, this relationship will differ for each individual. While each long-run "Laffer" 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 the vote productivity of additional public expenditure is positive.

Opposition to taxation will always increase with tax rates if both terms in the numerator of (4) are positive. It seems reasonable to assume this to be the case, even though increases in tax rates may lower tax revenues after some point (Geoffrey Brennan et al., 1984). Then, as long as $B_t > 0$ and $\partial b_t/\partial G > 0$, the first-order conditions (4) require that ε_t exceed -1. In other words, choice of a tax rate placing a voter on the backward-bending portion of his Laffer curve would imply that the government is foregoing revenues which could be used to generate further support and that the affected voter is at the same time opposing the government more strongly than he would at lower rates.[17]

In a world of heterogeneous taxpayers and positive administration costs, this conclusion may no longer hold for some individual taxpayers. When grouping occurs, the original optimal conditions no longer apply, with the result that some individuals may become subject to a group rate placing them on the backward-bending portion of their individual rate-revenue curve. This will occur if assignment to any other group would lower the government's overall expected support. (Two factors are relevant in assigning individuals to groups: revenue collected, which can be turned into political support through production of public goods, and the expected support from the individual himself. Assuming the number of groups to be fixed, the government will assign individuals so as to maximize net support from these two sources.)

[16] There may be further reasons for special provisions if there is a more direct link between the expenditure and tax sides. Expression (1) assumes that expected support by a particular individual is separable in G and v_t. In actual tax systems, we do observe some provisions which may represent a more direct link between the two sides of the budget. One can imagine a government creating a tax structure based initially on (1) and then amending it subsequently for certain broad classes of individuals having similar evaluations of public output. For example, people over 65 years of age may be given a special exemption to acknowledge a lower evaluation of public services. We would expect the cost of adjusting the definition of tax bases to exceed the cost of creating special provisions. As a result, the link between expenditures and taxes—as far as it exists—will be expressed primarily through the introduction of additional special provisions.

[17] 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 focuses on such differences, see Buchanan and Dwight Lee (1983).

The argument shows that we may expect to observe some individuals whose tax payments would increase if *they alone* faced lower tax rates. One should note, however, that the same conclusion does not apply to groups. No group will be on the backward-bending part of its aggregate rate-revenue relationship. Otherwise, the government could collect more revenues from the group as a whole by lowering the group's rate, while at the same time reducing opposition from all of its members.

VI. Comparison with Other Approaches

It is useful to compare the implications of our analysis to results derived from models that are based on different premises. We shall comment on the two approaches that have been most influential in recent years, the Leviathan model and the theory of optimal taxation.

In their work on taxation, Brennan and James Buchanan (1980) put major emphasis on underlying political forces while also making the level of expenditures endogenous. Nevertheless, their approach differs in an essential aspect from ours; they are concerned with a government attempting to maximize revenues and facing no significant political constraint. The government in our model has a different objective function and is effectively constrained by political forces even to the extent that opposition by unorganized voters will be reflected in tax structure.[18]

Brennan and Buchanan do not address the problem of how tax structure is created when bases as well as other major structural elements are endogenous. Presumably, Leviathan would also combine activities and individuals into groups, but the sorting would differ in two essential respects. Grouping in our framework reflects political factors determining how losses in full income are translated into political action in addition to the abilities of taxpayers to escape taxation which are Leviathan's major concern. Furthermore, the government has an incentive to economize on administration costs, while no such motivation exists in a world where government is not constrained politically in setting tax policy.

Both these differences have implications for empirical work. Statistical research based on our model requires a more explicit treatment of the $c(v)$ function and thus the development of proxy variables for the determinants of political influence. In addition, it is necessary to formulate variables reflecting administration costs (Winer and Hettich, 1987). Presumably, no such variables would be included in a model based on the existence of Leviathan-type behavior. Wallace Oates (1985) investigates such behavior by looking at whether or not decentralization constrains the size of government. Our theory suggests a more direct test, namely whether the evolution of tax structure and revenue composition is influenced by political and administrative factors in addition to economic ones.

While there are formal similarities between the theory of optimal taxation (OT) and the analysis developed here, there are also important substantive differences. In OT, the government maximizes a welfare function, usually written as a weighted sum of individual utilities, with the weights reflecting exogenously given distributional preferences. To our knowledge, writers on OT have not dealt with the creation of tax structure when tax bases are endogenous. While their work could be extended to include an analysis of sorting, the resulting equilibrium would differ since factors determining how losses in full income are translated into political support have no role in OT.

Optimal taxation is generally conceived of as a normative theory not concerned with explaining actual government behavior, but intended to provide a standard of reference which abstracts from the political setting in which tax policy is made. In this context, the interesting comparison concerns the efficiency of equilibrium.

[18]For this reason, our model also differs from that of Becker (1983) in which only the interests of organized groups are reflected in policy choices by the government.

If the optimal tax problem is stated as the maximization of social welfare subject to the raising of a fixed budget, efficiency in taxation requires that the change in social welfare per dollar of additional revenue be equalized across revenue sources. Efficiency of this kind is not a general characteristic of the model presented here, where as in equation (4), a support-maximizing government equalizes the change in expected political support per dollar of additional revenue across revenue sources. As a result, support-maximizing governments will create tax structures that differ significantly from solutions envisioned in the OT literature.

We may still ask whether a tax system of the kind described in the paper can be considered globally efficient. If we interpret tax structure as the long-run equilibrium of a competitive political system in which political opposition depends on the loss in full income, no political party can offer an alternative tax system generating the same political support with a lower welfare loss for any individual. In this sense tax structure is 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 toward the redesign of political institutions.

VII. 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 stylized 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 these elements are combined into different structures depends on administration costs and on the nature of political and economic responses to taxation among individuals.

Tax structure is a system of related parts in equilibrium, not merely a collection of separate and ill-designed components. This has important implications for the understanding of tax policy. Changes must pass a political as well as an economic test and reforms in one part of the system may lead to unexpected repercussions elsewhere as the government attempts to establish a new equilibrium. The analysis also suggests that the evolution of tax systems can be viewed as a sequence of responses to changing economic, administrative, and political factors. Future empirical work should adopt a framework that can account for the systematic influence of these determinants on tax history.

APPENDIX: GROUPING OF TAXPAYERS INTO RATE BRACKETS (OR ACTIVITIES INTO BASES)

Let the number of rate brackets be some number $K < N$, the number of taxpayers, and assume that first-order conditions in the absence of grouping can be written as

$$(A1) \qquad a_{ik} + m \cdot t_{ik} = g_{ik} - h \cdot t_{ik}.$$

The left side of (A1) represents the marginal political cost of taxing person $i (i = 1,2,\ldots, n_k)$ in group $k (k = 1,2,\ldots, K)$, analogous to the numerator in (4), while the right side stands for the marginal benefit of raising t_{ik} and spending the extra revenue. Heterogeneity of behavior is captured by differences in the constant terms. Imposing a rate t_{ik}, differing from the politically optimal rate t_{ik}^* found by solving (A1), results in a loss in support from each taxpayer equal to the integral of the difference between marginal political costs and benefits over the interval from t_{ik}^* to t_{ik}. Given (A1), this integral is equal to $v \cdot (t_{ik} - t_{ik}^*)^2$ where $v = (m + h)/2$. Similarly, the loss in support from taxing all members of any group k alike at rate t is equal to $v \cdot \Sigma_i (t - t_{ik}^*)^2$. The rate t that minimizes this loss is the least squares solution $t_{\cdot k} = \Sigma_i t_{ik} / n_k$. Thus with K brackets or groups the total loss in support from grouping can be reduced to $v \cdot \Sigma_k \Sigma_i (t_{\cdot k} - t_{ik}^*)^2$. This loss can be made as small as possible if taxpayers are assigned among groups so as to minimize the variation of the t_{ik}^*'s within each group.

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