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HORIZONTAL EQUITY IN STATE TAXATION

by

John Eric Fredland

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of the requirements for the degree of
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Professor Robin Barlow, Chairman
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ABSTRACT

HORIZONTAL EQUITY IN STATE TAXATION

by

John Eric Fredland

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This paper presents an empirical study of the distribution of state tax burdens among persons in similar circumstances. The basic approach is to apply the state of California tax system, chosen as an example, to a nationwide sample of 13,728 consumer units collected by the United States Bureau of Labor Statistics in its Consumer Expenditure Study 1960-1961.

The first task in undertaking a tax burden study is to choose a base for taxation. Income is chosen here. Four different income definitions are tested: a broad definition, encompassing a number of imputed sources; a narrow definition, which includes relatively few imputations; and each of these adjusted for family size. Using each definition, a selection from the total sample is taken, including those with incomes at each $1000 level plus or minus two per cent, from $2000 through $17,000. Incidence assumptions are made for each of the eight major revenue sources in California: personal income tax,

corporation income tax, sales tax, cigarette tax, gasoline tax, alcoholic beverages taxes, fees and taxes assessed on motor vehicles, and the tax on insurance premiums. The fiscal system is applied to each of the four subsamples, and distributions of tax payment are developed for each of the revenue sources, for several combinations of revenue sources (for example, gasoline and motor vehicle taxes), and for the system as a whole. A total of 700 distributions are considered. Comparisons are made between distributions among revenue sources, across income levels, and across income definitions.

Among the results are support for the concept of cancelling inequities, evidence that broad-based taxes have relatively narrow horizontal dispersions, even when their base is not income, and the finding that the personal income tax has significantly smaller dispersions at relatively high levels of income than at relatively low levels.

Since the focus of the study is on the application of a tax system to a group of consumers, and not the particular equity of the California system, the fact that the sample is not drawn from California is not a major concern, although it does mean that the results are less useful as policy prescriptions than they otherwise would be.

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ABBREVIATIONS

Income Definitions

ABI	Adjusted Broad Income
ANI	Adjusted Narrow Income
BI	Broad Income
NI	Narrow Income

Taxes

ALC	Alcoholic Beverages Taxes and Fees
CIG	Cigarette Tax
CYT	Corporation Income Tax
GAS	Gasoline Tax
INS	Insurance Company Gross Premiums Tax
MVT	Motor Vehicle Taxes and Fees
OBT	Other Business Taxes
PYT	Personal Income Tax
SLT	Sales Tax
TOT 1	Total tax payments
TOT 2	Total tax payments less gasoline tax and motor vehicle taxes and fees

INTRODUCTION

The vertical distribution of the tax burden of state tax systems has been the subject of considerable empirical study in past years.[1] In contrast, scant empirical attention has been paid to the distribution of the tax burden among those in similar economic circumstances. Economists have often made such pronouncements as:

> ". . . within each of the major taxes are found gross inequities in the treatment of persons or businesses in similar circumstances with respect to various subjects or bases for taxation . . ."[2]

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[1] See, for example:

O. H. Brownlee, Estimated Distribution of Minnesota Taxes and Public Expenditure Benefits, University of Minnesota Studies in Economics and Business, No. 21, (Minneapolis: University of Minnesota Press, 1960).

William H. Hickman, Distribution of the Burden of California Sales and Other Excise Taxes, (Sacramento: State Board of Equalization, Division of Research and Statistics, 1958).

R. A. Musgrave and D. D. Daicoff, "Who Pays the Michigan Taxes?" Michigan Tax Study Staff Papers, (Lansing: Citizens' Advisory Committee on the Michigan Tax Study, 1958).

University of Wisconsin Tax Study Committee, Wisconsin's State and Local Tax Burden, (Madison, 1959).

Gerhard N. Rostvold, "Distribution of Property, Retail Sales, and Personal Income Tax Burdens of California: An Empirical Analysis of Inequity in Taxation," National Tax Journal, Vol. XIX (March, 1966) p. 38.

[2] Harvey E. Brazer, Taxation in Michigan: An Appraisal, Michigan Pamphlets No. 30, (Ann Arbor: Institute of Public Administration, University of Michigan, 1961) p. 24.

But exactly how gross are these inequities? Reed R. Hansen in an article in which he develops two hypothetical families to show the possible horizontal inequities of the sales tax says:

> "Current tax literature contains no discussion of the horizontal inequities identified with the retail sales tax . . . Any attempt to find remedies for this capriciousness of the sales tax is restricted by inadequate budgetary data, and a dearth of studies on this subject."[3]

The lack of attention paid to horizontal tax burdens has been due, as Hansen says, to a lack of necessary data rather than to the unimportance of the subject. For discussion of tax equity, the horizontal distribution of burdens is as significant as the vertical distribution. Using data from the U. S. Bureau of Labor Statistics (BLS), Consumer Expenditure Study 1960-61, I have made a start in this paper toward filling the empirical gap.

The aim of this study is to discover the dispersion of tax payments made to the state of California, chosen as an example, by taxpaying units in approximately equal economic circumstances. To this end, I have defined equal circumstances in several ways, made incidence assumptions for the eight major state revenue sources in California, and applied that fiscal system to the nation-wide BLS sample of 13,728 consumers. Since the focus of the study is on the application of a tax system to a group of consumers,

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[3]Reed R. Hansen, "An Empirical Analysis of the Retail Sales Tax with Policy Recommendations," National Tax Journal, Vol. XV (March, 1962) p. 12.

and not the particular equity of the California system, the fact that the sample is not drawn from California is not a major concern. However, it does mean that the results are less useful for policy prescriptions for California than they otherwise would be. Distributions of tax payment are developed for each revenue source and for the system as a whole. Comparisons are made between distributions among revenue sources, across income levels, and across income definitions.

The study is divided into eight chapters and fifteen appendices. Chapter 1 deals with various theoretical issues underlying the project; Chapters 2 and 3 with its empirical design. The remaining chapters present the results of the investigation. The appendices detail the assumptions and data adjustments made.

CHAPTER I

EQUITY IN TAXATION

Equity in taxation involves the question of who should, in the sense of "fairness," give up economic resources to support government activities. At the outset of a discussion of equity, one should note that it is only one, and not necessarily the commanding consideration in evaluating the worth of a tax or a tax system. An inequitable tax may score well on efficiency or neutrality grounds; it may stimulate rapid economic growth or tend to keep the economy fully employed; it may be easy to administer. All of these considerations concern the politician and/or economist designing or studying a tax system, to an extent depending on his view of the society's goals.

A fair distribution of tax burden is a normative concept. Any distribution may be regarded as equitable by someone. Still, there is an old and oft revered central tenet of tax equity: "Equal treatment of persons dissimilar in no relevant respect," with the corollary that unequals shall be treated unequally, which is the usual starting point in discussing equity. By itself, the statement is general, unless one prefers random distribution of tax burden; thus it has no operational content. Giving it content involves defining "relevant

respects," and deciding exactly what constitutes equal (and unequal) treatment. These in turn present four problems: choosing an index or standard of equality, defining it precisely, discovering the incidence of the taxes being considered, and deciding on the proper degree of inequality between unequals, that is, deciding on the rate structure. In a study of horizontal equity, the first three are, of course, concerns; the fourth, for the most part, is not.

Choice of Index

People hardly need agree on what respects are relevant in defining equals for tax purposes. An index of equality does not even have to be an economic one--bloodline, IQ, cigarette consumption or any other variable would do if people felt it just. However, since taxation involves transferring command over resources--an economic action, we tend to believe that fairness requires an economic index, at least as a basis for evaluating tax equity. Individuals in similar economic circumstances should be treated alike. There are three possible economic bases: wealth, consumption, and income, with the overlap among the three varying with particular definitions of them. Most economists, but by no means all, regard income as the most appropriate index. If similar economic circumstances are the "relevant respects" and income is used to define economic circumstances, there is no place, as far as equity is concerned, for a tax on anything other than income. A tax on consumption, for example, when judged by an income index, will inevitably

prove horizontally inequitable.[1] However, noneconomic considerations can be, and are in fact regarded as relevant also. To the extent that this is true, two indices can logically exist together. Leaving this problem aside for the moment, let us assume that income is the chosen index, and turn to the task of defining it.

Definition of the Index

1) Theoretical Definition

Much has been written on the economic definition of income, mostly with nods to Professors Haig and Simons.[2] Economists regard total accretion--the flow of all things of economic value to a consuming unit in a given time period as the proper definition. Thus, all factor earnings; all transfers, both monetary and nonmonetary, from both public and private sources; all gain in the market value of assets held, whether or not the gain is realized; all imputed income, including services rendered to oneself, and rent of owner occupied housing, are income. Any costs of earning income are deductible. This

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[1] Whether or not it is vertically inequitable in an average sense depends on what rates are considered equitable. Of course, if one looks at individuals, a consumption tax will inevitably be vertically inequitable also.

[2] R. M. Haig, "The Concept of Income--Economic and Legal Aspects" in Readings in the Economics of Taxation, R. A. Musgrave and Carl S. Shoup, eds., (Homewood, Ill.: Richard D. Irwin Inc., 1959).

Henry C. Simons, Personal Income Taxation, (Chicago: University of Chicago Press, 1938).

is a consistent theoretical concept[3] although, of course, not a practical one for taxation purposes. For purposes of evaluating the equity of a tax or a tax system however, a standard need not be practical as long as the items of income are susceptible to monetary measure. One may set up an ideal and admit that, in fact, some sacrifice of equity must be made for administrative reasons.

It can be argued, however, that the total accretion concept is not an acceptable income definition for measuring equity. For example, I may feel that whether a man has a lazy wife or an industrious one should be irrelevant for tax purposes. Under a true total accretion index, the man with the industrious wife has more income than the man with the same money income and the lazy wife, and the former should thus, in the interests of equity, be rewarded with a higher tax bill. The difficulty with rejecting total accretion as an equity standard is that any shortfall from it involves drawing arbitrary lines. Which income is relevant in defining similar economic circumstances for equity purposes, and which is not? If a man builds his own house, and has his wife cut his hair, is the imputed house-rent income, but the barbering service not income? If total

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[3]From a theoretical point of view, determining what is and is not income is not particularly difficult. However, defining the costs of earning income is not a theoretically easy task. Many expenditures are both consumption and costs of earning income. For example, broadly construed, food consumption is a cost of earning. Thus, the concept is not as complete and consistent as it may first appear.

accretion is the index, both should be included, although one may in fact include the first and not the second in an empirical study such as this one because he often knows that the man owns a house and can estimate, if he does not actually know, house value, and thus can impute rent. Usually one does not know that the man's hair is cut by his wife. But apart from this empirical problem, there is a question as to whether the haircut "income" is relevant in evaluating the equity of a tax system. I deny that it is. The denial is no more than a value judgment.

A particularly difficult aspect of the same problem involves government benefits. Any separation of the tax side from the benefit side is artificial. Transfer payments are usually regarded as income, while subsidies, such as, for example, on the provision of low income housing or low cost school lunches, and other uses of resources by government are not. Logically, this distinction is difficult to justify. If receipts from one type of benefit from government activity are income, and thus relevant for defining equals, why should the receipt of other benefits be irrelevant? One might affirm the relevance of such benefits and attempt to impute them to consuming units, as is done for example by Gillespie[4]; one might avoid the imputation judging it as desirable but too difficult empirically; or one might deny that at

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[4]W. Irwin Gillespie, "Effect of Public Expenditures on the Distribution of Income" in Essays in Fiscal Federalism, R. A. Musgrave, ed., (Washington, D. C.: The Brookings Institution, 1965).

least some of these benefits should be imputed, declaring them to be irrelevant for defining equals.

In this study I have not imputed benefits mostly because of the extreme difficulty in doing so. Useful imputations are more difficult for a horizontal study than for a vertical study because of the necessity of assigning benefits to individual consuming units in the former, rather than to groups of consuming units, as is done in the latter. Transfer payments are, however, included here. The only defense of this particular treatment of government benefits is expediency, combined with the notion that transfers are popularly regarded as income, while other benefits are not.

There are few guidelines for assigning some types of collectively consumed benefits. How is defense expenditure to be allocated, for example? Whether it is properly assigned in equal amounts to all consuming units, proportional to income, proportional to capital, or some other way is strictly a matter of opinion. It is worth noting that if assigned in equal amounts to all families, or proportional to income as otherwise defined, the inclusion of such benefits has no effect on the horizontal distribution of tax payments.[5]

In sum, then, total accretion is a consistent theoretical concept of income, but it may not be usable as an equity standard

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[5]The reader should note that if benefits are included in income, taxes must be subtracted before tax burden can be measured in order to avoid double counting. See Gillespie, "Distribution of Income," p. 126 ff.

for two reasons: first, because sufficient data rarely exist to apply it, and second, because there are some types of income which may be regarded as irrelevant in defining equity. For both reasons frankly arbitrary choices must be made. The element of arbitrary choice is thus inescapable not only in designing a workable tax system, but in defining a standard with which to evaluate a system as well.

2) Definition in this Study

Two definitions of income are used in this study. The "broad" income definition (BI) is hardly a total accretion definition, although it is far more inclusive than any definition actually used for tax purposes. It includes all monetary receipts, certain goods and services received in kind, retained earnings in corporations, and imputed rental income. Appendix A describes the items included in detail. No attempt has been made to include services rendered within the family, nor government non-monetary benefits, nor unrealized capital gains.

The "narrow" definition of income (NI) only includes monetary receipts. It was chosen for two reasons: first, because the broad definition involves a number of imputations based on fairly crude and arguable assumptions, and it was felt useful to present the horizontal distribution of tax payment under a relatively imputation-free definition; second, because the narrow definition is much closer to a "popular" definition of income.

3) Other Problems

Thus far a pair of related and difficult aspects of income definition have been neglected--those of the appropriate time period or receipt, and the regularity of receipt. In this study, a one year time period is made necessary by the data. It can be argued that a longer period is more appropriate, and judgments of equity based on a longer period are likely to be very different from those based on annual data. For example, whether an annual income tax is horizontally equitable over time depends on the rate structure. A man with a fluctuating annual income will, under a progressive rate structure, pay more than another man who receives the same income in equal sized increments. Thus, using a one year time period may make an annual income tax look horizontally equitable when it is in fact inequitable. On the other hand, using annual income as a standard to evaluate other taxes, particularly a fairly general consumption tax, may make a tax which is in fact horizontally equitable appear inequitable. A man whose income in the survey year is abnormally low may retain a high standard of consumption and thus pay a large sales tax relative to another whose income is normally at the low level. The apparent inequity may be an illusion if individuals consume according to their permanent income. In fact, if permanent consumption (Y_c) is uniquely related to permanent income (Y_p), a general sales tax is as horizontally equitable as a proportional annual income tax (and more equitable than an annual income tax with any other rate structure.) The strength of

the relationship between Y_c and Y_p has been the subject of much controversy, backed by too little empirical evidence.[6] As far as I know, advocates of the uniqueness of the relationship between Y_c and Y_p have never suggested that it applies to all individuals, but rather to income classes. A tax based on consumption would thus appear horizontally inequitable under a permanent income equity standard as under an annual income equity standard. However, given the relation between Y_p and Y_c, the degree of inequity would show up much smaller under the permanent income standard.

Even using data for a one year time period, one might be able to "get at" the concept of permanent income if some means for separating "transitory" income components from permanent income components were available. The transitory components are but a small part of one's permanent income, although perhaps a large part of one's income in any one year, and thus must receive differential treatment in setting up a permanent income equity standard. The BLS survey provides sufficient detail to separate out the positive transitory components, but no good way to separate out the equally important negative ones. I have thus chosen not to include a permanent income concept among the income definitions used in this study.

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[6]Robert Ferber, "Research on Household Behavior," Chapter XII in Surveys of Economic Theory, Vol. II, (New York: St. Martin's Press, 1966) contains a discussion of and a complete bibliography on the permanent income hypothesis and other consumption theories.

4) Family Size and Other Refinements

Thus far it has been assumed that similar economic circumstances constitute the appropriate measure of equality, and that income, defined in some way, is the best measure of economic circumstances. While most economists would accept the first, few would accept the view that income alone is an adequate measure of economic circumstances, even were there universal agreement on the appropriate income definition. Two individuals are not economically equal, given the same income, if one has a larger family. A minority would argue that family size is a matter of choice and is no different, for tax purposes, from other types of consumption, but most would probably agree that an equity index should include a family size adjustment, at least at the bottom end of the income scale. Exactly how family size should be taken into account, however, is a difficult question. Given sufficient data, I might have avoided the issue altogether by defining as equals only those with the same income and family size, and leave it up to the reader todecide how families of different sizes should be compared.[7] I have not done this for lack of sufficient sample size, but have been obliged to face the issue directly.

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[7]James R. Beaton, "Family Tax Burdens by Income Levels," National Tax Journal, Vol. XVI (March, 1963), p. 14, adopts this approach for a vertical burden study.

There are two approaches to adjustment for family size. One, which I will call the "welfare approach," is that of the Federal personal income tax: to subtract a per capita exemption from each family's income. Equally circumstanced taxpayers are then those with equal incomes less exemptions. The size of the exemption presumably reflects the amount of economic difference an extra family member makes--the extra amount required to provide some minimum or adequate level of living.[8] The second approach, which I will call the "equivalent income approach" is to divide family income by the number of family members, or by family size adjusted to take account of economies of scale; this is the approach adopted here. An example of its actual practice is the income splitting provision of the Federal personal income tax.[9] Both the broad and the narrow income definitions used in this study are adjusted for family size, the adjustments reflecting the BLS equivalent income calculations made in 1960.[10]

The philosophy underlying the equivalent income approach is quite different from that underlying the welfare approach. The

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[8]The exemption need not be a flat per capita figure, of course. It can decline with family size, age of dependents or any other variable, including income. A relatively sophisticated version of this approach is found in: Martin David, "Welfare, Income and Budget Needs," Review of Economics and Statistics, Vol. XLI (November, 1959), p. 393.

[9]An alternative way to look at the equivalent income approach is to view it as an exemption which is a percentage of income.

[10]"Estimating Equivalent Incomes or Budget Costs by Family Type," Monthly Labor Review, Vol. 83 (November, 1960), p. 1197.

adjustment under the equivalent income approach reflects the increment of income a man needs to support an additional family member at the same level of living to which the family was accustomed before it took on the additional member. The needed increment thus varies directly with income. The welfare approach is undoubtedly more relevant when the purpose is to make policy prescriptions for equalizing the vertical income distribution. It is precisely the income differences associated with the different levels of support for a given type of family member at different levels of income which are to be reduced. The reason for making a family size adjustment under the welfare approach is to insure that the basic needs of the family members are accounted for before equalization takes place. In this study, however, I wish to define equals as those who have attained the same standard of living, and abstract from questions of vertical redistribution. The allowance per family member must then vary with income.[11]

There are other circumstances that make for differences in economic equality that are regarded, at least by much of income tax law in the United States, as "relevant respects." For example, for a family in which the wife is working, a deduction is often allowed for child care. Unusually large medical expenses reduce a man's

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[11]See Harold M. Groves, Federal Tax Treatment of the Family (Washington, D. C.: The Brookings Institution, 1963), particularly Chapters I and VI for a complete discussion of the issues involved in adjusting for family size.

taxpaying ability relative to those without such expenses, and deduction is often allowed for these. Advanced age makes an economic difference regarded as relevant under most income tax statutes. If such refinements are warranted, the index of equity should be similar economic circumstances, as defined by income minus exemptions and these deductions. I have chosen here to disregard all but family size, rather than to become enmeshed in choosing reasonable refinements and attempting to quantify them.

5) Noneconomic Refinements

It has been said that economists are generally in favor of "similar economic circumstances" as a standard of equity, but are not in general agreement as to the proper definition of these circumstances. The political process in the United States does not recognize "similar economic circumstances" alone as an adequate equity index. Charitable contributions, for example, are deductible under the Federal and most state income taxes. Such a deduction, if it is regarded as equitable (and of course, it may be, and usually is, defended on grounds other than equity), essentially changes the equity index to: equal income unless a taxpayer gives to the church or other organizations, in which case he is more worthy in some sense than non-givers, and thus should pay less tax. Charitable giving--a noneconomic or at least paraeconomic consideration, becomes a "relevant respect." Unless economic considerations alone are regarded

as relevant for defining equals, there is no lack of logic in refining the index to include a deduction for charitable contributions. The same reasoning can, of course, be used to justify any possible revision of a tax law.

By allowing for noneconomic respects, other taxes may be found more equitable than a tax based on income. For example, two taxpayers might be regarded equal if they earned equal incomes unless one should be so foolish and sinful as to buy cigarettes, in which case he should pay more tax; or so foolish as to buy alcoholic beverages; or to accumulate wealth rather than spend it. In other words, a wealth or consumption tax can equitably coexist with an income tax, after income is chosen as an equity index, if the wealth or consumption tax is justified for noneconomic reasons--to "get at" some noneconomic differences between taxpayers that are regarded as relevant. None of such noneconomic refinements are made in this study. The purpose of this discussion is merely to point out that what is equitable is a matter of opinion, and that noneconomic considerations can have a place in an equity index. The income definitions in this study reflect my opinion as to what is equitable, with certain modifications made necessary by the data.

6) Benefit Principle Taxation

Special attention must be paid to the benefit principle in the context of equity as defined above. If income modified by family size

is the equity index, there is no place for benefit taxation on equity grounds. A man with $10,000 and a car pays more gasoline tax than a man with $10,000 and no car--this is horizontal inequity. A defender of benefit taxation can admit the inequity and argue for the concept on allocative grounds. He can also argue that the appropriate equity index is income modified by family size unless benefits can be accurately evaluated, in which case benefit taxation is appropriate. Apart from the difficulty in deciding when benefits can and cannot be accurately evaluated, such an approach places the advocate of benefit taxation in the same league with those who would defend cigarette taxation as equitable, in that the standard of equity is: income, unless some particular situation exists. This is not a position that most benefit principle advocates would favor. Finally one might argue that benefit taxation is not really taxation, but rather the operation of a quasi-market; then it has no relevance at all to a discussion of equity. This is essentially the Musgrave approach--taxes should be assessed entirely according to benefits received for all allocative activities of government.[12] Equity is then an issue only with reference to taxation for redistribution. Income can still be the equity standard as long as all government benefits, both monetary and nonmonetary, and private charity are excluded from the income definition. However, for most allocative activities,

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[12]R. A. Musgrave, The Theory of Public Finance (New York: McGraw-Hill, 1959), Chapter 1.

there is in fact little or no connection between benefits and taxes, and it would be almost impossible to make such connections in many cases because of the difficulty in assigning benefits, as mentioned earlier. Some taxes, notably the gasoline and motor vehicle taxes do bear some relation to benefits received. Whether the connection is close enough to warrant exclusion from a discussion of equity is an open question. There is clearly some difference between the highway user taxes and general fund levies. As is obvious from the fact that such taxes are included here, I do not believe that the differences are great enough to warrant complete exclusion. However, all taxes are discussed individually, so that the reader can make his own judgment on whether the highway user levies should be included in a study of tax equity.

Incidence

Tax incidence refers to all changes in the income distribution brought about by the introduction of the tax in question, holding the expenditure side and the fiscal systems of other levels of government constant. Strictly speaking, we must introduce the tax as a replacement for an existing tax in order to abstract from changes due to deflation. An alternative would be to assume that whatever expenditures are financed by the new tax cause no distributional changes at all.[13]

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[13]Musgrave, Public Finance, Part III, particularly Chapter 10, discusses incidence thoroughly.

As a practical matter, one can only make assumptions on first round changes in income distribution. For example, it is assumed here that the personal income tax is borne by the taxpayer--that the only distributional change that occurs is the reduction of the taxpayer's income by 100 per cent of the tax. In fact, of course, secondary changes occur--the taxpayer may reduce his supply of labor, product prices may change due to changes in demand and factor costs, and so on.

Incidence assumptions had to be made for each tax. In some cases they were rather straightforward; for the business taxes there were numerous complications. The personal income and consumption taxes are assumed borne by consumers. Assumptions on incidence and exporting of business taxes vary with industry or industry group. Any business tax revenue assigned to instate consumers is allocated by total consumption; any assigned to instate shareholders is allocated by dividends received. The assumptions are crude and arguable, but are made with the thought that some insight is better than none, and that assumptions based on cursory examination of broad industries are better than arbitrarily assuming the same incidence and exporting assumptions apply to all industries.

One important institution, the Federal offset, effected shifting of nearly all taxes. Under the Federal personal and corporate income taxes, the taxpayer is allowed to deduct from taxable income all

taxes paid to other jurisdictions.[14] The effect of this provision is to shift a portion of state taxes paid by those who itemized deductions to the Federal government (and thus to taxpayers nationally), the portion varying with the marginal Federal tax rate of each individual. It is assumed here that 50 per cent of the California corporate income tax is shifted because of the offset, and that 22 per cent of the gasoline, sales, personal income, cigarette, and alcoholic beverages taxes paid by those taxpayers who itemize is shifted for the same reason.[15] It is worth noting that further violence is done to theory in that while portions of the taxes included are assumed shifted outstate, consequent changes in the Federal fiscal structure to compensate for revenue lost are not considered.

Conclusion

The main point to be emphasized here is that equity is a normative concept. While the index, or rather indices, of equality defined and used in this study may, I hope, have some general appeal, they have no claim to being the only logical, reasonable indices. The validity of the results presented here, given my conception of equity,

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[14]In 1961, all taxes by individuals were deductible from personal income. In 1964, the scope for deductibility was narrowed, and now includes only income, property, sales and gasoline taxes.

[15]See section entitled, "Federal Offset" in Chapter 2 below for discussion of the percentages used.

depend on the reasonableness of my various imputations and assumptions; but if the reader's conception of equity is radically different from my own, my results are irrelevant for him regardless of the reasonableness of the assumptions.

CHAPTER 2

DESIGN OF THE PROJECT

The purpose of this study is to develop horizontal distributions of tax payments by applying a state tax system to a group of consumers. The group of consumers used is a nationwide sample of 13,728 family units surveyed by the Bureau of Labor Statistics in 1960-61. A description of the survey is contained in Appendix B. The tax system used is that of the state of California, which is described in Appendix C.

The study could have been done using a hypothetical tax system. For taxes falling directly on consumers, statutory rates easily could be invented and applied to appropriate expenditure and income items for each consumer (assuming incidence 100 per cent on consumers). For those taxes such as the corporation income tax, which are paid by business but shifted at least in part to consumers, the task would be only slightly more difficult. Total tax collections are the starting point. They must be taken as a proportion of all or some part of aggregate consumption expenditure, and in turn, the resulting percentage applied to individual consumers. One could assume hypothetical amounts for collections and aggregate consumption. Rather than inventing and attempting to defend "reasonable" figures for rates, collections, and consumption, however, and trying to make

the study more than an abstract exercise, I decided to use an actual system. The reasons for choosing California in particular are discussed below.

Choice of California

The California tax system was chosen for four reasons: first, it includes all the main sources of state government revenue. It is as near to being "representative" as any state fiscal structure, and the results may thus have more general relevance than they would were another state chosen. Second, California has a heterogeneous population, which is more closely approximated by a nationwide sample than the populations of many other states. The results may thus have more relevance for the state chosen than they would were another state with a more homogeneous population chosen. Third, California is large geographically, and has a large population relative to surrounding states. Assumptions that Californians do all of their buying and traveling instate are thus not too unrealistic. Further, assumptions on incidence and exporting of business taxes are facilitated, as will be shown later. Finally, there is a quantity of excellent source material on the California fiscal system, particularly the Report of the Senate Fact Finding Committee on Revenue and Taxation[1] and

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[1] California Legislature, Senate, Report of the Senate Fact Finding Committee on Revenue and Taxation (January, 1965). Henceforth cited as the Report.

a vertical burden study, based on the 1950 BLS Survey of Consumer Expenditures, done for California by William D. Hickman in 1958.[2] The Hickman study is updated, using the same 1960-61 survey data used here, in the Report.

In essence, it is assumed that all consumers surveyed are Californians. In view of the aim of the study, the inaccuracy of the assumption is not of major concern, but let us look at it briefly. There are at least two senses in which the assumption is inaccurate. First, a similar size sample of Californians would not have the same distribution of income, sources of income, and expenditures. Second, were the sample chosen actually living in California, their expenditures would differ from those actually recorded. Such factors as climate, distance between places, and relative prices would alter demand patterns. These inaccuracies are not a concern except that it must be assumed that the California tax system itself would not alter expenditure patterns. That is, were the consumers in the survey actually subject to California taxes, it is assumed that their consuming habits would remain similar to their present habits.

Taxes Considered

The California tax system as it existed in 1961 is applied to the sample. I am considering the eight sources of revenue listed

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[2]William D. Hickman, Distribution of the Burden of California Sales and Other Excise Taxes (Sacramento: State Board of Equalization, Division of Research and Statistics, 1958).

in Table 1. An attempt is made to handle those portions of the sales, gasoline, and motor vehicle taxes that are initially paid by business, as well as those portions falling initially on consumers.

TABLE 1

YIELDS FROM SELECTED SOURCES,
CALIFORNIA, FISCAL 1961

Taxes	Yield (million $)	Yield (%)
Sales and use	$711,702	30.4%
Personal Income	269,103	11.5
Corporate Income	272,718	11.7
Alcoholic Beverages (including licenses)	64,022	2.7
Cigarette	66,024	2.8
Insurance premiums	66,745	2.9
Gasoline	350,801	15.0
Motor vehicle taxes and fees	277,317	11.9
Total, included taxes	$2,078,432	88.9
Total, all taxes	$2,338,201	100.0

Source: California Statistical Abstract, Table Q-6, p. 182.

Several sources of revenue in California are excluded from the study: parimutuel tax, inheritance and estate tax, gift tax, corporate organization and qualification fee, severance tax on oil

and gas, and the unemployment compensation and disability tax. Reasons for exclusion are contained in Appendix C.

Income Classes

Income is defined in four ways, as discussed in Chapter 1 and Appendix A: Broad Income, an inclusive definition; Narrow Income, a money income definition; and each of these categories adjusted by family size. The sample is divided into income classes, income defined in each of these four ways. There are 16 income classes under each of the unadjusted definitions, and nine under the adjusted definitions. Lack of data prevented using 16 classes for the adjusted definitions. For the unadjusted definitions, the first class is $2000 plus or minus two per cent, and there is a class at each thousand dollar mark, plus or minus two per cent, through $17,000. For the adjusted definitions, the classes are $1000 through $9000.[3] Since the income classes are defined at a dollar figure plus or minus two per cent, the class widths of course increase with income, from a minimum of $80 to a maximum of $680. A given consuming unit in the sample may fall in an income class under none, one, two, three, or all four of the definitions. For example, a two person family with $9000 of broad income including $1100 of imputed income, will be in the broad income class: $9000 $\pm$ 2 per cent ($8820 - $9180) and the

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[3] $1000 $\pm$ $40 is the first class under the adjusted definitions. Other classes are $\pm$ 2 per cent.

narrow income class: $8000 ± 2 per cent ($7840 - $8160). Assume that adjusted family size is 1.32. The family thus has an adjusted broad income of $9000/1.32 = $6818, which does not fall in any adjusted broad income class considered; and an adjusted narrow income of $7900/1.32 - $5985, which falls in the narrow adjusted income class $6000 ± 2 per cent ($5880 - $6120). The consuming unit is thus included in the study under three of the definitions, but not under the fourth.

Imputations

Imputations and assumptions relating to individual taxes are discussed in the chapters and appendices on those taxes, but there are several assumptions relating to the whole study which are discussed here. These relate to income definition, the adjustment for family size, the Federal offset, and the incidence of taxes on business.

1) Income Definition

The broad income definition required imputing the rental value of owner occupied housing, undistributed corporate earnings, and realized capital gains. Rental value of owner occupied housing was imputed following the work of Okner, who estimated an average

return on net equity of .06.[4] The other variables needed to make the calculation, house value and annual mortgage interest payments, are available directly from the survey data. Realized capital gains and corporate earnings were both imputed on the basis of dividends received, using Statistics of Income data.[5] The ratio of gross capital gains to dividends received, by those who received dividends, by adjusted gross income class, was used to impute capital gains. The ratio of corporate dividends paid out to corporate net income was used to impute undistributed earnings.[6]

Imputing the unshifted portion of the corporate income tax to individual shareholders obviously necessitates adding to income the amount of tax paid. However, there is professional disagreement on the appropriateness of including retained earnings in income. It would be permissible to include the entire unshifted portion of the corporate tax in the tax side and not include retained earnings on the income side only if the tax were assumed not to fall on retained earnings; that is if it were assumed to be fully reflected in reduced

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[4]Benjamin A. Okner, Income Distribution and the Federal Income Tax, Michigan Governmental Studies No. 47, Appendix A (Ann Arbor: Institute of Public Administration, University of Michigan, 1966), p. 103. Okner used a more conservative 5 per cent figure in his empirical work, and I have followed that course here. See Appendix A.

[5]U. S. Treasury, Internal Revenue Service, Statistics of Income, 1960-61 Corporation Income Tax Returns.

[6]Details of the above imputations are contained in Appendix A.

dividends. Such an assumption seems unwarranted, thus I have included retained earnings.[7, 8]

2) Family Size Adjustment

Family size was accounted for by dividing both the broad income and the narrow income definitions by an adjusted family size, creating two additional income definitions. The adjusted sizes are based on a BLS index of "equivalent income" constructed to "measure the relative income required to maintain the same level of well being."[9] The adjustment accounts for both size of family and age of children. For example, a six person family with the oldest child over 12 but at least one child under 18 is assigned an adjusted value of 3.00.

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[7]See G. A. Bishop, "Income Redistribution in the Framework of the National Income Accounts," National Tax Journal, Vol. XIX (December, 1966), p. 378.

See also the Musgrave-Tucker controversy, in which the appropriateness of including retained earnings in income was discussed at some length.

R. A. Musgrave and L. Frane, "Rejoinder to Dr. Tucker," National Tax Journal, Vol. V (March, 1952), p. 15.

R. S. Tucker, "Rebuttal," ibid., p. 36.

R. A. Musgrave and L. Frane, "Concluding Note," ibid., p. 39.

[8]Double counting is obviously involved in including in income retained earnings, dividends, and corporate profits tax payment, as well as realized capital gains. Capital gains presumably reflect to some extent the earnings positions of companies. The precise nature of the relationship is of course incalculable since security prices depend on many intangibles. The procedure of including all elements, used here, is similar to that followed by Gillespie, "Income Distribution," p. 125 and Table 13, p. 174, together with the notes to Table 13, p. 173.

[9]"Estimating Equivalent Incomes or Budget Costs by Family Type," Monthly Labor Review, Vol. 83 (November, 1960), p. 1197.

If that family had a broad income of $9000, it would be placed in an income class with a single consumer having a broad income of $3000. If that family had no child over 12, on the other hand, it would be assigned an adjusted value of 2.70. Its adjusted income would then be $3333, which does not fall in any broad income adjusted class considered in the study. The adjusted family sizes used, together with a brief description of the BLS study cited above are given in Appendix A.

3) Federal Offset

Another assumption which concerns the entire project is that made with regard to the Federal offset. Taxes paid are deductible from adjusted gross income to define taxable income for purposes of the Federal income tax.[10] In effect, then, a certain portion of state tax paid by an individual is in fact shifted to the Federal government, the amount varying with the marginal rate of the taxpayer. This shifting occurs if, and only if, the taxpayer itemizes his deductions when computing his Federal tax. If his marginal rate is 20 per cent, then 20 per cent of his state tax paid is shifted, since his Federal taxable income is reduced by the full amount of state tax paid, and his Federal tax payment is thus smaller by 20 per cent of the state tax paid. In the analysis here, each

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[10] In 1960-61, during the survey, all taxes paid were deductible. In 1964, the scope of deductibility was narrowed somewhat. Only income, sales, personal and real property, and gasoline taxes are presently deductible.

taxpayer's state personal income tax is calculated both with a standard deduction and with itemized deductions. If it was found to be advantageous for a taxpayer to itemize under the state tax law, I assumed that it was also advantageous under the Federal tax law, and partial shifting was thus assumed to have occurred. I assumed a marginal tax rate of 22 per cent applied to all taxpayers in the study. The minimum rate in 1960-61 was 20 per cent. Since the maximum income of those sampled here is only $17,340, under a much broader set of definitions than used in the tax code, the assumption of 22 per cent is probably not far from correct, except perhaps for some single consumers. If a taxpayer itemized, the effective state tax on him was reduced by 22 per cent for the cigarette, alcoholic beverages, sales, personal income, and motor vehicle taxes.

The corporate income tax was handled in a similar manner, using a marginal rate of 50 per cent.

4) Assumptions on Business Taxes

It is often suggested that corporate profits taxes operate as selective excises, falling heavily on some goods and services, and not at all on others. A similar statement could be made about other taxes paid by business, for example the sales tax, although most of these others would not be as selective. For purposes of this study, however, all taxes assumed shifted from business to consumers are treated as general consumption taxes. This assumption obviously

prejudices somewhat the results presented below. The business taxes appear more horizontally equitable than they are in fact because no allowance is made for their selective impact. An attempt to allow for selectivity was abandoned early in the study. The data available did not permit reasonable allocations of tax payment to specific expenditure categories. It seems to me that using four digit industries and a national input-output matrix together with incidence and exporting assumptions of the type made here would reasonably pinpoint the burden of a state corporate profits tax although not the other indirect taxes paid by business. In any case, that much detail is beyond the scope of the present study.

Although these taxes are found equitable here, policy conclusions based on these facts must naturally be approached with caution.[11] Since the taxes are handled separately, the assumptions with regard to the business taxes, of course, do not affect the results for other taxes, or comparisons among other taxes.

Details of the incidence and exporting assumptions for taxes included here are contained in Appendices J, K, and L. The procedure followed in assigning shifted taxes to total consumption is outlined in Appendix L.

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[11] The reader should see Chapter 5 for further discussion.

Limitations

The work here is subject to numerous limitations. One set of error sources relates to the assumptions and imputations made in manipulating the data. These are discussed throughout the study and the appendices. A second group of limitations concerns the data themselves. Errors may arise from sampling, processing, and from the responses or lack of responses of those interviewed. The extent of sampling error is, of course, measurable. The BLS has not published estimates of sampling error, however. Processing errors were "minimized by extensive review and editing, and by machine screening."[12] Two types of interview error can be distinguished: errors due to failure of some of the sample to cooperate in the survey; and errors due to inaccurate answers given by those who did participate. These two types are discusses briefly below.

1) Nonresponse Errors

Eighty per cent of the sample furnished usable schedules. Information was obtained from some nonrespondents, but it has not yet been fully analyzed. Analysis of the BLS Consumer Expenditure Survey of 1950 found that sample losses did not seriously affect expenditure averages.[13] If the same is true of the 1960 survey,

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[12]Bureau of Labor Statistics, "Handbook for Survey Users" (December, 1964), mimeograph, p. 13.

[13]Helen H. Lamale, Study of Consumer Expenditure Income and Savings--Methodology of the Survey of Consumer Expenditures in 1950 (Philadelphia: University of Pennsylvania, Wharton School of Finance and Commerce, 1959).

the results of the present study will be substantially unaffected. However, the BLS notes that the loss rates were not constant throughout the income distribution. Particularly, they are higher for consumers at the extremes of the vertical distribution, and for single consumers. Thus, nonresponse errors may affect the horizontal tax payment distributions in some income classes.

2) Reporting Errors

Both expenditures and incomes tend to be underreported in surveys such as this one, with expenditures understated somewhat less than income. Thus, at any level of income, the distribution of tax payments for any consumption-based tax (the sales and excises taxes, and those taxes on business assumed here to be shifted to general consumption) should be biased to the right--toward a heavier burden than actually exists. No measure of the extent of bias has been undertaken.

Among expenditure reporting errors, most are due to memory error. Small items, irregularly purchased, are subject to large, but apparently fairly random memory errors. BLS found that these were unlikely to affect averages, but they are a potential source of bias for the sales tax distributions in the present study. However, as long as the errors average to zero, there should be no serious effect on the horizontal distribution of tax payment. Calculated tax payment for a given consuming unit may deviate widely from its

"true" tax payment, but at any income level, the distribution of tax payments by all consuming units at that level should not be systematically affected. Large items of expenditure tend to be accurately reported.

Some expenditure reporting errors are not due entirely to memory lapses. Particularly, expenditures on alcoholic beverages and tobacco are subject to deliberate systematic underreporting. Such systematic underreporting will affect the distributions of excise tax payments on the two items, moving the peaks to the left and probably collapsing the distributions. In the case of alcoholic beverages, the reporting error is very substantial. In the vertical burden study in the Report, it was found that reported expenditure, as calculated from the same BLS data used here, accounted for only some 41 per cent of the alcoholic beverages tax revenue actually collected in California in 1960.[14] No reasonable adjustment can be made for the underreporting in a horizontal study, however.

Income from interest, dividends[15] and rent is known to be substantially underreported; that from entrepreneurial sources somewhat underreported. Since consumers in this study are grouped on the basis of income, some serious errors could be present. Those with non-wage and salary income will tend to fall in income classes

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[14] Report, Part II, p. 78.

[15] Underreporting has been reduced by now existing requirements that banks and corporations file information returns reporting payment of interest and dividends.

below the levels to which they actually belong. Assuming expenditures by those who underreport income are not significantly different from expenditures by those who actually have the same income but report it accurately, the peaks of the tax payment distributions should be biased to the right, and the distributions stretched, for consumption based taxes. The distributions of personal income tax payments should not be systematically affected. Taxes are calculated here on the basis of income reported. For a given consuming unit, if actual (higher) income were reported, calculated tax payments would be higher, but the unit would be placed in a higher income class with a larger mean tax payment. The effect on the distribution of corporate income tax payment depends on the incidence assumptions. To the extent that incidence is on consumers, the corporate income tax is a consumption tax and the distribution should be biased to the right. To the extent that it is on the stockholders, since dividends are underreported, and the tax is allocated on the basis of dividends, the distributions should be biased to the left. The net effect is unknown.

3) Error Due to Basic Survey Orientation

With regard to the quality of the data, one final point should be kept in mind. The survey was undertaken primarily to revise the consumer price index. The primary emphasis in data collection was on a complete and reasonable record of expenditures. The data on income and saving were given distinctly secondary emphasis. A balancing equation was calculated for each consumer. Ideally

receipts would equal disbursements for each case. However, this was rarely true, and schedules were not rejected because the balancing error was large. As long as the expenditure schedule seemed reasonable, the consuming unit was included. A study such as the one presented in this paper, which relies heavily on the income data collected, must be evaluated with the orientation of the survey in mind.[16]

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[16]The above discussion based on: BLS, "Handbook for Survey Users," p. 15.

CHAPTER 3

ORGANIZATION OF THE STUDY AND MEASUREMENT OF DISPERSION

This chapter briefly examines the organization of the remainder of the study and discusses the coefficient of variation, the basic statistical tool used here for measuring equity.

Organization of the Study

1) Basic Questions

This study deals with three variables: tax, income level, and income definition. As discussed in Chapter 2, for the broad and the narrow income definitions, nine taxes and groups of taxes are considered, at each of 16 levels of income. There are thus 288 separate distributions. For the adjusted broad income and adjusted narrow income definitions, nine taxes and nine income levels, or 162 additional distributions are developed. In addition, further distributions may be developed by combining certain taxes and tax groups at each income level and definition. Five such combinations were made, the most important of which is a combination of all tax payments.[1]

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[1] Others are total tax payments less road user charges; personal income tax plus sales tax; cigarette tax and alcoholic beverages taxes; and gasoline and motor vehicle fees and taxes. Reasons for the choice of these particular combinations are discussed below. See Chapter 8.

Given 16 income levels for two definitions and nine income levels for two other definitions, an additional 250 distributions are generated. Thus, a total of 700 distributions are being considered here. In order to draw meaningful conclusions, indeed, to draw any conclusions at all, this mass of data must be approached in an orderly fashion. To this end, five lines of inquiry were formulated:

1. Can an overall "order of equity" be discerned? That is, is one tax horizontally more equitable than all others at most or all levels of income (given definition), another second most equitable, and so on, or does the order of equity change over income levels so that no one tax is significantly more horizontally equitable overall?

2. Is the total tax package overall more horizontally equitable than its components? That is, where does the total tax package fit in the "order of equity" mentioned above? If it appears equitable relative to most, or all, individual taxes, there is evidence that there are cancelling inequities among the individual taxes.

3. Is there a trend in the horizontal equity of the total tax package over income levels, or is the total package about equally dispersed at all income levels?

4. Does the total tax package appear less dispersed under one income definition than another, or does the choice of income definition make little difference to the evaluation of equity of the total tax package?

5. Are the conclusions with regard to the order of equity, the equity of the total tax package, and the trend in equity of the total tax package

across income levels similar under each of the income definitions?

Analysis of these "basic questions" is presented in Chapter 8.

2) Individual Taxes

The above questions are directed largely toward the overall equity of the total tax package. In addition, the individual taxes are examined, both because there are interesting questions with regard to equity involved, and because analysis of the behavior of individual taxes is necessary to the examination of the five questions listed above. Chapters 4 through 7 discuss the individual taxes. For each tax, several sets of information are examined:

1. Certain nondispersion characteristics are tabulated.

a. The distribution of payments under the broad income definition is divided into appropriately sized brackets, by income level, with the percentage falling in each cell presented. Distributions for other income definitions are contained in Appendix N. Certain statistical characteristics of the distributions are also presented. In view of the non-normal character of a number of the distributions, such information is useful to the reader in understanding and evaluating conclusions presented here. Mean tax payment divided by income is calculated, yielding a rough measure for evaluating vertical equity.

b. For each income definition and income level, mean tax payment as a percentage of mean total tax payment is also presented. This

information is useful in analyzing the overall tax package. The larger the proportion of the total package which is represented by one tax, the greater impact the dispersion of that tax has on the dispersion of the overall tax package at any one income level. The relative importance of a tax changes markedly over income levels in some cases.

2. The coefficient of variation for each income definition and level is presented.

a. Comparison is made, given income definition, across income levels. Significant differences between levels are noted and trends toward greater or lesser dispersion across income levels are noted and discussed.

b. Comparison is made, given income levels, between definitions. Differences in the apparent equity of a tax when family size is taken into account are noted and discussed.

c. The standard significance test for the coefficient of variation is used. In addition, a simple sign test is used to test for significant differences between definitions. Using this test, if dispersion under one definition is smaller than dispersion under another definition at most levels of income, it can be concluded that there is a significant difference between the definitions. All significance tests made throughout the study are made at the .05 level.

3. The equity order position at each income level for each definition is presented, enabling the reader to see the relative equity of a tax at any level and/or definition.

3) Benefit Taxation

A theoretical question noted in Chapter 1 is that of the role of the benefit principle, particularly with reference to the road user charges. The issue is discussed in Chapter 7. The author personally leans toward including gasoline and vehicle taxes together with other levies. However, I have made most calculations of the equity of the total tax package both ways: including, and excluding the road user charges. Differences in results between these two concepts of the total tax package are presented in Chapter 8.

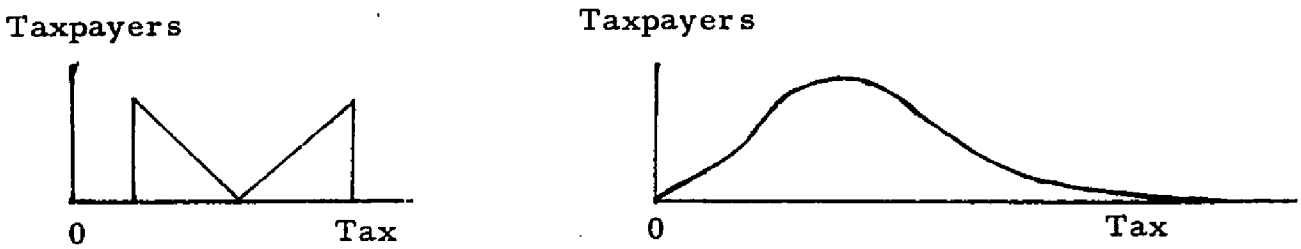
Coefficient of Variation

1) Dispersion

Dispersion may be defined as the extent to which sample values deviate from the arithmetic mean, the median, or any other measure of central tendency. There is, of course, no single correct measure of dispersion. Nor is there any necessity that answers given using different measures be consistent. With distributions approaching normality, and even with single peaked non-normal distributions, the measures do tend to be consistent. However, the more non-normal are the distributions, the less likely is consistency. The tax distributions studied here are mostly right skewed because of the zero minimum. In addition, they often deviate from normality in other ways, with multiple peaks and heavy zero concentrations.

In the face of non-normal distributions, there is no measure that would conform to everyone's intuitive idea of equity. Most would

think of equity in terms of concentration around the mean. This intuitive concept proves troublesome with accepted measures of dispersion applied to extreme non-normal distributions. A hypothetical example:



A distribution such as the one on the left may have a smaller standard deviation than the distribution on the right. It is then, less dispersed, or in the terminology of this study, more equitable. One's intuition may not agree.

Although no measure may conform in every case to one's concept of equity, still a single measure must be chosen for consistency, and conclusions based upon it. The coefficient of variation (standard deviation divided by the mean) is chosen for use here. However, the distributions themselves are also presented to expose any oddities in shape which might make conclusions based on the coefficient of variation questionable.

2) Absolute and Relative Measures

Usually, dispersion is measured in absolute terms. The variance, or its square root, the standard deviation, is the most commonly used statistic. An absolute measure cannot be used here however, because comparisons are made, given income level, among

taxes which have different rates and yields; or given tax, across income levels, where yields again differ, and, in some cases, rates differ as well. For example, the absolute dispersion of the cigarette tax should be much smaller, given income level, than the absolute dispersion of the sales tax, simply because people pay much larger amounts of sales tax. To compare distributions such as these, with significantly different means, a measure of relative, or percentage variation is needed. Any measure of absolute dispersion divided by any measure of central tendency can be used as a measure of relative variation. The most commonly used measure is the coefficient of variation, and that is the measure used here as a standard of equity.

3) Characteristics of the Coefficient of Variation

Several comments should be made concerning the use and limitations of the coefficient of variation. First, the coefficient and other similar relative measures share an important problem--as the mean approaches zero, the measure approaches infinity and any comparison is insignificant. This situation occurs for several distributions here. The second point concerns the standard error. The standard error of the coefficient of variation, which can be used to indicate the probable range in which the population coefficient of variation will fall, can readily be calculated.[2] Using the standard

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[2]See L. T. C. Tippett, The Methods of Statistics (4th ed.; New York: John Wiley and Sons, Inc., 1952), p. 124-126.

error, the significance of the difference between two coefficients of variation can also be readily calculated. However, the standard error calculation is based on the assumption of distributional normality, so that the results of the calculation of significant differences may be inaccurate. The central limit theorem suggests that for most samples of the size used in this study, the distribution of sample coefficients of variation will approach normality, thus making the standard error calculations reasonable.[3] There are, however, 12 (of 50) income classes under various definitions with sample sizes less than 100, and five with samples smaller than 50.[4] Finally, it should be noted that both the standard deviation and the mean are affected by extreme values. Therefore, the coefficient of variation is also affected.

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[3]For a discussion of the central limit theorem, see J. E. Freund, Modern Elementary Statistics (3rd ed.; Englewood Cliffs, N.J.: Prentice-Hall Inc., 1967), p. 210-212. Note also that Murray R. Spiegel, Theory and Problems of Statistics (New York: McGraw-Hill, 1961), p. 144 suggests that the standard error calculation for the coefficient of variation is accurate if the sample is greater than or equal to 100, and the population distribution is near normal. These stringent conditions are not met by all distributions studied here.

[4]For sample sizes, see Table 2 for the broad income definition and Appendix N for other definitions.

CHAPTER 4

PERSONAL AND CORPORATE INCOME TAXES

In Chapter 1, income is defended as the appropriate index of equity. Only a tax on income can, then, be perfectly equitable. An income tax is not inevitably equitable, of course. The extent of inequity depends on the differences between income as defined for tax purposes and the definition of the index; and upon incidence assumptions. In this chapter, the taxes on income considered in this study--the personal income tax (PYT) and the corporation income tax (CYT) are discussed.

Personal Income Tax

The yield of the personal income tax in California in 1961 was $269 million, or 11.5 per cent of total revenues.[1] The tax was assigned to the sample in close conformance with the California tax code. Incidence is assumed to be 100 per cent on the income recipient. Detail concerning procedures used in applying PYT to the sample are contained in Appendix I. Appendix C contains details of the tax code.

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[1] It was thus the fifth most important of the revenue sources considered here. However, collections were nearly as great as those for the third and fourth sources--the corporate income tax and motor vehicle taxes and fees. See Table 1.

TABLE 2

DISTRIBUTION OF PERSONAL INCOME TAX PAYMENTS
BY INCOME LEVEL (BROAD INCOME DEFINITION)

		BRACKETS (% LESS THAN OR EQUAL TO)									
Income Level		0	$10	$20	$30	$40	$50	$60	$70	$80	$90
1.	($2,000)	95.6	4.4								
2.	($3,000)	81.4	11.3	7.3							
3.	($4,000)	78.0	6.4	11.9	3.7						
4.	($5,000)	62.5	22.4	4.7	4.0	6.4					
5.	($6,000)	44.7	32.4	16.6	2.1	2.4		1.8			
6.	($7,000)	28.4	31.5	23.4	12.3	.8	1.0	1.3	.3	1.0	
7.	($8,000)	12.8	22.8	29.6	21.4	8.3	.5	1.1	.3		1.1
8.	($9,000)	7.0	12.0	25.6	28.3	16.9	5.3	1.5	.3	.9	
9.	($10,000)	1.7	18.3	17.4	26.4	22.2	13.9	5.9	1.4	.7	.3
10.	($11,000)	1.6	3.2	11.1	18.3	24.2	16.7	8.3	6.4	5.2	.8
11.	($12,000)	3.4	2.3	4.6	12.0	22.8	14.3	14.8	9.2	5.7	5.1
12.	($13,000)	.7	.7	4.4	8.9	14.1	13.3	11.8	15.6	9.6	5.9
13.	($14,000)			2.5	4.1	10.6	7.4	9.8	13.1	12.3	7.4
14.	($15,000)		1.0		1.0	5.0	8.0	7.0	11.0	12.0	20.0
15.	($16,000)		2.7	1.4	2.7	2.7	4.1	1.4	5.4	10.8	14.9
16.	($17,000)					3.4	3.4	3.4	3.4	5.2	10.4

Notes:

Table shows percentage of the sample falling within each bracket of each level of income.

Rows may not add to 100.0% due to rounding.

TABLE 2--Continued

$100	$110	$120	>$120	Sample Size	Min. $	Max. $	Mean $	Mean Income
				91	0	3	.12	.00006
				151	0	12	1	.00047
				218	0	21	3	.00075
				299	0	37	5	.00098
				380	0	55	6	.00105
				381	0	77	10	.00149
.5	1.6			374	0	105	18	.00220
.6	.3	.3	1.2	343	0	133	24	.00267
.3	.2	.1	1.0	288	0	138	31	.00306
.4	.8	.4	2.8	252	0	199	42	.00382
1.7	1.1	.6	2.3	175	0	249	48	.00401
11.1	1.5	.7	1.5	135	0	232	58	.00446
5.7	9.0	9.0	9.0	122	11.69	199	76	.00545
7.0	4.5	4.5	19.0	100	4.24	259	89	.00596
10.8	9.5	8.1	25.6	74	2.19	196	98	.00612
10.4	13.8	12.1	34.5	58	31.47	194	108	.00634
				Total 3441				

TABLE 3

MEAN PERSONAL INCOME TAX PAYMENT
AS A PERCENTAGE OF MEAN TOTAL
TAX PAYMENT BY INCOME LEVEL

Income Level	Adjusted Broad Income	Broad Income	Narrow Income	Adjusted Narrow Income
1A. $1,000	∞	—	—	∞
1. $2,000	.4%	.2%	.4%	.8%
2. $3,000	4.2	1.5	1.3	6.0
3. $4,000	9.4	2.4	1.9	11.5
4. $5,000	15.5	3.2	4.0	17.1
5. $6,000	20.7	3.5	4.5	21.2
6. $7,000	23.1	5.2	6.9	26.0
7. $8,000	29.4	7.8	9.0	31.8
8. $9,000	30.2	9.6	11.9	37.6
9. $10,000		11.0	12.7	
10. $11,000		14.0	16.3	
11. $12,000		14.8	16.7	
12. $13,000		16.6	20.3	
13. $14,000		20.6	24.8	
14. $15,000		22.3	25.0	
15. $16,000		21.7	24.9	
16. $17,000		22.8	33.1	

1) Nondispersion Characteristics

Table 2 brackets PYT payments at each income level, and contains other statistics, for the broad income definition only.[2] It shows the proportion of the sample falling within each bracket (i. e. paying approximately the same amount of tax) at each income level. Examination of the data shows that zero tax payment is the usual case at low levels of income. At levels above $6000, the distributions cease to have zero modes but continue to be strongly right skewed.

Table 3 shows the relative importance of PYT at each level of income under each definition. Importance rises sharply with income, of course. A relatively larger portion of the taxes of higher income earners are paid in the form of personal income tax. At the $1000 level, for ABI and ANI, all those sampled paid zero tax, accounting for the absence of figures in the table.

2) Coefficients of Variation

Table 4 shows the coefficient of variation at each level of income under each definition. The statistics for the BI and NI definitions suggest that the tax becomes sharply more equitable at successively higher levels of income. There are two reasons for this result. First, at low levels of income there are important sources of nontaxable income, particularly social security. More important, exemptions take on declining importance as income rises.

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[2]See Appendix N for similar statistics for other definitions.

TABLE 4

PERSONAL INCOME TAX
COEFFICIENTS OF VARIATION

Income Level	Adjusted Broad Income	Broad Income	Narrow Income	Adjusted Narrow Income
1A. ($1,000)	0	—	—	0
1. ($2,000)	486.5 *	470.9	290.8	364.3 *
2. ($3,000)	94.9 *	*238.3	263.0	* 80.8 *
3. ($4,000)	59.4	*214.2	240.7	* 63.3
4. ($5,000)	58.2	*197.9	162.7	* 57.1
5. ($6,000)	58.8	*158.6 *	133.4 *	* 52.0
6. ($7,000)	72.8 *	*121.8	107.8 *	* 57.9
7. ($8,000)	49.7	*103.3 *	* 81.3	* 58.4
8. ($9,000)	68.0	82.6 *	73.8 *	70.1
9. ($10,000)		62.8	60.8	
10. ($11,000)		70.3	* 56.0	
11. ($12,000)		60.2	56.9	
12. ($13,000)		52.9	46.4 *	
13. ($14,000)		44.0	* 70.4 *	
14. ($15,000)		50.1	47.7	
15. ($16,000)		42.4	40.1	
16. ($17,000)		32.8	45.1	

Note: * identifies significant differences between coefficients at adjacent levels of income, or adjacent income definitions.

TABLE 4--Continued

SUMMARY

CROSS LEVEL[a]

Adjusted Broad		Broad		Narrow		Adjusted Narrow	
INC	SIGN	INC	SIGN	INC	SIGN	INC	SIGN
4	0	2	0	3	1	4	0
DEC	SIGN	DEC	SIGN	DEC	SIGN	DEC	SIGN
4	3	13	3	12	4	4	2

[a]INC refers to number of income levels at which coefficient of variation is larger than at next lower level of income.

DEC refers to number of income levels at which coefficient of variation is smaller than at next lower level of income.

SIGN refers to number of significant increases or decreases.

CROSS DEFINITION[b]

Adjusted Broad compared to Broad		Broad compared to Narrow		Adjusted Narrow compared to Narrow	
AB<B	SIGN	B<N	SIGN	AN<N	SIGN
7	6	4	1	7	6
AB>B	SIGN	B>N	SIGN	AN>N	SIGN
1	0	12	2	1	0

[b]AB>B refers to the number of levels at which the coefficient of variation for the Adjusted Broad definition was larger than that for the Broad definition. A larger coefficient of variation is associated with more dispersion and less equity.

Under the California system, the exemption for a single individual is $1500, for a two person family, $3000, and there is an additional exemption of $600 for each additional dependent. To take a simple example, let us suppose that the entire population consists equally

of one and two person families, that all income is taxable wages and salaries, that the tax rate is a single percentage, and that exemptions are $1500 and $3000. Then, beginning at the $3000 level of income and going up, absolute dispersion (measured by, say, the standard deviation) will remain constant at successively higher levels of income, but relative dispersion, measured by the coefficient of variation, will decline.[3] Under the adjusted definitions, when family size is accounted for, the increasing equity across levels disappears above the $3000 level (Columns 2 and 5 in Table 4). Exemptions have been accounted for by dividing income by a family adjustment factor. In contrast to the above example, absolute dispersion rises with income level; in turn, relative dispersion does not decline.

3) Cross Definition

Table 4 also allows comparison across definitions. As noted earlier, the inequity of an income tax depends on the differences between the tax law definition of income and the equity index definition. The closer the tax definition to the equity standard, the more equitable the tax will appear. None of the four index definitions used here conforms to the legal definition. One would expect, however, that the money income concept (NI) would conform more closely than the broad concept, and that the adjusted definitions would conform more

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[3]In California, the tax rate rises with income. That change would complicate the example given, but would not negate the principle.

TABLE 5

RELATIVE EQUITY OF THE
PERSONAL INCOME TAX BY INCOME LEVEL
AND INCOME DEFINITION

Income Level	Adjusted Broad Income	Broad Income	Narrow Income	Adjusted Narrow Income
1A. $1,000	1	--	--	1
1. $2,000	9	9	8	9
2. $3,000	7	8	8	7
3. $4,000	3	8	9	5
4. $5,000	3	8	8	2
5. $6,000	4	8	8	3
6. $7,000	5	8	8	3
7. $8,000	2	8	7	4
8. $9,000	5	7	7	4
9. $10,000		5	5	
10. $11,000		7	5	
11. $12,000		5	4	
12. $13,000		5	4	
13. $14,000		3	4	
14. $15,000		3	4	
15. $16,000		3	3	
16. $17,000		2	3	

Note: Table presents the place of the personal income tax in the equity order of the nine taxes considered.

closely than the unadjusted definitions, since the definition of income for tax purposes is a money income concept, adjusted for family size.

As expected, PYT evaluated using BI is more dispersed (less equitable) than it is using the narrow income definition. This is true at 12 of 16 levels of income, sufficient to conclude PYT is significantly more dispersed under BI than under NI.

When the adjustments are made for family size, the results also conform to expectations. PYT evaluated under ABI is more equitable than under BI in seven of eight cases, and the differences are significant in six of these cases. The results for NI and ANI are the same. The eighth case in both sets of definitions is the $2000 level. For that level, mean tax payment is close to zero, and no comparisons among coefficients of variation can be significant.

One would expect that, if PYT under BI appears less equitable than under NI, a similar result would prevail under the adjusted definitions. Here, however, the evidence is insufficient to draw the conclusion.

4) Cross Tax

The decline in dispersion of personal income tax payments is sharp relative to the results for other taxes, as can be seen from Table 5. The position of PYT in the equity order changes from one of the most inequitable at low levels of income to one of the most equitable at relatively high levels of income under both unadjusted definitions. When family size is accounted for, the trend in the

coefficient of variation disappears (Table 4) and the trend in relative equity is in turn less evident.

5) Conclusion

A tax on income is the only tax which can be perfectly equitable. The extent to which it is not reflects differences between the concept of equity under the tax law and that under the income definition here. Apart from the issue of family size, these differences revolve around deductions from taxable income, and more important, around the exclusion from income of various types of accruals.

Some deductions represent attempts to make the law more equitable than it would otherwise be (for example, the medical deduction); others involve violation of our equity standard in pursuit of specific goals (notably, deduction of charitable contributions to stimulate charitable giving.) As noted in Chapter 1, I have ignored the former rather than attempting to decide which deductions, (or which portions of which deductions) are "reasonable" from an equity viewpoint. It is worth noting that for the purpose of evaluating the horizontal equity of the income tax, ignoring deductions in the equity standard is of little importance, even if the deductions are "reasonable" adjustments. At most levels of income which are examined here, the standard deduction washes out the equity effect introduced by the deductions. If man A has unusual expenditures which reduce his taxpaying ability, then in the interests of equity, his tax should be smaller than that of man B, who has no such expenditures. However,

if the expenditures are no more than 10 per cent of A's taxable income (up to $1000), he is no better off than B, who, without the expenditures, gets a standard deduction. In fact, of course, even A may find that he is better off taking the standard, and ignoring his unusual expenditures. As for clearly non-equity refinements in the law, each must be evaluated on its own merits, recognizing that each contributes to inequity, though it may accomplish other goals.

The problem of exclusions is the problem of the definition of income, discussed in Chapter 1. I suggested there that there are some elements of "income" which are irrelevant for tax purposes (for example, housewives services) and ought not to be included in an equity standard. Regardless of their relevance, these, and certain other items, may be said to be excluded from income as defined in the tax law for practical reasons--the administrative difficulty in assessing them outweighs any improvement in equity that might accrue because of inclusion. However, a number of exclusions exist for other than administrative expediency. That is, income from certain sources could be included without administrative difficulty, but is not. The justifications for these exclusions are various. Like deductions, some exclusions exist in the interest of pursuing other goals. For example, excluding scholarship income is a subsidy to education. Others may be justified in terms of equity--for example, the exclusion of workman's compensation. However, in my judgment, such an exclusion cannot improve horizontal equity. In the case of workman's compensation, first

there is the problem of two individuals with the same income, both of whom are disabled, one of whom is receiving excluded compensation (and thus paying smaller tax), while the other (who may be, for example, self-employed) is not. Second and more basically, an exclusion, unlike a deduction, takes no account of the extent to which taxpaying ability is actually reduced due to the unusual circumstance--in this case, illness or disability. I would contend that a reasonable horizontal equity standard might be: equal income, unless one taxpayer is disabled, in which case his tax payment should be smaller because he must make involuntary and unusually large medical payments. A far less reasonable standard is: equal income unless one taxpayer is disabled, in which case tax payment should be smaller because he is more deserving. Excluding workman's compensation conforms more to the latter than to the former.

In sum, many exclusions and deductions exist for reasons other than attempts to improve equity. Each of these must be evaluated on its own terms, balancing its merits against the inequities it causes. Some deductions are defensible in equity terms. As far as the equity of the income tax is concerned, however, the standard deduction largely destroys the effectiveness of these refinements. No exclusion is, in my opinion, defensible in equity terms. PYT is not revealed particularly equitable by the standard developed here--partly because many considerations besides equity are involved in designing the tax;

partly because attempts to build equity into the tax are, in my view, misguided.[4]

6) Summary

The following observations summarize the most significant results of the above discussion.

1. PYT appears more equitable when evaluated by the NI index than by the BI, and more equitable when family size is accounted for than when it is not.

2. There is a trend toward greater equity in PYT as income rises (BI and NI definitions).

3. PYT is one of the most inequitable taxes at low levels of income but among the more equitable at high levels (BI and NI).

4. The combination of increasing equity and increasing importance (Table 2 and Table 3) with rising income make PYT an important factor in the increasing equity of the total tax package with increasing income. (See Chapter 8.)

Corporation Income Tax

The yield of the corporate income tax in California in 1961 was $273 million, or 11.7 per cent of total revenue. The tax was assigned to individuals in their capacities as consumers and as

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[4]For an extensive discussion of exclusion and deductions under the Federal income tax, see: Richard Goode, The Individual Income Tax (Washington, D.C.: The Brookings Institution, 1964), Chapters VI and VII. The California tax in most respects is similar to the Federal tax.

TABLE 6

DISTRIBUTION OF CORPORATION INCOME TAX PAYMENTS BY INCOME LEVEL (BROAD INCOME DEFINITION)

Income Level		BRACKETS (% LESS THAN OR EQUAL TO)						
		$5	$10	$15	$20	$25	$30	$35
1.	($2,000)	47.2	46.2	6.6				
2.	($3,000)	11.9	66.2	15.2	5.3	.7	.7	
3.	($4,000)	3.2	55.0	33.5	6.9	.9		.5
4.	($5,000)	1.3	36.1	48.5	11.4	2.3		
5.	($6,000)	.3	15.0	49.5	25.4	7.4	1.1	.3
6.	($7,000)	.8	8.1	43.8	34.9	8.4	2.1	
7.	($8,000)		3.5	32.4	40.9	16.6	4.5	.5
8.	($9,000)	.3	1.2	19.2	44.6	25.0	5.8	1.2
9.	($10,000)		3.1	10.8	34.4	30.2	9.7	5.9
10.	($11,000)		1.6	7.1	28.2	35.8	16.3	5.6
11.	($12,000)	.6	2.3	5.1	19.4	30.8	23.4	8.0
12.	($13,000)			5.9	17.0	26.6	23.0	15.6
13.	($14,000)		2.5	4.1	9.1	27.9	24.6	16.4
14.	($15,000)				8.0	15.0	34.0	14.0
15.	($16,000)				4.1	12.2	13.5	24.3
16.	($17,000)				3.5	6.9	19.0	25.9

Notes:

Table shows percentage of sample falling within each bracket at each level of income.

Rows may not add to 100% due to rounding.

TABLE 6--Continued

$40	$45	$50	>$50	Sample Size	Min. $	Max. $	Mean$	Mean Income
				91	2	13	6	.00280
				151	2	29	8	.00277
				218	3	33	10	.00252
.3				299	3	36	12	.00230
	.3	.3	.3	380	4	52	14	.00235
.8	.3		.8	381	4	61	16	.00223
.3	.3	.3	.9	374	5	76	17	.00219
.6	.6	.3	1.2	343	5	90	19	.00214
1.4	1.1	1.0	2.4	288	6	97	22	.00223
2.0	.8	.8	2.0	252	7	104	23	.00211
2.3	1.7	1.7	4.6	175	5	104	26	.00215
5.2	1.5	1.5	3.7	135	11	127	27	.00211
4.1	4.1	3.3	4.1	122	7	62	28	.00198
13.0	2.0	2.0	12.0	100	16	89	34	.00224
18.9	6.8	5.4	14.9	74	17	158	40	.00252
17.2	8.6	6.9	12.1	58	15	109	38	.00224
				Total 3441				

TABLE 7

MEAN CORPORATE INCOME TAX PAYMENT
AS A PERCENTAGE OF MEAN TOTAL
TAX PAYMENT BY INCOME LEVEL

Income Level	Adjusted Broad Income	Broad Income	Narrow Income	Adjusted Narrow Income
1A. $1,000	8.6%	--	--	8.5%
1. $2,000	8.0	9.3%	9.3%	8.6
2. $3,000	7.9	8.7	8.6	8.1
3. $4,000	7.7	8.3	9.0	7.8
4. $5,000	7.6	7.6	8.2	8.1
5. $6,000	7.9	7.8	7.9	8.7
6. $7,000	8.5	7.9	8.1	9.9
7. $8,000	8.0	7.7	8.1	10.0
8. $9,000	9.5	7.7	7.8	11.4
9. $10,000		8.0	7.7	
10. $11,000		7.8	7.4	
11. $12,000		7.9	7.9	
12. $13,000		7.8	8.5	
13. $14,000		7.5	10.2	
14. $15,000		8.4	8.6	
15. $16,000		9.0	9.2	
16. $17,000		8.0	9.5	

stockholders. In both cases, crude imputations had to be made due to the nature of the data and to the complexity of the problems themselves. Four steps were followed: the tax collections were allocated to industry division, then (in many cases) to two digit industry; incidence assumptions were made for each industry; exporting assumptions were made for each industry, for both the portion of tax falling on consumers and that portion falling on stockholders; and finally, the tax was assigned to individual consuming units in the sample according to total consumption, and to individual stockholders according to dividends received. Details of these procedures are contained in Appendix L. The outcome of the calculations was that the tax is assumed to be 45 per cent exported ($123 million exported). Of the tax borne by Californians, 70 per cent ($101 million) is allocated to consumers and 30 per cent to stockholders.

1) Nondispersion Characteristics

Table 6 brackets corporate income tax payments in five dollar increments at each income level, and contains other statistics, for the broad income definition only.[5] Since the tax is assigned in part to total consumption, there are no zero taxpayers.

Table 7 shows the relative importance of CYT in total tax payments at each level of income under each definition. The mean tax payment appears to be about the same percentage of mean total tax payments at all levels, regardless of definition. A tax on general

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[5]See Appendix N for similar statistics for other definitions.

consumption alone declines in importance with increasing income (Table 11). The CYT, allocated to both consumption and shareholding, maintains its place, then, because of the increased importance of shareholding at higher income levels.

2) Coefficients of Variation

Table 8 shows the coefficients of variation at each income level under each definition. At low levels of income, dividends are an unimportant source of income. That portion of the tax assigned to consumption is, then, the key to horizontal equity at these levels; few people have dividends and thus pay the unshifted portion of the tax. Since a tax on total consumption is relatively equitable (see Chapter 5 and Table 17), CYT should appear relatively equitable at low levels, which it does. At higher levels, the portion of the tax assigned to income takes on increasing importance. Since the tax falls on a single source of income to the exclusion of all others, it should, at least when viewed in isolation, appear inequitable.[6] Some evidence of increasing inequity exists, although there is no regular trend toward greater dispersion at higher levels of income. The coefficients for the eight higher levels of income are observably larger than those for the eight lower levels (BI and NI). The lack of a clear result here is

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[6]Of course, the inequity of the tax on this single source of income may be offset in part by the fact that the personal income tax does not apply to capital gains to the same extent that it applies to income from other sources, assuming those who bear the corporate income tax are the same as those who receive capital gains.

TABLE 8

CORPORATION INCOME TAX
COEFFICIENTS OF VARIATION

Income Level	Adjusted Broad Income	Broad Income	Narrow Income	Adjusted Narrow Income
1A. ($1,000)	58.8 *	--	--	61.2 *
1. ($2,000)	40.3	38.4	48.4	* 75.6 *
2. ($3,000)	35.8 *	*44.6 *	43.5	45.2
3. ($4,000)	48.1	*37.0	* 91.9 *	* 47.5 *
4. ($5,000)	47.4	*33.1	* 70.6 *	73.9 *
5. ($6,000)	52.7	*35.2 *	* 54.2	* 98.4
6. ($7,000)	60.0	*40.0	* 52.5 *	* 94.2
7. ($8,000)	84.3	*38.1	* 66.2 *	*155.1
8. ($9,000)	64.6	*41.7 *	41.4 *	*119.3
9. ($10,000)		48.7	49.6	
10. ($11,000)		41.2	42.8 *	
11. ($12,000)		46.5	* 68.1 *	
12. ($13,000)		51.3 *	* 93.4	
13. ($14,000)		35.4 *	*100.9	
14. ($15,000)		44.7	* 82.8	
15. ($16,000)		59.3	69.0	
16. ($17,000)		45.1	*119.5	

Note: * identifies significant differences between coefficients at adjacent levels of income, or adjacent income definitions.

TABLE 8--Continued

SUMMARY

CROSS LEVEL[a]

Adjusted Broad		Broad		Narrow		Adjusted Narrow	
INC	SIGN	INC	SIGN	INC	SIGN	INC	SIGN
4	1	9	3	7	4	5	3
DEC	SIGN	DEC	SIGN	DEC	SIGN	DEC	SIGN
4	1	6	2	8	3	3	1

[a]INC refers to number of income levels at which coefficient of variation is larger than at next lower level of income.

DEC refers to number of income levels at which coefficient of variation is smaller than at next lower level of income.

SIGN refers to number of significant increases or decreases.

CROSS DEFINITION[b]

Adjusted Broad compared to Broad		Broad compared to Narrow		Adjusted Narrow compared to Narrow	
AB<B	SIGN	B<N	SIGN	AN<N	SIGN
1	1	14	10	1	1
AB>B	SIGN	B>N	SIGN	AN>N	SIGN
7	6	2	0	7	5

[b]AB<B refers to the number of levels at which the coefficient for the Adjusted Broad definition was smaller than that for the Broad definition. A smaller coefficient is associated with less dispersion, or greater equity.

explained in part by a slight trend toward equity, as income increases, in the portion of the tax assigned to consumption (see Table 17).

3) Cross Definition

CYT is significantly more equitable using the unadjusted definitions rather than the definitions adjusted for family size. (Table 8) Adjusting for family size involves dividing total income for each family by an adjustment factor. The larger the family--the higher the factor. (See Appendix A, Part III.) Thus, ABI and ANI involve comparison of high income, large families (high income divided by a large factor) with low income small families (low income divided by a small factor). Total consumption of high income units is, of course, larger than that of low income units, and larger still in this comparison because the high income units also have more members. The distribution of the consumption-borne portion of the CYT should thus be more inequitable under ABI and ANI than under BI and NI. (See Table 17.) To the extent that shareholding is related to total income, the effect of the unshifted portion of the tax will be to augment the inequity of the portion borne by consumption for ABI and ANI. To the extent that shareholding is negatively related to family size, it will tend to offset the inequity. The latter effect is not sufficient to overcome the tendencies in the opposite direction.

CYT is more equitable using BI rather than NI. Dispersion is smaller for the broad definition in 14 of 16 cases--significantly so in ten cases (Table 8). For an interpretation of this result, see 4) below.

TABLE 9

RELATIVE EQUITY OF THE
CORPORATE INCOME TAX BY INCOME LEVEL
AND INCOME DEFINITION

Income Level	Adjusted Broad Income	Broad Income	Narrow Income	Adjusted Narrow Income
1A. $1,000	3	--	--	3
1. $2,000	1	1	2	3
2. $3,000	1	2	2	2
3. $4,000	2	2	5	2
4. $5,000	2	2	3	5
5. $6,000	2	2	2	7
6. $7,000	2	2	3	7
7. $8,000	7	2	5	9
8. $9,000	4	2	2	7
9. $10,000		2	2	
10. $11,000		2	2	
11. $12,000		2	6	
12. $13,000		3	7	
13. $14,000		2	8	
14. $15,000		2	7	
15. $16,000		5	5	
16. $17,000		5	9	

Note: Table presents the place of the corporate income tax in the equity order of the nine taxes considered.

4) Cross Tax

The relative position of the corporate income tax in the equity order at each income level for each definition is shown in Table 9. At low levels of income the dispersion of corporate tax payments is usually second only to the dispersion of payments of taxes assigned only to total consumption. At higher levels of income, the tax becomes relatively less equitable. The decline in relative equity is much more observable for the narrow and narrow adjusted definitions than for the broad ones.

The greater inequity of CYT under NI as compared with BI, reported above, along with the observable decline over income levels for NI and ANI, mentioned here, are both results stemming basically from methodology. First, as already noted, at low levels of income (under all definitions) most in the sample do not have income from capital gain and dividend sources. Thus, the tax is based mainly on total consumption at those levels, and is found to be quite equitable. At higher levels, the income portion of CYT payment becomes relatively more important. Yet under the broad definitions, CYT remains relatively equitable, while under the narrow definitions, it does not. Capital gains and retained earnings are included in income under the broad definitions, but not under the narrow ones. Calculation of CYT payment is not affected by this difference. Under the narrow definitions, a man who has heavy capital gains and retained earnings (which are "not income" for the purposes of the income definition) is assigned

heavy tax payment. He is compared with those having similar income from other sources (and no CYT payment). Under the broad definitions, he is compared with those having larger incomes from other sources. Thus, there appears greater inequity under the narrow definitions. The treatment of CYT under the narrow definitions is on shaky theoretical ground. As is noted in Chapter 2, it is wrong to credit a taxpayer with the tax payments and not with the income on which the taxes were paid, unless the taxes are assumed to be reflected entirely in reduced dividends. The alternative to the treatment used here however, is to eliminate the income side from consideration altogether. This treatment results in viewing the CYT as equivalent to OBT (see Chapter 5). Dispersion is exactly the same since both are based on total consumption.

5) Conclusion

The corporate income tax is not, strictly speaking, justifiable on equity grounds. Under an assumption of no shifting, it is inevitably inequitable since it falls on one source of income to the exclusion of others. To the extent that it reaches income only lightly touched by the personal income tax, its inequity is somewhat offset, but it still exists. Shareholders at low income levels are paying a high rate of tax on income from one source; others at the same income level with no income from that source pay lower rates. The ideal tax on incomes involves integration of the CYT and PYT, preferably by a partnership

method in which corporate earnings, distributed or not, are taxed to shareholders.[7]

To the extent that the tax is shifted to consumers, the equity issue is a different one. If the tax is truly a tax on total consumption, as is assumed here, it is quite equitable. If, on the other hand, it is a selective excise, as is undoubtedly the case, although I have not been able to get at the selectivity here, this equity is lessened. Since profitable corporations produce many products, however, I would expect the CYT, even as a selective consumption tax, to be considerably more equitable than such single item taxes as, for example, the cigarette or alcoholic beverages tax.

In short, under the assumptions here, the CYT is relatively equitable at many levels of income. However, equally good alternative assumptions on incidence would materially alter the result. Judgment on horizontal equity must be reserved. As has been noted many times, no one really knows who pays the corporate income tax--which is a major reason why the tax is a popular one.

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[7]There is much literature on integration of the two taxes. See J. A. Pechman, Federal Tax Policy (Washington, D. C.: The Brookings Institution, 1966), p. 132-139 for a summary of the issues and proposals for integration. R. A. Musgrave, Public Finance, p. 173-175 contains a clear discussion of the horizontal equity issue involved. See also, Carl S. Shoup, Public Finance, (Chicago, Ill.: Aldine Publishing Co., 1969), p. 315-321.

CHAPTER 5

SALES TAX AND OTHER BUSINESS TAXES

This chapter includes discussion of the sales tax (SLT) on consumer goods, and of certain taxes on business (called here for convenience, other business taxes (OBT)), including sales tax on items purchased by business, and gasoline and motor vehicle levies on commercial vehicles. These taxes are grouped together in one chapter because the business taxes, like the sales tax on consumer goods, are viewed here as broad based consumption taxes.

As was mentioned in Chapter 1, if income is the appropriate index of equity, a tax on consumption is inevitably somewhat horizontally inequitable. However, a consumption tax with a sufficiently broad base is not likely to be very inequitable since most income is spent on consumption. In fact, broad based consumption taxes, as these are assumed to be, show up more equitable under an income standard than the income tax tested here, since the latter excludes many sources of income.

Sales Tax

The yield of the sales tax in California in 1961 was $712 million or 30.4 per cent of total revenues, making the tax by far

TABLE 10

DISTRIBUTION OF SALES TAX PAYMENTS
BY INCOME LEVEL (BROAD INCOME DEFINITION)

		BRACKETS (% LESS THAN OR EQUAL TO)						
Income Level		$20	$40	$60	$80	$100	$120	$140
1.	($2,000)	70.4	23.1	5.5	--	--	1.1	
2.	($3,000)	45.0	39.1	7.9	3.3	2.6	2.0	
3.	($4,000)	23.8	46.4	18.4	6.4	1.8	1.8	.9
4.	($5,000)	20.4	39.8	21.8	10.0	3.0	3.3	1.0
5.	($6,000)	6.6	38.4	25.0	16.3	7.6	2.9	2.4
6.	($7,000)	5.5	36.8	28.6	15.5	7.4	4.2	1.1
7.	($8,000)	3.5	25.7	34.0	18.5	8.0	5.1	2.9
8.	($9,000)	2.6	20.7	31.8	19.6	9.9	6.7	6.1
9.	($10,000)	2.8	16.3	27.4	19.5	12.2	8.0	8.3
10.	($11,000)	2.4	11.9	25.0	25.4	15.1	8.3	8.7
11.	($12,000)	5.1	9.1	25.2	20.6	16.6	6.3	5.7
12.	($13,000)	1.4	10.4	22.2	15.6	18.5	12.6	8.9
13.	($14,000)	--	12.3	23.0	20.5	17.2	9.1	5.7
14.	($15,000)	2.0	5.0	16.0	22.0	22.0	15.0	5.0
15.	($16,000)	2.7	5.4	13.5	18.9	20.3	13.5	4.1
16.	($17,000)	--	5.2	10.3	17.2	12.1	25.8	12.1

Notes:

Table shows percentage of sample falling within each bracket at each level of income.

Rows may not add to 100.0% due to rounding.

TABLE 10--Continued

$160	$180	$200	>$200	Sample Size	Min. $	Max. $	Mean $	Mean Income
				91	.49	105	17	.00870
				151	4	119	28	.00927
.5				218	5	153	35	.00885
--	.3	.3		299	4	183	41	.00820
.8				380	8	148	50	.00836
.8	.3			381	6	168	51	.00732
1.9	.3	.3		374	8	187	58	.00728
2.0	.6			343	9	178	64	.00714
2.8	1.4	.3	1.0	288	5	258	72	.00724
.8	1.2	--	1.2	252	7	263	74	.00677
6.3	3.4	.6	1.1	175	4	239	79	.00656
3.7	3.0	1.5	2.2	135	18	280	86	.00660
5.7	3.3	.8	2.5	122	23	267	84	.00599
3.0	3.0	3.0	4.0	100	14	241	92	.00610
9.5	4.1	5.4	2.7	74	12	209	98	.00611
5.2	5.2	3.4	3.4	58	24	259	106	.00621
				Total 3441				

TABLE 11

MEAN SALES TAX PAYMENT AS A PERCENTAGE OF MEAN TOTAL TAX PAYMENT BY INCOME LEVEL

Income Level	Adjusted Broad Income	Broad Income	Narrow Income	Adjusted Narrow Income
1A. $1,000	30.0%	--	--	29.5%
1. $2,000	29.0	29.1%	25.8%	28.8
2. $3,000	26.9	30.1	28.5	26.7
3. $4,000	25.2	28.4	25.7	25.4
4. $5,000	24.0	27.2	26.9	24.1
5. $6,000	22.2	27.8	27.0	23.1
6. $7,000	22.2	26.0	25.8	21.4
7. $8,000	19.3	25.7	25.8	18.3
8. $9,000	18.6	25.7	25.8	15.3
9. $10,000		25.9	24.9	
10. $11,000		24.8	24.1	
11. $12,000		24.2	24.6	
12. $13,000		24.6	21.3	
13. $14,000		22.7	22.6	
14. $15,000		22.9	22.6	
15. $16,000		21.7	21.7	
16. $17,000		22.4	18.4	

the most important source of revenue. $471 million or 20.2 per cent of total revenues was estimated by the Report to be the extent of the direct burden on consumers.[1] The three per cent tax was assigned to the sample according to 23 expenditure categories. Of the items commonly subject to sales tax[2], the most important exemption is food other than that consumed in restaurants. Incidence of the tax is assumed to be 100 per cent on the consumer. Details of the procedures used in arriving at sales tax payments are contained in Appendix F.

1) Nondispersion Characteristics

The sample at each income level for the broad income definition is bracketed at $20 intervals according to SLT payments (Table 10). Statistics for other definitions are included in Appendix N. There are no zero taxpayers at any level for the SLT.

Table 11 shows mean SLT payments as a percentage of mean total tax payments. The table suggests that SLT payments decline in relative importance with increases in income, particularly under the income definitions adjusted for family size.

2) Coefficients of Variation

Table 12 shows the coefficients of variation for each income level and definition. There is some suggestion that the SLT is more

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[1] Report, Appendix 3, p. 78.

[2] The sales tax in most states is imposed on sales of tangible personal property at retail or for consumption. In addition most states tax certain selected services. California exempts services, including those commonly taxed elsewhere. (See Appendix C.)

TABLE 12

SALES TAX
COEFFICIENTS OF VARIATION

Income Level	Adjusted Broad Income	Broad Income	Narrow Income	Adjusted Narrow Income
1A. ($1,000)	102.1 *	--	--	99.1 *
1. ($2,000)	68.0 *	83.9	76.9	65.2
2. ($3,000)	57.8	*79.1	66.5	61.3
3. ($4,000)	63.5	64.7	64.9	60.5
4. ($5,000)	63.9	65.8 *	63.8 *	63.5
5. ($6,000)	58.9	54.5	55.3	56.2
6. ($7,000)	63.3	52.5	51.9	60.3
7. ($8,000)	57.5	52.0	56.3	56.2
8. ($9,000)	56.3	51.2	51.8	68.5
9. ($10,000)		54.5	51.2	
10. ($11,000)		49.1	49.3	
11. ($12,000)		54.4	47.7	
12. ($13,000)		52.4	*41.5	
13. ($14,000)		52.8	48.5	
14. ($15,000)		50.3	46.1	
15. ($16,000)		47.4	46.7	
16. ($17,000)		44.5	39.6	

Note: *identifies significant differences between coefficients at adjacent levels of income, or at adjacent income definitions.

TABLE 12--Continued

SUMMARY

CROSS LEVEL[a]

Adjusted Broad		Broad		Narrow		Adjusted Narrow	
INC	SIGN	INC	SIGN	INC	SIGN	INC	SIGN
3	0	4	0	3	0	3	0
DEC	SIGN	DEC	SIGN	DEC	SIGN	DEC	SIGN
5	2	11	1	12	1	5	1

[a]INC refers to number of income levels at which the coefficient of variation is larger than at the next lower level of income.

DEC refers to number of income levels at which the coefficient of variation is smaller than at the next lower level of income.

SIGN refers to number of significant increases or decreases.

CROSS DEFINITION[b]

Adjusted Broad compared to Broad		Broad compared to Narrow		Adjusted Narrow compared to Narrow	
AB<B	SIGN	B<N	SIGN	AN<N	SIGN
4	1	5	0	5	0
AB>B	SIGN	B>N	SIGN	AN>N	SIGN
4	0	11	1	3	0

[b]AB<B refers to number of levels at which the coefficient for the Adjusted Broad definition is smaller than that for the Broad definition. A smaller coefficient is associated with less dispersion, or greater equity.

equitable at higher levels than at lower levels, but the evidence is slight. It might be explained by the fact that a few individuals at low income levels purchased large taxable items in the survey year,

TABLE 13

RELATIVE EQUITY OF THE SALES TAX BY INCOME LEVEL AND INCOME DEFINITION

Income Level	Adjusted Broad Income	Broad Income	Narrow Income	Adjusted Narrow Income
1A. $1,000	4	--	--	4
1. $2,000	3	3	3	2
2. $3,000	3	3	3	3
3. $4,000	4	3	2	3
4. $5,000	5	3	2	3
5. $6,000	5	3	3	4
6. $7,000	4	3	2	4
7. $8,000	4	3	2	3
8. $9,000	3	3	3	3
9. $10,000		3	3	
10. $11,000		3	3	
11. $12,000		4	3	
12. $13,000		4	2	
13. $14,000		6	3	
14. $15,000		5	2	
15. $16,000		4	4	
16. $17,000		4	2	

Note: Table presents the place of the sales tax in the equity order of the nine taxes considered.

making their tax payments several times those of others in the income class.[3]

3) Cross Definition

Table 12 shows that no apparent differences exist between dispersions of SLT payments, given income level, under various definitions. Family size adjustment makes little difference in evaluating the equity of the sales tax. One might expect the tax to appear more equitable under the unadjusted definitions. The adjusted definitions involve comparison of larger, higher income (and thus heavier spending) families with small, low income families. Since consumption spending takes most of income, no matter what the family size, the tax should appear more equitable under the unadjusted definitions. This result in fact occurs with taxes on total consumption.[4] SLT in California exempts food, however, reducing the tax payments of larger families, offsetting the higher-income-higher-consumption effect, and making the tax appear equally equitable under all definitions.

4) Cross Tax

Table 13 shows the relative position of SLT in the overall equity order at each level of income, for each definition. The tax appears relatively less equitable at higher levels of income under the broad definition, due to the decreasing dispersion of other taxes,

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[3]All purchases made in the survey year are included entirely, even though financing extends beyond the survey year.

[4]See Other Business Taxes, 3) Cross Definition, below.

notably the personal income tax and motor vehicle taxes and fees, (see Tables 4 and 37) and not due to changes in the dispersion of SLT (see Table 12).

5) Summary Comments

1. The sales tax appears relatively equitable under the equity standard used here. The broadness of the tax base mitigates the inequity of using consumption rather than income as the base on which the tax is calculated. Particularly, it is significant that SLT appears at most levels less dispersed than the personal income tax under BI and NI; and even when correction is made for family size, SLT and PYT are equally equitable. The sales tax is not as capricious horizontally as is often supposed.[5]

2. The exemption of food makes the sales tax appear no more equitable when family size is not taken into account than when it is.

3. There is little change in the relative dispersion of the sales tax across income levels under any definition.

Other Business Taxes

The taxes included in this group are the sales tax paid by business, motor vehicle taxes and fees on commercial vehicles, and gasoline taxes paid by users of business vehicles. Vehicle and gasoline taxes are obviously of somewhat different nature than the sales tax and

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[5]See Hansen, "An Empirical Analysis." He sets up a hypothetical example to show the extent of possible horizontal inequity under the sales tax and draws implications from the example.

It is worth noting here that vertical equity, may, of course, be far better served by the personal income tax.

might appropriately be discussed in Chapter 7 on road user charges. They are included here, however, because like the SLT, they are assigned to total consumption in this study. The distribution of tax payments for both the sales tax on business and the vehicle and gasoline taxes is thus exactly the same.

Somewhat different procedures were used in calculation of the burden on consumers for each of these three categories. For the sales tax, four steps were involved: first, the dollar revenue collected from business was estimated; second, the tax collections were allocated by industry division; third, exporting assumptions were made; and finally the tax was allocated to consumers according to total consumption. Incidence of the unexported portion of the tax was assumed to be 100 per cent on consumers. Details of procedures related to the sales tax on business purchases are contained in Appendix K.

Four steps were also involved for the motor vehicle taxes and fees, which include a registration fee, a license fee, and a gross receipts tax on long distance carriers: first, the proportion of motor vehicle revenue collections from commercial vehicles was estimated; second, the taxes were allocated by type of vehicle; third, exporting assumptions were made; and fourth, the tax was allocated to total consumption. Incidence of that portion of the tax not exported was assumed 100 per cent on the consumer. A similar procedure was followed for the gasoline tax. The same incidence and exporting

TABLE 14

DISTRIBUTION OF MOTOR VEHICLE AND GASOLINE TAXES PAID BY BUSINESS BY INCOME LEVEL (BROAD INCOME DEFINITION)

	BRACKETS (% LESS THAN OR EQUAL TO)						
Income Level	$5	$10	$15	$20	$25	$30	$35
1. ($2,000)	30.8	57.1	11.0	1.1			
2. ($3,000)	6.6	58.9	29.1	3.3	.7	.7	.7
3. ($4,000)	1.8	38.5	45.4	11.0	2.3	.9	
4. ($5,000)	1.3	19.7	49.9	22.8	5.7	.7	
5. ($6,000)	.5	6.8	40.5	39.5	14.7	2.6	.3
6. ($7,000)	.3	4.2	29.4	41.2	18.1	5.3	1.6
7. ($8,000)	--	2.1	14.4	41.7	28.1	9.9	2.7
8. ($9,000)	--	1.5	10.5	30.4	35.9	17.8	2.9
9. ($10,000)	.3	2.1	7.3	19.4	34.8	24.3	6.6
10. ($11,000)	--	2.8	3.6	14.3	34.9	27.0	11.9
11. ($12,000)	--	1.7	8.0	14.3	22.9	24.0	20.0
12. ($13,000)	--	--	3.7	12.6	25.2	22.2	15.6
13. ($14,000)	--	.8	3.3	13.1	17.2	20.5	19.7
14. ($15,000)	--	1.0	2.0	8.0	11.0	22.0	28.0
15. ($16,000)	--	--	1.4	6.8	13.5	18.9	14.9
16. ($17,000)	--	--	--	3.4	10.3	19.0	22.4

Notes:

Table shows percentage of sample falling within each bracket at each level of income.

Rows may not add to 100.0% due to rounding.

TABLE 14--Continued

$40	$45	$50	>$50	Sample Size	Min. $	Max. $	Mean$	Mean Income
				91	3	16	7	.00325
				151	2	30	9	.00310
				218	3	26	11	.00282
				299	3	28	13	.00264
				380	4	33	16	.00264
				381	4	34	17	.00247
.3	.5	--	.3	374	7	54	20	.00246
.9	.3			343	6	41	21	.00233
4.2	.9			288	4	41	23	.00230
4.8	.4	.4		252	5	46	24	.00222
5.7	1.1	1.1	1.1	175	5	54	26	.00213
15.6	2.2	1.5	1.5	135	12	63	28	.00213
17.2	3.3	3.3	1.7	122	7	68	29	.00208
14.0	9.0	4.0	1.0	100	8	54	31	.00207
17.6	16.2	6.8	4.1	74	11	61	33	.00208
19.0	12.1	6.9	6.9	58	16	58	35	.00203
				Total 3441				

TABLE 15

SALES TAX ON BUSINESS

Income Level	Mean $	Mean/Income
1. $2,000	8	.00415
2. $3,000	12	.00397
3. $4,000	14	.00360
4. $5,000	17	.00336
5. $6,000	20	.00335
6. $7,000	22	.00316
7. $8,000	25	.00314
8. $9,000	27	.00297
9. $10,000	29	.00293
10. $11,000	31	.00283
11. $12,000	33	.00271
12. $13,000	35	.00271
13. $14,000	37	.00266
14. $15,000	39	.00263
15. $16,000	42	.00265
16. $17,000	44	.00250

TABLE 16

MEAN OTHER BUSINESS TAXES PAYMENT
AS A PERCENTAGE OF MEAN TOTAL TAX PAYMENT
BY INCOME LEVEL

Income Level	Adjusted Broad Income	Broad Income	Narrow Income	Adjusted Narrow Income
1A. $1,000	23.0%	--	--	22.2%
1. $2,000	21.4	24.8%	22.3%	21.2
2. $3,000	20.6	22.0	21.5	20.2
3. $4,000	19.5	20.6	20.0	19.2
4. $5,000	18.3	19.9	19.4	17.8
5. $6,000	17.4	19.9	20.0	17.2
6. $7,000	17.2	19.9	19.9	16.0
7. $8,000	15.4	19.6	19.3	14.7
8. $9,000	15.3	18.7	19.0	12.5
9. $10,000		18.7	18.2	
10. $11,000		18.5	17.7	
11. $12,000		17.9	17.7	
12. $13,000		18.0	17.6	
13. $14,000		18.0	16.4	
14. $15,000		17.5	16.4	
15. $16,000		16.8	16.2	
16. $17,000		16.6	15.6	

assumptions were used, and the tax was assigned to the sample according to total consumption.

1) Nondispersion Characteristics

Table 14 shows the motor vehicle and gasoline taxes and fees paid by the sample, bracketed at five dollar intervals at each income level for the broad income definition. The distributions for other income definitions are included in Appendix N. Table 15 contains statistics pertaining to the sales tax on business purchases. The distributions are exactly similar to those in 14, multiplied by a factor of 1.27. (See Appendices J, K, and L.)

Table 16 contains mean combined tax payments as a percentage of mean total tax payments. The tax payments decline in relative importance as income rises.

2) Coefficients of Variation

Table 17 contains the coefficients of variation for each income level and definition. There is no significant difference between dispersion at higher levels and that at lower levels for any definitions, although there is slight suggestion of a trend toward increasing equity with increasing income for the unadjusted definitions.

3) Cross Definition

Table 17 reveals significant differences between the unadjusted definitions and their respective adjusted definitions. Dispersion of tax payments under BI is smaller than under ABI in seven of eight cases (six significant) and smaller under NI than under ANI at all eight levels

TABLE 17

CONSUMPTION BASED BUSINESS TAXES
COEFFICIENTS OF VARIATION

Income Level	Adjusted Broad Income	Broad Income	Narrow Income	Adjusted Narrow Income
1A. ($1,000)	58.4 *	--	--	55.1 *
1. ($2,000)	42.2 *	40.6	39.3	43.7 *
2. ($3,000)	36.1 *	*42.5 *	*35.1	37.6
3. ($4,000)	43.1	*34.0	35.2	37.4 *
4. ($5,000)	44.6	*30.7	31.8	*48.2
5. ($6,000)	43.6	*29.1	29.7	*42.8
6. ($7,000)	43.7	*28.3	29.2	*45.9
7. ($8,000)	44.4	*28.0 *	28.0	*48.6
8. ($9,000)	48.6	*25.0	25.7	*59.0
9. ($10,000)		28.2	26.9	
10. ($11,000)		26.9 *	29.7	
11. ($12,000)		31.7	*25.4	
12. ($13,000)		30.4	26.6	
13. ($14,000)		32.7	29.1	
14. ($15,000)		27.5	25.1	
15. ($16,000)		29.4	30.4	
16. ($17,000)		26.9	29.1	

Note: *identifies significant differences between coefficients at adjacent levels of income, or at adjacent income definitions.

TABLE 17--Continued

SUMMARY

CROSS LEVEL[a]

Adjusted Broad		Broad		Narrow		Adjusted Narrow	
INC	SIGN	INC	SIGN	INC	SIGN	INC	SIGN
5	1	5	1	5	0	4	1
DEC	SIGN	DEC	SIGN	DEC	SIGN	DEC	SIGN
3	2	10	2	10	0	4	2

[a]INC refers to number of income levels at which the coefficient of variation is larger than at the next lower level of income.

DEC refers to number of income levels at which the coefficient of variation is smaller than at the next lower level of income.

SIGN refers to number of significant increases or decreases.

CROSS DEFINITION[b]

Adjusted Broad compared to Broad		Broad compared to Narrow		Adjusted Narrow compared to Narrow	
AB<B	SIGN	B<N	SIGN	AN<N	SIGN
1	1	8	0	0	0
AB>B	SIGN	B>N	SIGN	AN>N	SIGN
7	6	8	2	8	5

[b]AB<B refers to number of levels at which the coefficient for the Adjusted Broad definition is smaller than that for the Broad definition. A smaller coefficient is associated with less dispersion, or greater equity.

(five significant). As noted previously, the adjusted definitions involve comparison of high income large families with low income small families, while the unadjusted definitions involve comparison of equal income

TABLE 18

RELATIVE EQUITY OF OTHER BUSINESS TAXES
BY INCOME LEVEL AND INCOME DEFINITION

Income Level	Adjusted Broad Income	Broad Income	Narrow Income	Adjusted Narrow Income
1A. $1,000	2	--	--	2
1. $2,000	2	2	1	1
2. $3,000	2	1	1	1
3. $4,000	1	1	1	1
4. $5,000	1	1	1	1
5. $6,000	1	1	1	1
6. $7,000	1	1	1	1
7. $8,000	1	1	1	1
8. $9,000	1	1	1	1
9. $10,000		1	1	
10. $11,000		1	1	
11. $12,000		1	1	
12. $13,000		1	1	
13. $14,000		1	1	
14. $15,000		1	1	
15. $16,000		1	1	
16. $17,000		1	1	

Note: Table presents the place of consumption based business taxes in the equity order of the nine taxes considered.

families. Consumption is more closely tied to income than family size, and the result is thus to be expected.

One might expect a tax assigned to total consumption to appear more equitable under the broad income concept than under the narrow income concept, if consumption is related to total income rather than to money income, as might logically be expected. However, the statistics do not bear out this expectation. There is no observed difference between BI and NI for OBT.

4) Cross Tax

Table 18 shows the relative position of the OBT in the equity order under each definition. Not surprisingly because of the broad total consumption base, OBT is consistently more equitable than all other taxes considered, including the other broad based consumption tax, SLT. The OBT base is considerably wider than the SLT base, because the former includes all consumption, while SLT excludes services, food, and certain other items. (See Appendices C and F.)

5) Conclusions

OBT, like SLT, appears quite equitable under the standard used in this study. In fact, OBT is the most equitable tax under all definitions. Is the logical conclusion then, that if horizontal equity is the paramount consideration, a tax system should consist primarily of "other business taxes?" I would not embrace this conclusion for two reasons. First, the assumptions here on incidence are crude. These taxes are not likely to be as selective as the corporate income tax as

far as incidence on consumers is concerned, but they are hardly general consumption taxes. Second, an income tax could be designed which would be more equitable than the most general consumption tax, given my equity standard. However, I would argue that from a horizontal equity viewpoint, a general consumption tax is quite acceptable, relative to most alternatives.

CHAPTER 6

CIGARETTE, ALCOHOLIC BEVERAGES AND INSURANCE TAXES

In this chapter, the cigarette tax (CIG), alcoholic beverages taxes and fees (ALC), and the insurance company gross premiums tax (INS) are discussed. Taxes on one or a small range of uses for income are not likely to score well on horizontal equity grounds, and these three taxes are in fact near the bottom of the equity order. The insurance tax, not surprisingly, appears more equitable than the cigarette or alcoholic beverages taxes.

Cigarette Tax

The cigarette tax of three cents per package was assigned to consumers according to their expenditures in the data category, "Tobacco." Details of the calculations are contained in Appendix D. The cigarette tax accounted for 2.8 per cent of California revenues in 1961.

1) Nondispersion Characteristics

The sample at each income level is bracketed at $5 intervals according to CIG payments (Table 19), for the broad income definition. The distributions for other income definitions are contained in Appendix N.

TABLE 19

DISTRIBUTION OF CIGARETTE TAX PAYMENTS
BY INCOME LEVEL (BROAD INCOME DEFINITION)

	BRACKETS (LESS THAN OR EQUAL TO)						
Income Level	0	$5	$10	$15	$20	$25	$30
1. ($2,000)	42.9	24.2	17.6	8.8	3.3	2.2	.9
2. ($3,000)	34.4	23.2	19.9	13.2	7.3	1.3	.7
3. ($4,000)	30.2	17.0	17.4	20.2	4.6	6.4	2.3
4. ($5,000)	27.8	16.0	17.7	20.7	6.7	4.3	4.0
5. ($6,000)	22.6	17.2	18.7	20.6	9.0	6.1	3.7
6. ($7,000)	23.9	12.6	19.4	22.1	9.5	6.0	3.7
7. ($8,000)	20.4	12.8	16.3	26.5	9.9	9.1	2.7
8. ($9,000)	24.2	7.0	22.2	25.4	7.6	7.0	4.1
9. ($10,000)	21.6	12.2	14.2	25.0	10.4	4.2	5.9
10. ($11,000)	21.4	9.5	20.6	23.8	8.3	7.1	5.6
11. ($12,000)	27.4	10.9	20.0	11.4	9.9	9.7	6.3
12. ($13,000)	27.4	9.6	19.3	20.8	7.4	12.6	--
13. ($14,000)	18.0	16.4	16.4	20.5	12.3	5.7	7.4
14. ($15,000)	37.0	8.0	17.0	16.0	6.0	6.0	3.0
15. ($16,000)	21.6	10.8	14.9	24.3	13.5	4.1	5.4
16. ($17,000)	24.1	8.6	22.4	25.8	6.9	5.2	3.4

Notes:

Table shows percentage of sample falling within each bracket at each income level.

Rows may not add to 100.0% due to rounding.

TABLE 19--Continued

$35	$40	>$40	Sample Size	Min. $	Max. $	Mean $	Mean Income
			91	0	27	4	.00215
			151	0	26	5	.00180
.9	.5	.5	218	0	40	8	.00193
2.0	.7		299	0	39	9	.00170
1.1	1.1	.3	380	0	50	9	.00152
1.6	.8	.5	381	0	68	10	.00137
.5	.8	1.1	374	0	50	10	.00130
1.7	.3	.6	343	0	44	10	.00109
2.4	2.4	1.7	288	0	67	11	.00114
1.2	1.2	1.2	252	0	46	10	.00096
1.7	.6	2.3	175	0	46	11	.00088
2.2	--	.7	135	0	44	9	.00072
1.6	--	1.6	122	0	42	11	.00079
2.0	1.0	4.0	100	0	52	10	.00063
1.4	1.4	2.7	74	0	46	11	.00069
--	--	3.4	58	0	44	9	.00055
			Total 3441				

TABLE 20

MEAN CIGARETTE TAX PAYMENT
AS A PERCENTAGE OF MEAN TOTAL TAX
PAYMENT BY INCOME LEVEL

Income Level		Adjusted Broad Income	Broad Income	Narrow Income	Adjusted Narrow Income
1A.	$1,000	8.3%	--	--	7.3%
1.	$2,000	5.9	7.1%	7.2%	5.7
2.	$3,000	4.5	5.7	6.5	4.5
3.	$4,000	4.4	6.2	5.2	3.8
4.	$5,000	3.8	5.7	5.0	3.4
5.	$6,000	2.7	5.0	4.8	2.5
6.	$7,000	2.7	4.8	4.3	2.9
7.	$8,000	2.4	4.6	4.4	2.2
8.	$9,000	2.1	3.9	3.6	1.9
9.	$10,000		4.1	3.7	
10.	$11,000		3.5	3.2	
11.	$12,000		3.2	2.6	
12.	$13,000		2.7	2.6	
13.	$14,000		3.0	2.6	
14.	$15,000		2.4	2.5	
15.	$16,000		2.4	2.4	
16.	$17,000		2.0	2.3	

One feature of the distributions in 19 is worth pointing out. The distributions in most cases have two significant peaks - at zero, and usually at $15 tax payment. This suggests that among smokers, those that smoke a pack per day are more common than those that smoke less.[1]

Table 20 shows that CIG is a relatively small portion of total tax payments at any level of income. However, it is relatively more important at lower levels than at higher ones.

2) Coefficients of Variation

Table 21 portrays the coefficients of variation for each income level under each definition. As is expected for any tax which falls on a single consumption item, particularly one which a large portion of the population does not use at all, the coefficients are large - CIG is quite inequitable horizontally. There is little to suggest that the tax is more equitable at some levels than at others, or that there is any trend toward greater equity with increasing income.

3) Cross Definition

Table 21 also shows that no apparent differences exist between the broad and narrow definitions or either of those definitions and their adjusted counterparts. CIG is about equally inequitable under all definitions.

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[1] A pack per day is about $11 of tax per year.

TABLE 21

CIGARETTE TAX
COEFFICIENTS OF VARIATION

Income Level		Adjusted Broad Income	Broad Income	Narrow Income	Adjusted Narrow Income
1A.	($1,000)	136.6	--	--	126.0
1.	($2,000)	112.1	141.0	135.7	107.4
2.	($3,000)	95.1	111.7	102.6	94.7
3.	($4,000)	92.9	107.5	106.1	106.7
4.	($5,000)	100.3	100.4	96.4	103.7
5.	($6,000)	100.5	96.3	97.6	111.3
6.	($7,000)	113.2	97.2	101.5 *	100.4
7.	($8,000)	100.4	86.7	83.4	98.7
8.	($9,000)	106.0	88.2	90.0	97.2
9.	($10,000)		97.2	87.2	
10.	($11,000)		90.1	96.2	
11.	($12,000)		100.1	105.4	
12.	($13,000)		95.7	106.2	
13.	($14,000)		86.9	85.0	
14.	($15,000)		118.2	89.6	
15.	($16,000)		93.2	88.6	
16.	($17,000)		100.1	95.2	

Note: *identifies significant differences between coefficients at adjacent levels of income, or at adjacent income definitions.

TABLE 21--Continued

SUMMARY

CROSS LEVEL[a]

Adjusted Broad		Broad		Narrow		Adjusted Narrow	
INC	SIGN	INC	SIGN	INC	SIGN	INC	SIGN
4	0	6	0	9	0	2	0
DEC	SIGN	DEC	SIGN	DEC	SIGN	DEC	SIGN
4	0	9	0	6	1	6	0

[a]INC refers to number of income levels at which the coefficient of variation is larger than at the next lower level of income.

DEC refers to number of income levels at which the coefficient of variation is smaller than at the next lower level of income.

SIGN refers to the number of significant increases or decreases.

CROSS DEFINITIONS[b]

Adjusted Broad compared to Broad		Broad compared to Narrow		Adjusted Narrow compared to Narrow	
AB<B	SIGN	B<N	SIGN	AN<N	SIGN
4	0	6	0	3	0
AB>B	SIGN	B>N	SIGN	AN>N	SIGN
4	0	10	0	5	0

[b]AB<B refers to number of levels at which the coefficient for the Adjusted Broad definition is smaller than that for the Broad definition. A smaller coefficient is associated with less dispersion, or greater equity.

4) Cross Tax

CIG stands fairly firmly in eighth place in the equity order, in most cases less dispersed only than ALC, as is shown in Table 22. It stands somewhat higher in relative position at low levels of income. As

TABLE 22

RELATIVE EQUITY OF THE CIGARETTE TAX BY INCOME LEVEL AND INCOME DEFINITION

Income Levels	Adjusted Broad Income	Broad Income	Narrow Income	Adjusted Narrow Income
1A. $1,000	5	--	--	6
1. $2,000	7	4	6	6
2. $3,000	8	5	5	8
3. $4,000	8	6	6	8
4. $5,000	8	6	7	8
5. $6,000	8	7	7	8
6. $7,000	8	7	7	8
7. $8,000	8	7	8	6
8. $9,000	8	8	8	6
9. $10,000		8	8	
10. $11,000		8	8	
11. $12,000		8	8	
12. $13,000		8	8	
13. $14,000		8	7	
14. $15,000		8	8	
15. $16,000		8	8	
16. $17,000		8	7	

Note: Table presents the place of the cigarette tax in the equity order of the nine taxes considered.

noted above, dispersion changes little across income levels. Dispersion among other taxes declines, (notably PYT, MVT, and OBT) and the tax becomes relatively more inequitable.

5) Conclusion

The cigarette tax is indefensible on equity grounds, given an income equity standard, as is obvious from the above results. It is never defended on equity grounds, of course, but rather as a sumptuary excise, a revenue producer,[2] a tax on immorality, or occasionally as a negative benefits tax.[3] On these grounds, such a tax may have a place in the tax system. On equity grounds, it does not.

Alcoholic Beverages Taxes and Fees

The alcoholic beverages taxes include levies on liquor, wine and beer, and license fees levied on retail, wholesale, and manufacturing establishments. The taxes were assigned to consumers according to expenditures in the data category, "Alcoholic beverages." Details of the numerous assumptions involved in assigning the tax are contained in Appendix E. Total alcoholic beverage tax collections accounted for 2.7 per cent of total revenues in California in 1961.

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[2]It might be noted that a tax cannot be effective both as a sumptuary excise and as a revenue producer, since the purpose of the former is to discourage consumption. British experience suggests that the tax is far less effective as a sumptuary than as a revenue producer.

[3]The social costs of smoking are dubious, even with the current evidence linking smoking and cancer; and the revenues are not in any sense earmarked to cover those costs, even to the extent that they can be defined.

TABLE 23

DISTRIBUTION OF ALCOHOLIC BEVERAGES TAX PAYMENTS BY INCOME LEVEL (BROAD INCOME DEFINITION)

		BRACKETS (LESS THAN OR EQUAL TO)						
Income Level		0	$5	$10	$15	$20	$25	$30
1.	($2,000)	75.8	19.8	1.1	1.1	1.1	--	--
2.	($3,000)	64.3	31.8	.7	.7	.7	1.3	--
3.	($4,000)	46.7	41.8	5.0	4.1	.9	.9	--
4.	($5,000)	49.6	36.5	6.1	4.0	1.0	.3	1.0
5.	($6,000)	37.1	49.0	7.9	3.2	.3	1.3	.5
6.	($7,000)	30.2	49.9	9.9	4.7	3.2	1.1	.5
7.	($8,000)	29.7	49.0	9.8	5.1	2.4	2.1	.5
8.	($9,000)	31.2	47.8	11.1	5.0	.9	1.5	.6
9.	($10,000)	23.6	50.7	13.5	4.9	2.1	1.4	1.4
10.	($11,000)	22.2	51.6	14.3	6.0	1.2	1.2	2.4
11.	($12,000)	26.9	42.9	13.7	10.3	2.9	1.1	1.1
12.	($13,000)	23.7	46.0	14.8	7.4	5.9	2.2	--
13.	($14,000)	18.0	38.5	23.0	8.2	4.1	3.3	2.5
14.	($15,000)	17.0	38.0	21.0	11.0	3.0	--	2.0
15.	($16,000)	20.3	33.8	13.6	13.5	4.1	1.4	5.4
16.	($17,000)	15.5	39.7	12.0	13.8	8.6	3.4	1.7

Notes:

Table shows percentage of sample falling within each bracket at each level of income.

Rows may not add to 100.0% due to rounding.

TABLE 23--Continued

$35	$40	> $40	Sample Size	Min. $	Max. $	Mean $	Mean Income
--	1.1	--	91	0	37	1	.00050
--	--	.7	151	0	63	1	.00047
.5	--	--	218	0	31	2	.00048
.3	--	1.3	299	0	87	3	.00060
.5	--	.3	380	0	44	2	.00042
.3	--	.3	381	0	50	3	.00047
.5	.5	.5	374	0	40	4	.00046
.6	.3	1.2	343	0	81	4	.00042
1.7	.3	.3	288	0	66	4	.00045
1.2	--	--	252	0	34	4	.00038
.6	.6	--	175	0	38	5	.00038
--	--	--	135	0	24	5	.00035
--	--	2.4	122	0	82	7	.00052
3.0	--	5.0	100	0	83	9	.00061
1.4	5.4	1.4	74	0	57	9	.00056
1.7	1.7	1.7	58	0	135	10	.00056
			Total 3441				

TABLE 24

MEAN ALCOHOLIC BEVERAGES TAX PAYMENT AS A PERCENTAGE OF MEAN TOTAL TAX PAYMENT BY INCOME LEVEL

Income Level	Adjusted Broad Income	Broad Income	Narrow Income	Adjusted Narrow Income
1A. $1,000	.9%	--	--	.8%
1. $2,000	1.3	1.6%	1.6%	1.3
2. $3,000	1.4	1.4	1.0	1.5
3. $4,000	1.6	1.5	1.4	1.6
4. $5,000	2.2	2.0	1.9	2.4
5. $6,000	1.8	1.4	1.3	2.1
6. $7,000	1.9	1.7	1.6	1.8
7. $8,000	2.1	1.6	1.7	2.4
8. $9,000	2.5	1.5	1.9	2.7
9. $10,000		1.6	1.5	
10. $11,000		1.4	1.3	
11. $12,000		1.4	1.3	
12. $13,000		1.3	1.8	
13. $14,000		2.0	1.8	
14. $15,000		2.3	2.1	
15. $16,000		2.0	1.6	
16. $17,000		2.0	1.9	

1) Nondispersion Characteristics

The sample at each income level is bracketed according to ALC payments, as shown in Table 23, for the broad income definition. Distributions for the other income definitions are contained in Appendix N. The most outstanding feature of the distributions here is the extreme concentration of zero tax payment at low levels of income.

ALC is a relatively unimportant part of total tax payments of California taxpayers, as is shown in Table 24. The lack of importance of the tax makes its impact on the equity of the total tax package small. The impact is probably larger than these data suggest, however, due to the underreporting of alcoholic beverage consumption.

2) Coefficients of Variation

As is expected for any tax which falls on a single consumption item, particularly one which a large portion of the population does not use at all, ALC appears quite inequitable under all definitions, as may be seen in Table 25. There appears to be somewhat greater equity at higher levels of income relative to low ones, due to the greater proportion of people who consume at least some of these beverages at the higher levels.

3) Cross Definition

Table 25 also shows that ALC is more equitable under the definitions adjusted for family size than under the respective unadjusted definitions. The coefficient for broad income adjusted is lower than that for broad income in all eight cases; and the ANI coefficient is smaller than the NI coefficient for seven of eight levels. This is not a readily

TABLE 25

ALCOHOLIC BEVERAGES TAXES
COEFFICIENTS OF VARIATION

Income Level	Adjusted Broad Income	Broad Income	Narrow Income	Adjusted Narrow Income
1A. ($1,000)	312.2	--	--	314.8
1. ($2,000)	233.9	440.3	349.1	240.7
2. ($3,000)	192.2	437.7	295.6	172.1
3. ($4,000)	167.0	222.8	215.0	151.7
4. ($5,000)	184.9	296.0	250.1	188.5
5. ($6,000)	131.1	*211.5	179.2	205.7
6. ($7,000)	136.8	172.9	200.6	*137.5
7. ($8,000)	166.0	178.8	164.6	121.6
8. ($9,000)	138.3	213.0	172.6	144.9
9. ($10,000)		172.6	157.1	
10. ($11,000)		153.1	148.7	
11. ($12,000)		142.6	155.2	
12. ($13,000)		122.8	*223.7	
13. ($14,000)		153.3	151.1	
14. ($15,000)		165.6	146.4	
15. ($16,000)		132.5	115.3	
16. ($17,000)		194.1	110.4	

Note: *identifies significant differences between coefficients at adjacent levels of income, or at adjacent income definitions.

TABLE 25--Continued

SUMMARY

CROSS LEVEL[a]

Adjusted Broad		Broad		Narrow		Adjusted Narrow	
INC	SIGN	INC	SIGN	INC	SIGN	INC	SIGN
3	0	6	0	5	0	3	0
DEC	SIGN	DEC	SIGN	DEC	SIGN	DEC	SIGN
5	0	9	0	10	0	5	0

[a]INC refers to number of income levels at which the coefficient of variation is larger than at the next lower level of income.

DEC refers to number of income levels at which the coefficient of variation is smaller than at the next lower level of income.

SIGN refers to number of significant increases or decreases.

CROSS DEFINITIONS[b]

Adjusted Broad compared to Broad		Broad compared to Narrow		Adjusted Narrow compared to Narrow	
AB<B	SIGN	B<N	SIGN	AN<N	SIGN
8	1	3	1	7	1
AB>B	SIGN	B>N	SIGN	AN>N	SIGN
0	0	13	0	1	0

[b]AB<B refers to number of levels at which the coefficient for the Adjusted Broad definition is smaller than that for the Broad definition. A smaller coefficient is associated with less dispersion, or greater equity.

explicable result. Can it be explained by the fact that expenditures on alcoholic beverages take second priority compared to expenditures involved in raising a family? When those with equal income but unequal family sizes are compared, there is large dispersion, perhaps with those

having family responsibilities spending smaller amounts. When family size is adjusted for, so that large high income families are being compared with small low income families, the tax appears more equitable because the high income of the large families tends to be associated with higher consumption of alcoholic beverages. This effect offsets the tendency toward smaller purchases due to the size of the families. This is hardly a convincing argument, but there are no other apparent reasons.

ALC also appears somewhat more equitable under the narrow unadjusted definition than under the broad one. I can think of no explanation for this result.

4) Cross Tax

ALC is the least equitable tax at nearly all levels of income, under all definitions, as is shown in Table 26. It is interesting to note that, although both CIG and ALC fall on single items of a somewhat similar nature, ALC is significantly more inequitable. There is apparently not as wide a range of dissimilar consumption patterns for cigarettes as for alcoholic beverages. Comparison of the distributions indicates that there is a relative lack of extremes in CIG payments, a fact that may be explained by the fact that cigarettes are not as commonly shared with associates as are alcoholic beverages. A further explanation of the differences between ALC dispersion and CIG dispersion is the greater reluctance on the part of consumers to report the former.

TABLE 26

RELATIVE EQUITY OF ALCOHOLIC BEVERAGE TAX BY INCOME LEVEL AND INCOME DEFINITION

Income Level	Adjusted Broad Income	Broad Income	Narrow Income	Adjusted Narrow Income
1A. $1,000	9	--	--	9
1. $2,000	8	8	9	8
2. $3,000	9	9	9	9
3. $4,000	9	9	8	9
4. $5,000	9	9	9	9
5. $6,000	9	9	9	9
6. $7,000	9	9	9	9
7. $8,000	9	9	9	8
8. $9,000	9	9	9	8
9. $10,000		9	9	
10. $11,000		9	9	
11. $12,000		9	9	
12. $13,000		9	9	
13. $14,000		9	9	
14. $15,000		9	9	
15. $16,000		9	9	
16. $17,000		9	8	

Note: Table presents the place of the alcoholic beverage tax in the equity order of the nine taxes considered.

5) Conclusion

There is no defense for taxation of alcoholic beverages on equity grounds. Like the cigarette tax, alcoholic beverages taxes are defended as revenue producers, sumptuary excises, taxes on immorality, or levies to compensate for social costs. It is notable that the latter argument is less dubious for alcoholic beverages than it is for cigarettes, although the social costs created by alcoholic beverages are not in any way matched to revenues raised by the tax. Alcoholic beverages taxes may have a place in a tax system on non-equity grounds; they are the least horizontally equitable tax in the tax system.

Insurance Company Tax

The insurance company tax is 2.35 per cent of gross premiums less certain deductions. The tax is assigned to consumers according to their expenditure on insurance. Incidence is assumed 100 per cent on consumers. Details of the calculation of insurance tax burden are contained in Appendix M. The insurance tax yield in 1961 in California was $66 million, or 2.9 per cent of total state revenues.

1) Nondispersion Characteristics

The sample at each income level is bracketed according to INS payment as shown in Table 27 for the broad income definition. Distributions of other taxes are contained in Appendix N.

Table 28 shows that INS remains about three per cent of the average consumer's total tax payment for most levels of income.

TABLE 27

DISTRIBUTION OF INSURANCE TAX PAYMENTS
BY INCOME LEVEL (BROAD INCOME DEFINITION)

Income Level	BRACKETS (% LESS THAN OR EQUAL TO) 0	$5	$10	$15	$20	$25	$30
1. ($2,000)	22.0	73.6	3.3	--	--	--	1.1
2. ($3,000)	29.8	59.6	8.6	1.3	--	--	.7
3. ($4,000)	12.8	71.6	14.7	.9			
4. ($5,000)	9.7	66.1	22.4	1.3	--	--	--
5. ($6,000)	4.5	56.1	32.6	5.8	.8	--	.3
6. ($7,000)	2.9	42.6	43.9	9.7	.5	.3	--
7. ($8,000)	2.7	31.8	46.0	14.7	3.5	1.3	
8. ($9,000)	1.5	30.0	42.9	16.9	7.0	1.5	.3
9. ($10,000)	.7	30.5	42.0	17.7	6.2	1.4	.7
10. ($11,000)	.8	22.2	36.5	29.0	7.1	2.0	.8
11. ($12,000)	3.4	16.0	41.1	21.7	9.7	4.0	.6
12. ($13,000)	.7	20.8	31.1	23.7	14.8	5.9	2.2
13. ($14,000)	--	14.8	33.6	27.0	19.7	4.1	.8
14. ($15,000)	2.0	13.0	27.0	25.0	19.0	9.0	--
15. ($16,000)	--	12.1	25.6	29.8	10.8	5.4	8.1
16. ($17,000)	--	15.5	22.4	20.7	17.2	12.1	1.7

Notes:

Table shows percentage of sample falling within each bracket at each level of income.

Rows may not add to 100.0% due to rounding.

TABLE 27--Continued

$35	>$35	Sample Size	Min. $	Max. $	Mean $	Mean Income
		91	0	26	2	.00085
		151	0	26	2	.00070
		218	0	11	3	.00068
--	.3	299	0	58	4	.00072
		380	0	27	5	.00078
--	.3	381	0	36	6	.00081
		374	0	25	7	.00086
		343	0	29	8	.00087
.7		288	0	33	8	.00080
.4	1.2	252	0	51	9	.00085
2.3	1.1	175	0	63	10	.00088
.7		135	0	31	11	.00082
		122	.43	27	11	.00077
4.0	1.0	100	0	35	12	.00082
4.1	4.1	74	.21	41	15	.00091
3.5	6.9	58	2	73	15	.00090
		Total 3441				

TABLE 28

MEAN INSURANCE TAX PAYMENT
AS A PERCENTAGE OF MEAN TOTAL TAX PAYMENT
BY INCOME LEVEL

Income Level	Adjusted Broad Income	Broad Income	Narrow Income	Adjusted Narrow Income
1A. $1,000	2.0%	--	--	1.9%
1. $2,000	2.5	2.9%	2.4%	2.7
2. $3,000	3.1	2.2	2.3	3.1
3. $4,000	3.2	2.1	2.6	3.1
4. $5,000	3.0	2.4	2.7	3.0
5. $6,000	3.2	2.6	2.9	3.2
6. $7,000	3.2	2.9	2.8	2.7
7. $8,000	2.9	3.0	3.0	3.1
8. $9,000	2.4	3.1	3.1	3.2
9. $10,000		2.9	3.0	
10. $11,000		3.1	3.2	
11. $12,000		3.2	3.2	
12. $13,000		3.0	3.1	
13. $14,000		2.9	2.9	
14. $15,000		3.1	2.8	
15. $16,000		3.2	3.2	
16. $17,000		3.2	2.6	

2) Coefficients of Variation

Table 29 shows the coefficients of variation for each level of income for each definition. There is no observable pattern among the coefficients under any definition, and considerable fluctuation from level to level.

3) Cross Definition

There is no difference between INS evaluated under BI and under NI. There is no difference overall between the adjusted and unadjusted definitions. It does seem, however, that the adjusted definitions are more equitable at lower levels of income (levels 1-4) and the unadjusted definitions at higher levels.

4) Cross Tax

Table 30 shows the position of INS in the equity order across income levels under each definition. It clearly stands above CIG and ALC, and on some occasions above the road user charges as well, although it is, of course, inequitable relative to more broadly based taxes.

5) Conclusion

There is no place, of course, for a tax on insurance premiums under the equity standard used here. The tax, like the CIG and ALC taxes, applies to a single item of expenditure, and as such is, as expected, quite inequitable horizontally. However, since there are relatively few non-consumers of insurance above the $3000 or $4000 level, and because even for those who are extremely well insured, tax

TABLE 29

INSURANCE TAX
COEFFICIENTS OF VARIATION

Income Level	Adjusted Broad Income	Broad Income	Narrow Income	Adjusted Narrow Income
1A. ($1,000)	143.0 *	--	--	124.0
1. ($2,000)	92.4 *	*177.0	127.2	110.5 *
2. ($3,000)	75.5	*139.9 *	116.7 *	* 70.8
3. ($4,000)	79.6	87.0 *	88.6	76.7 *
4. ($5,000)	78.5	*113.8 *	* 79.9	95.2
5. ($6,000)	81.5	73.1	70.8	82.5
6. ($7,000)	92.5	* 64.9	73.9 *	84.6
7. ($8,000)	81.7	* 59.5	62.5	*102.5
8. ($9,000)	87.3	60.3	67.3	164.6
9. ($10,000)		63.9	65.2 *	
10. ($11,000)		69.6	84.2	
11. ($12,000)		76.9 *	72.5	
12. ($13,000)		59.9	60.0	
13. ($14,000)		51.7	* 76.3	
14. ($15,000)		59.6	63.4	
15. ($16,000)		61.8	85.9	
16. ($17,000)		77.2	63.4	

Note: *identifies significant differences between coefficients at adjacent levels of income, or at adjacent income definitions.

TABLE 29--Continued

SUMMARY

CROSS LEVEL[a]

Adjusted Broad		Broad		Narrow		Adjusted Narrow	
INC	SIGN	INC	SIGN	INC	SIGN	INC	SIGN
4	0	8	1	5	1	5	1
DEC	SIGN	DEC	SIGN	DEC	SIGN	DEC	SIGN
4	2	7	3	10	2	3	1

[a]INC refers to number of income levels at which the coefficient of variation is larger than at the next lower level of income.

DEC refers to number of income levels at which the coefficient of variation is smaller than at the next lower level of income.

SIGN refers to number of significant increases or decreases.

CROSS DEFINITION[b]

Adjusted Broad compared to Broad		Broad compared to Narrow		Adjusted Narrow compared to Narrow	
AB<B	SIGN	B<N	SIGN	AN<N	SIGN
4	3	10	1	3	1
AB>B	SIGN	B>N	SIGN	AN>N	SIGN
4	2	6	1	5	1

[b]AB<B refers to number of levels at which the coefficient for the Adjusted Broad definition is smaller than that for the Broad definition. A smaller coefficient is associated with less dispersion, or greater equity.

payments do not deviate by more than six times from the mean, except at very low income levels, INS appears more equitable than other single item taxes. At some levels, it is not significantly different in dispersion from the sales tax, although overall the latter is far less dispersed.

TABLE 30

RELATIVE EQUITY OF THE INSURANCE TAX
BY INCOME LEVEL AND INCOME DEFINITION

Income Level	Adjusted Broad Income	Broad Income	Narrow Income	Adjusted Narrow Income
1A. $1,000	7	--	--	5
1. $2,000	5	7	5	7
2. $3,000	5	7	6	5
3. $4,000	7	4	4	7
4. $5,000	6	7	5	7
5. $6,000	6	5	5	6
6. $7,000	7	5	5	6
7. $8,000	6	5	4	7
8. $9,000	6	5	5	9
9. $10,000		6	6	
10. $11,000		6	7	
11. $12,000		6	7	
12. $13,000		6	5	
13. $14,000		5	5	
14. $15,000		6	5	
15. $16,000		6	7	
16. $17,000		7	5	

Note: Table presents the place of the insurance tax in the equity order of the nine taxes considered.

CHAPTER 7

GASOLINE AND MOTOR VEHICLE TAXES

In this chapter, taxes on motor vehicles owned by consumers and on gasoline purchased by them are considered. Like the taxes discussed in the previous chapter, these taxes fall on single items, leaving consumers a wide range of alternative, untaxed uses of income. One expects, then, that they will be quite inequitable when evaluated by an income standard, although not perhaps as inequitable as the cigarette or alcoholic beverages taxes, since the latter involve taxation of items which many do not use.

The crucial issue with regard to these road-user charges is whether equity is an issue at all, since they are related to benefits received. As noted in Chapter 1, if benefit taxation is really the operation of the market, equity is irrelevant.[1] One merely pays for the services one uses. Since road user charges in almost all states (including California) are earmarked for highway building and maintenance, the highway system may be thought of as a sort of public

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[1]Horizontal equity can have relevance in a benefit taxation framework, but only if all government benefits are included in income. As income is defined in this study however, equity cannot be a consideration in situations which are "operation of the market." See Chapter 1, page 14 for further discussion.

utility operated by the government. The analogy is a rough one however, since the connection between benefits and payments is much less exact in the highway case than for the typical utility.[2] A tax on gasoline is an imperfect indicator of road use because vehicles are differentially efficient in their use of fuel. Road use, in turn, is an imperfect indicator of a vehicle's contribution to wear and tear on existing roads, or more particularly, of a driver's demand for new roads in other areas. A tax on motor vehicles related to vehicle market value, such as exists in California, is not related to road use at all, and measures neither wear and tear, nor demand for new routes. On the other hand, it may be noted that the motor vehicle tax together with the gasoline tax is a more accurate reflection of benefit received than is either alone, since a new, high value vehicle is likely to be more efficient in the use of fuel. Thus, the two together may be a fairly accurate indicator of road use.[3]

The relevance of the equity issue for road user charges is not a matter that can be resolved scientifically. That there is a connection between gasoline and motor vehicle taxes and benefits received in the form of highway services is obvious. The connection

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[2]In spite of earmarking, considerable diversion to non-highway uses takes place, in California and elsewhere. See Advisory Committee on Intergovernmental Relations, State Aid to Local Governments (April, 1969) Table A26, pp. 94-95.

[3]Although the use of fuel still varies with driving conditions.

is even closer if congestion costs are considered.[4] The connection could conceptually be made still closer with a more complex system of tariffs. However, that there are, under the tax system in present use, and probably under any system which could be devised, redistributive aspects of taxation of gasoline and motor vehicles of a non-market character, is also apparent. The connection between price and service is necessarily more tenuous than that of a public utility. In this study, each tax is evaluated separately, which allows the reader to make his own judgement on the relevance of the equity issue here. Further, when the equity of the total tax package is examined, it is evaluated with and without the gasoline and motor vehicle taxes. (See Chapter 8.)

Gasoline Tax

The yield of the gasoline tax (GAS) in California in 1961 was $351 million, or 15 per cent of total revenues. An estimated 2.5 per cent was collected from commercial vehicles. (See Appendix J.) The tax is six cents per gallon, which was assigned to consumer expenditures on "Gasoline, motor oil, lubrication, washing, etc." Details of the calculations are contained in Appendix G.

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[4]Any tax on vehicles measures the extent to which they cause congestion. Further, the taxes tend to be larger for larger vehicles, and larger vehicles, by their nature involve more congestion (unless used at hours and in places where there are few other vehicles). Finally, in congested areas, fuel consumption will tend to be higher because of driving conditions.

TABLE 31

DISTRIBUTION OF GASOLINE TAX PAYMENTS
BY INCOME LEVEL (BROAD INCOME DEFINITION)

Income Level	BRACKETS (% LESS THAN OR EQUAL TO) 0	$10	$20	$30	$40	$50	$60	$70	$80
($2,000)	59.4	13.2	14.3	7.7	4.4	--	1.1		
($3,000)	42.4	13.9	15.9	13.9	3.3	6.6	3.3	--	.7
($4,000)	32.6	10.6	17.0	15.1	8.7	7.8	2.3	1.8	1.4
($5,000)	22.4	10.4	10.4	18.0	10.8	12.4	5.4	5.4	3.0
($6,000)	17.6	6.1	12.1	15.5	15.5	12.4	7.9	4.2	2.9
($7,000)	10.8	6.3	15.7	19.2	16.3	11.9	6.3	3.7	4.2
($8,000)	9.9	5.4	11.2	15.8	20.1	11.3	10.7	4.8	4.0
($9,000)	9.9	5.8	9.3	14.3	16.6	14.6	9.6	8.2	3.5
($10,000)	9.0	4.2	8.0	13.2	19.8	13.9	12.2	9.0	2.8
($11,000)	8.3	4.8	6.4	13.1	19.0	19.8	7.1	6.0	6.0
($12,000)	11.4	3.4	8.5	10.8	12.6	16.0	9.1	6.3	7.4
($13,000)	7.4	7.4	8.9	12.6	13.4	14.1	10.4	7.4	3.7
($14,000)	9.0	6.6	9.8	10.7	10.6	12.3	10.7	11.5	6.6
($15,000)	10.0	4.0	12.0	15.0	10.0	10.0	18.0	8.0	7.0
($16,000)	5.4	6.8	6.8	16.2	9.5	16.2	5.4	4.1	8.1
($17,000)	10.3	--	5.2	6.9	10.4	15.5	15.5	10.3	6.9

Notes:

Table shows percentage of sample falling within each bracket at each level of income.

Rows may not add to 100.0% due to rounding.

TABLE 31--Continued

$90	$100	$110	$120	>$120	Sample Size	Min. $	Max. $	Mean $	Mean / Income
					91	0	54	7	.00346
					151	0	72	13	.00443
.9	.9	.3	.2	.5	218	0	175	20	.00498
.5	.5	.5	.5		299	0	117	26	.00530
1.6	1.6	.7	.6	1.3	380	0	206	33	.00549
2.3	2.2	.5	.5	.3	381	0	165	33	.00474
1.9	1.8	.8	.8	1.6	374	0	192	37	.00469
2.1	2.0	1.2	1.1	1.8	343	0	175	40	.00440
2.1	2.1	.5	.5	2.8	288	0	212	41	.00412
2.2	2.2	1.4	1.4	2.4	252	0	157	42	.00386
4.0	4.0	1.5	1.4	3.5	175	0	209	47	.00392
2.6	2.6	2.2	2.2	5.1	135	0	151	46	.00351
3.3	3.3	2.5	2.4	.8	122	0	174	45	.00319
1.5	1.5	.5	.5	2.0	100	0	166	41	.00272
4.8	4.7	2.7	2.7	6.8	74	0	178	52	.00325
5.2	5.1	2.6	2.6	3.4	58	0	221	55	.00322
					Total 3441				

TABLE 32

MEAN GASOLINE TAX PAYMENT AS A PERCENTAGE OF MEAN TOTAL TAX PAYMENT BY INCOME LEVEL

Income Level	Adjusted Broad Income	Broad Income	Narrow Income	Adjusted Narrow Income
1A. $1,000	13.9%	--	--	14.2%
1. $2,000	18.2	11.5%	14.3%	17.3
2. $3,000	17.1	14.0	15.2	16.2
3. $4,000	15.1	16.0	17.8	14.7
4. $5,000	13.5	17.6	17.5	12.8
5. $6,000	12.1	18.3	17.3	10.0
6. $7,000	10.6	16.9	17.0	9.8
7. $8,000	10.2	16.5	15.0	8.8
8. $9,000	9.2	15.9	14.6	7.8
9. $10,000		14.8	15.1	
10. $11,000		14.2	13.9	
11. $12,000		14.4	13.4	
12. $13,000		13.2	13.0	
13. $14,000		12.1	8.4	
14. $15,000		10.2	9.7	
15. $16,000		11.5	10.0	
16. $17,000		11.6	8.3	

1) Nondispersion Characteristics

Table 31 contains GAS payments by income class for the broad income definition, bracketed at $10 intervals. Appendix N contains the distributions for other income definitions.

Table 32 shows the relative importance of GAS in the average total tax package at each level of income under each definition. Importance increases through the lower income classes, then declines. At low levels of income, there are a number of non-car owners, accounting for the small portion at those levels. As income rises, car ownership becomes more general. However, beyond a certain point, ownership and use does not increase with income, and the tax declines in relative importance.

2) Coefficients of Variation

Table 33 shows the coefficients of variation of GAS payments at each level of income under each definition. Dispersion appears to decline under the unadjusted definitions over the first five levels, as automobile ownership becomes more prevalent. Beyond the sixth level, there is no significant trend.

3) Cross Definition

GAS appears less dispersed under the adjusted relative to the unadjusted definitions at low levels of income. This may be explained by the fact that at low levels of income, families with children are less able to afford automobiles, while single people tend to have them. Thus, there is wide dispersion at low levels of income under the unadjusted definitions. When adjustment is made, the large families being compared

TABLE 33

GASOLINE TAX
COEFFICIENTS OF VARIATION

Income Level	Adjusted Broad Income	Broad Income	Narrow Income	Adjusted Narrow Income
1A. ($1,000)	194.3 *	--	--	159.6 *
1. ($2,000)	102.8	163.6	145.6	104.3 *
2. ($3,000)	85.0	*123.3	146.8	* 79.5
3. ($4,000)	79.1	*120.4 *	110.5	* 75.5
4. ($5,000)	81.3	90.1	87.6 *	87.9
5. ($6,000)	85.1	88.7 *	* 71.6	80.8
6. ($7,000)	73.0	75.3	77.7	78.0
7. ($8,000)	81.5	75.8	73.5	75.3
8. ($9,000)	87.8	72.9	69.6	81.2
9. ($10,000)		70.6	74.3	
10. ($11,000)		69.0	71.1	
11. ($12,000)		79.2	65.4	
12. ($13,000)		76.0	70.4	
13. ($14,000)		71.9	80.1	
14. ($15,000)		72.4	69.3	
15. ($16,000)		76.6	80.3	
16. ($17,000)		68.0	86.1	

Note: * identifies significant differences between coefficients at adjacent levels of income, or at adjacent income definitions.

TABLE 33--Continued

SUMMARY

CROSS LEVEL[a]

Adjusted Broad		Broad		Narrow		Adjusted Narrow	
INC	SIGN	INC	SIGN	INC	SIGN	INC	SIGN
4	0	3	0	7	0	2	0
DEC	SIGN	DEC	SIGN	DEC	SIGN	DEC	SIGN
4	1	12	2	8	1	6	2

[a]INC refers to number of income levels at which the coefficient of variation is larger than at the next lower level of income.

DEC refers to number of income levels at which the coefficient of variation is smaller than at the next lower level of income.

SIGN refers to number of significant increases or decreases.

CROSS DEFINITIONS[b]

Adjusted Broad compared to Broad		Broad compared to Narrow		Adjusted Narrow compared to Narrow	
AB<B	SIGN	B<N	SIGN	AN<N	SIGN
6	2	7	0	3	2
AB>B	SIGN	B>N	SIGN	AN>N	SIGN
2	0	9	1	5	0

[b]AB<B refers to number of levels at which the coefficient for the Adjusted Broad definition is smaller than that for the Broad definition. A smaller coefficient is associated with less dispersion, or greater equity.

with the small families and single individuals have larger incomes. They are thus better able to afford automobiles.

4) Cross Tax

GAS tends to stand sixth or seventh in the equity order, as can be seen from Table 34. It stands ahead of other taxes on single items,

TABLE 34

RELATIVE EQUITY OF THE GASOLINE TAX
BY INCOME LEVEL AND INCOME DEFINITION

Income Level	Adjusted Broad Income	Broad Income	Narrow Income	Adjusted Narrow Income
1A. $1,000	8	--	--	8
1. $2,000	6	6	7	5
2. $3,000	6	6	7	6
3. $4,000	6	7	7	6
4. $5,000	7	5	6	6
5. $6,000	7	6	6	5
6. $7,000	6	6	6	5
7. $8,000	5	6	6	5
8. $9,000	7	6	6	5
9. $10,000		7	7	
10. $11,000		5	6	
11. $12,000		7	5	
12. $13,000		7	6	
13. $14,000		7	6	
14. $15,000		7	6	
15. $16,000		7	6	
16. $17,000		6	6	

Note: Table presents the place of the gasoline tax in the equity order of the nine taxes considered.

since automobile ownership is more general than say, cigarette smoking, but it stands below the more broadly based taxes.

Motor Vehicle Taxes

The motor vehicle taxes (MVT) include an $8 registration fee, a license fee of two per cent of market value for all vehicles, plus several taxes which apply only to commercial vehicles. In total, the yield in California in 1961 was $277 million, or 11.9 per cent of total revenues. As estimated 3.4 per cent was collected from commercial vehicles, the remaining 8.5 per cent from private vehicles.[5] Crude assumptions were necessary to assign vehicle taxes to individual consumers because value of automobile stock is not available in the BLS data except for automobiles purchased during the survey year. Imputation was made on the basis of certain socio-economic variables. Details are contained in Appendix H.

1) Nondispersion Characteristics

Table 35 shows MVT payments by income level for the broad definition bracketed in $10 increments. Distributions for other definitions are included in Appendix N.

Several features of the distributions should be noted. First, if a consuming unit owns an automobile at all, it must have a tax payment of at least $10. The registration fee is $8 and it is assumed

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[5]See Appendix J for assumptions underlying this breakdown.

TABLE 35

DISTRIBUTION OF MOTOR VEHICLE TAX PAYMENTS BY INCOME LEVEL (BROAD INCOME DEFINITION)

		BRACKETS (% LESS THAN OR EQUAL TO)						
Income Level		$0	$10	$20	$30	$40	$50	$60
1.	($2,000)	60.4	--	29.7	3.3	3.3	2.2	1.1
2.	($3,000)	40.4	2.7	31.1	10.7	7.3	4.7	3.3
3.	($4,000)	31.6	1.8	28.0	17.9	4.6	11.9	.9
4.	($5,000)	18.7	1.3	27.0	30.8	2.4	15.7	1.7
5.	($6,000)	15.0	1.1	26.3	29.2	4.5	16.8	3.4
6.	($7,000)	7.9	1.3	21.0	34.4	3.2	23.9	4.7
7.	($8,000)	7.2	.5	16.3	39.6	3.5	23.8	4.3
8.	($9,000)	7.0	.6	2.6	47.4	1.5	27.4	5.8
9.	($10,000)	6.6	--	3.1	43.1	3.5	24.7	5.9
10.	($11,000)	6.0	.4	3.2	38.9	3.6	23.4	14.7
11.	($12,000)	4.0	--	1.7	38.9	1.7	22.9	13.1
12.	($13,000)	2.2	1.5	2.2	30.3	5.2	17.8	20.0
13.	($14,000)	4.9	.8	1.6	36.1	1.6	20.5	23.0
14.	($15,000)	5.0	--	2.0	31.0	4.0	22.0	18.0
15.	($16,000)	--	--	--	16.2	6.8	23.0	29.7
16.	($17,000)	1.7	--	1.7	10.4	12.1	10.4	34.5

Notes:

Table shows percentage of sample falling within each bracket at each level of income.

Rows may not add to 100.0% due to rounding.

TABLE 35--Continued

$70	$80	$90	$100	>$100	Sample Size	Min. $	Max. $	Mean $	Mean Income
					91	0	56	8	.00410
					151	0	57	14	.00480
2.3	.5	.3	.2		218	0	94	18	.00463
1.0	.3	.5	.5		299	0	92	22	.00438
2.1	1.1	.3	.2		380	0	94	25	.00412
2.9	.3	.3	.2		381	0	92	29	.00407
2.4	1.1	.6	.5	.3	374	0	100	30	.00378
3.5	2.3	.9	.9		343	0	99	34	.00376
8.3	1.4	1.4	1.4	.7	288	0	101	36	.00364
4.4	3.2	.6	.6	1.2	252	0	116	38	.00347
9.7	4.0	.6	.5	2.9	175	0	108	42	.00352
8.2	5.9	2.2	2.2	2.2	135	0	119	45	.00349
4.1	4.9	.8	.8	.8	122	0	110	41	.00293
6.0	5.0	3.0	3.0	1.0	100	0	118	44	.00293
9.5	6.8	2.7	2.7	2.7	74	23	112	52	.00328
6.9	12.1	3.5	3.4	3.5	58	0	108	54	.00316
					Total 3441				

TABLE 36

MEAN VEHICLE TAX PAYMENT AS A PERCENTAGE OF MEAN TOTAL TAX PAYMENT BY INCOME LEVEL

Income Level	Adjusted Broad Income	Broad Income	Narrow Income	Adjusted Narrow Income
1A. $1,000	13.4%	--	--	15.5%
1. $2,000	13.3	13.6%	16.7%	13.5
2. $3,000	14.3	15.2	15.3	13.9
3. $4,000	14.0	14.8	14.4	12.8
4. $5,000	12.1	14.5	14.4	11.3
5. $6,000	12.0	13.7	14.5	11.8
6. $7,000	11.7	14.5	13.3	9.5
7. $8,000	9.9	13.3	13.6	9.0
8. $9,000	10.3	13.5	12.1	7.7
9. $10,000		13.0	13.3	
10. $11,000		12.7	13.0	
11. $12,000		13.0	12.5	
12. $13,000		13.0	11.6	
13. $14,000		11.1	10.5	
14. $15,000		11.0	10.4	
15. $16,000		11.6	10.9	
16. $17,000		11.4	8.2	

here that the minimum automobile value is $100. That there are relatively few members of the sample falling in the $10 bracket is thus easily explained. More difficult to explain are the multiple peaks at higher levels of tax payment. They appear to be due to the nature of the imputations.

The relative importance of MVT payments in the total tax payment of the average individual appears to decline with increasing income as can be seen in Table 36.

2) Coefficients of Variation

Table 37 shows the coefficients of variation for each income level under each definition. There is a discernible increase in equity with rising income, which may be explained by the fact that automobile ownership is more general at higher levels of income, combined with the fact that the value of automobile stock ceases to rise dramatically with income beyond a certain level.

3) Cross Definition

There appears to be greater horizontal equity in MVT when it is evaluated under adjusted definitions, particularly at low income levels. This may be explained by the fact that larger families tend to have less valuable cars when compared to small families. However, families with larger incomes tend to have more valuable cars. Under the adjusted definitions, comparison is made between small low income families and larger, higher income families. The effect of higher incomes tends to cancel the family size effect. The income effect does not exist under the unadjusted definitions, and thus dispersion is greater.

TABLE 37

MOTOR VEHICLE TAXES
COEFFICIENTS OF VARIATION

Income Level	Adjusted Broad Income	Broad Income	Narrow Income	Adjusted Narrow Income
1A. ($1,000)	139.5 *	--	--	129.9 *
1. ($2,000)	87.7 *	*145.5	119.7	* 84.4 *
2. ($3,000)	63.7	*105.5	101.4	* 62.2
3. ($4,000)	63.9	* 93.8 *	82.3	* 61.9
4. ($5,000)	63.5	74.5	71.2 *	65.7 *
5. ($6,000)	58.7	68.1 *	* 59.8	51.1
6. ($7,000)	60.1	56.0	59.7	52.5
7. ($8,000)	53.8	55.3	57.7	51.9
8. ($9,000)	52.6	54.4	57.1	61.5
9. ($10,000)		55.7	53.1	
10. ($11,000)		51.2	49.6	
11. ($12,000)		49.5	45.3	
12. ($13,000)		48.3	44.0	
13. ($14,000)		48.1	45.7	
14. ($15,000)		50.2 *	46.8	
15. ($16,000)		36.5	36.9 *	
16. ($17,000)		39.2	54.7	

Note: * identifies significant differences between coefficients at adjacent levels of income, or adjacent income definitions.

TABLE 37--Continued

SUMMARY

CROSS LEVEL[a]

Adjusted Broad		Broad		Narrow		Adjusted Narrow	
INC	SIGN	INC	SIGN	INC	SIGN	INC	SIGN
2	0	3	0	3	1	3	0
DEC	SIGN	DEC	SIGN	DEC	SIGN	DEC	SIGN
6	2	12	3	12	1	5	3

[a]INC refers to number of income levels at which coefficient of variation is larger than at next lower level of income.

DEC refers to number of income levels at which coefficient of variation is smaller than at next lower level of income.

SIGN refers to number of significant increases or decreases.

CROSS DEFINITION[b]

Adjusted Broad compared to Broad		Broad compared to Narrow		Adjusted Narrow compared to Narrow	
AB<B	SIGN	B<N	SIGN	AN<N	SIGN
7	3	5	0	7	3
AB>B	SIGN	B>N	SIGN	AN>N	SIGN
1	0	11	1	1	0

[b]AB<B refers to the number of levels at which the coefficient for the Adjusted Broad definition is smaller than that for the Broad definition. A smaller coefficient is associated with less dispersion, or greater equity.

4) Cross Tax

Table 38 shows that MVT becomes more equitable relative to other taxes at higher levels of income. It is the most equitable of the single item taxes.

TABLE 38

RELATIVE EQUITY OF MOTOR VEHICLE TAXES
BY INCOME LEVEL AND INCOME DEFINITION

Income Level	Adjusted Broad Income	Broad Income	Narrow Income	Adjusted Narrow Income
1A. $1,000	6	--	--	7
1. $2,000	4	5	4	4
2. $3,000	4	4	4	4
3. $4,000	5	5	3	4
4. $5,000	4	4	4	4
5. $6,000	3	4	4	2
6. $7,000	3	4	4	2
7. $8,000	3	4	3	2
8. $9,000	2	4	4	2
9. $10,000		4	4	
10. $11,000		4	4	
11. $12,000		3	2	
12. $13,000		2	3	
13. $14,000		4	2	
14. $15,000		4	3	
15. $16,000		2	2	
16. $17,000		3	4	

Note: Table presents the place of motor vehicle tax in the equity order of the nine taxes considered.

Concluding Remarks

1. Of the narrow bases which are taxed, those relating to automobiles are better than most from a horizontal equity viewpoint, because automobile ownership is widespread.[6] There is considerable dispersion in tax payment due to variations in value and use of automobiles, but this dispersion is relatively smaller than it would be were a large segment of the population non-owners.

2. The results for MVT must be treated with some caution. Tax payment had to be assigned to consuming units indirectly and the results, as indicated by the distributions in Table 35, are not fully satisfactory. The position of the tax in the equity order is not unexpected, however, and the dispersions as measured by the coefficients of variation are not unreasonable.

3. There is little more to be said on the issue of relevance. I am trying here to evaluate the horizontal equity of a tax system. It is somewhat artificial to consider only the tax side of the fiscal system in evaluating equity. Given that the tax side alone is being considered, however, "benefit" taxation is irrelevant for equity only if it truly approaches the operation of the market. In my opinion, it does not.

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[6]Indeed, there are few other narrow bases which would produce more horizontal equity except perhaps the ownership (not purchase of) of television sets, beds and certain articles of clothing.

CHAPTER 8

RESULTS

In Chapter 3, five basic lines of inquiry were framed to give direction to the study of horizontal equity. In succeeding chapters, individual taxes were discussed. With the results reported in those chapters as supporting material, we will now return to the five questions: Does an order of equity exist? Is the total tax package more horizontally equitable than its components? Is there a trend in the horizontal equity of the total tax package over income levels? Does the total package appear less dispersed under one income definition than another? Are the conclusions with regard to the order of equity, the equity of the total tax package, and the trend in equity of the total package across income levels similar under each of the definitions? For clarity of presentation, only results under the broad income definition (BI) will be reported in the discussion of the first three questions. Results for the other definitions will be considered in the discussion of the fourth and fifth questions.

Order of Equity

1) Overall Equity

At any income level, the taxes may be ordered by the sizes of their coefficients of variation. The differences between the coefficients of successive taxes is sometimes significant, often not, and the "order of equity" of course changes from level to level. Some of these changes

appear systematic, others appear due to chance. In order to generalize about horizontal equity, instead of restricting discussion to consideration of single income levels, some method of combining the results for the individual income levels must be found. A straightforward method was adopted for this purpose. The taxes were ranked by coefficients of variation in ascending order at each income level. Ranks were then averaged, and the taxes were ordered by average rank. (See Table 39.) Two simple methods were then used to test the significance of the differences between successive taxes in the order: 1) the sign test (Test 1), which involves observing the number of levels at which a tax is less dispersed than the next lower one on the list; 2) the U test (Test 2) -- a rank-sum test which involves ranking the coefficients of variation for two taxes, regardless of income level, and in turn testing for significant differences between the two based on the sum of the ranks assigned to the observations for either tax.[1] The two tests need not give the same answer, of course. For example, if Tax A has a slightly smaller coefficient than Tax B at all 16 income levels, the sign test will reveal the two significantly different. If at the same time, the coefficients of the taxes range considerably in size, Tax B coefficients at many levels may be larger than Tax A coefficients at other levels. If so, the U test will not reveal Taxes A and B significantly different. Each test is made

[1]The two tests, which are referred to repeatedly throughout the chapter, are described in detail in Appendix O. Neither test makes any assumption about distributional normality.

TABLE 39

EQUITY ORDER--BROAD INCOME DEFINITION

Rank	Tax	Average Rank[a]	Significant Difference[b] Test 1	Test 2
1	Other business	1.06	*	*
2	Corporate income	2.38	*	*
3	Sales	3.56		
3	Motor vehicle	3.75	*	*
4	Insurance	5.81		
4	Gasoline	6.31	*	*
5	Cigarette	7.13	*	*
6	Alcoholic beverages	8.94		
Unranked	Personal income[c]	6.06		

[a]Average rank is the average position in the equity order across the 16 levels of income considered.

[b]Test 1 is a sign test.
Test 2 is a rank-sum test.

[c]Significantly less dispersed than Alcoholic beverages; significantly more dispersed than Sales, Corporate income, and Other business.

assuming, in effect, that the equity order at each level of income is a sample drawn from the same population. If, for example, a certain tax appears less dispersed than any others at a sufficient number of levels of income, it is judged to be more equitable overall, regardless of whether the differences at any one level are significant.[2]

Finally, ranks in the equity order were assigned according to significant differences. Thus in Table 39, CYT, ranked 2, is overall significantly more dispersed than OBT, but less dispersed than any taxes listed below it. SLT and MVT were both assigned the rank of 3, since differences in their ranking are small enough to be attributed to chance. Both are significantly less dispersed than INS or any other taxes further down the list.

Table 39 contains the overall equity order for the BI definition. PYT is not ranked because of its variability across income classes. It is very dispersed at low levels of income, and relatively equitable at high levels (See Chapter 4). As would be expected by examining Table 39, its dispersion is not significantly different from INS and GAS. However, neither is it significantly different from CIG by either test, and it is not revealed significantly different from MVT by Test 2.[3]

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[2]It is notable that both tests used here waste considerable information. Both neglect the absolute sizes of coefficients, concentrating on rank order instead. The disadvantage in this procedure is the risk of not recording as significant differences in dispersion which actually exist (Type II error). On the other hand, of course, the advantage is that it is unlikely that differences noted here do not in fact exist.

[3]It is significantly different from ALC and SLT by both tests.

TABLE 40

EQUITY ORDER POSITIONS BY INCOME DEFINITION (BROAD INCOME DEFINITION)

Income Level	Other Business Taxes	Corporate Income Tax	Sales Tax	Motor Vehicle Taxes	Insurance Tax	Gasoline Tax	Cigarette Tax	Alcoholic Beverages Tax	Personal Income Tax
$2,000	2	1	3	5	7	6	4	8	9
$3,000	1	2	3	4	7	6	5	9	8
$4,000	1	2	3	5	4	7	6	9	8
$5,000	1	2	3	4	7	5	6	9	8
$6,000	1	2	3	4	5	6	7	9	8
$7,000	1	2	3	4	5	6	7	9	8
$8,000	1	2	3	4	5	6	7	9	8
$9,000	1	2	3	4	5	6	8	9	7
$10,000	1	2	3	4	6	7	8	9	5
$11,000	1	2	3	4	6	5	8	9	7
$12,000	1	2	4	3	6	7	8	9	5
$13,000	1	3	4	2	6	7	8	9	5
$14,000	1	2	6	4	5	7	8	9	3
$15,000	1	2	5	4	6	7	8	9	3
$16,000	1	5	4	2	6	7	8	9	3
$17,000	1	5	4	3	7	6	8	9	2

2) Relative Positions of Individual Taxes

Table 40 shows the relative positions of the taxes across levels. Thus, it contains, in a sense, the equity order at each income level; however no significance tests have been made between successive taxes. Using the information in this table together with the coefficients themselves, Table 39 was derived. Comments on the changing relative positions are made above in the discussions of each tax. One fact is particularly worth noting however. PYT is relatively the second most dispersed up to $8000. At high levels of income, it is one of the least dispersed. This change accounts for its unranked status in Table 39.

3) Analysis

Let us summarize several comments made in Chapters 4-7 which relate to the equity order presented in Table 39.

1. Although income is the standard of equity used here, OBT is shown most equitable. This result is not surprising, since incidence is assumed to be on general consumption. The adage that the fairest tax is that with the broadest base holds true. PYT, though based on income, allows for numerous adjustments, and is clearly less equitable. SLT, which has a narrower consumption base, allowing for considerable expenditure on untaxed items, is also clearly less equitable than OBT. Since OBT is in fact somewhat selective in impact, however, policy conclusions based on its high equity order position must of course be drawn with caution.
2. CYT, which was assigned both to general consumption and to a single source of income, is also less equitable than OBT. It is the income-

incidence side of this tax that contributes the extra dispersion. As income increases, the income side of CYT becomes more important and the tax appears relatively less equitable.[4]

3. Single item taxes are least equitable. CIG and ALC stand at the bottom of the order. The wide dispersion of these items is not surprising. For both, there is a large concentration at zero consumption. A relatively large portion of the population does not consume these "nonessentials"; and a relatively large portion of those who do are reluctant to report such consumption. Relatively larger portions of the population use vehicles and buy insurance, thus the GAS, MVT, and INS taxes are relatively more equitable than CIG and ALC.

4. The increased equity of the PYT across levels is due to the significance of nontaxed sources of income at low levels, and to the declining importance of exemptions as income rises. These matters have been discussed at greater length in Chapter 4.

Relative Position of Total Tax Package

Total tax payments (TOT 1) may be combined for each individual taxpaying unit sampled, and the result treated as another tax. Thus, the dispersion of this package can be compared with the dispersion of the individual taxes. If the total appears less dispersed than its parts, we

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[4]As noted in Chapter 4, the equity of the tax is considered here in isolation, of course. The corporation income tax is inequitable by itself, but may be equitable in the overall context, by getting at lightly taxed sources of income, thus offsetting inequity in the personal income tax. The cancelling inequities issue is discussed in greater detail below.

can conclude that the inequities of the individual taxes must in part cancel each other, and that the removal of a relatively inequitable tax may not produce more overall equity.

TOT 1 was fit into the equity order described above. In the new equity order in Table 41 below, TOT 1 is in the second position, but not significantly more dispersed than OBT. The total package is thus significantly less dispersed than most of its parts. The question, then, is which tax dispersions offset each other.

1) Definitional Cancelling

There are several dispersions which must, by their nature, cancel.

1. On the income side, PYT and CYT offset each other to some extent, since PYT does not reach retained earnings or all capital gains, which are included as income under the BI definition. CYT payment, as calculated here, is larger when income is derived from those sources.
2. On the expenditure side, SLT offsets GAS and INS. Expenditure on the latter items is not subject to sales tax, and they represent alternative uses of income.
3. Similarly, there is a tendency for GAS, INS, CIG, and ALC to offset each other since they are in an overall sense substitutes -- expenditures on any one means less income available to expend on others. This tendency may be negated if two items are "complementary," i. e. if the consumption of one item makes the consumption of another more likely (see below).

Neither of the two taxes not mentioned in 1 to 3 above, OBT and MVT, have definitional offsets. OBT is related to total consumption and

TABLE 41

EQUITY ORDER INCLUDING
TOTAL TAX PAYMENTS (TOT 1)
(BROAD INCOME DEFINITION)

Rank	Tax	Average Rank	Significant Difference Test 1	Significant Difference Test 2
1	Other business	1.38		
1	Total (TOT 1)	2.00		*
2	Corporate income	3.06	*	*
3	Sales	4.56		
3	Motor vehicle	4.75	*	*
4	Insurance	6.81		
4	Gasoline	7.31	*	*
5	Cigarette	8.13	*	*
6	Alcoholic beverages	9.94		
Unranked	Personal income	7.06		

See notes to Table 39.

thus is not reduced by greater expenditure on any items reached by other expenditure taxes. MVT is a wealth tax in California. As such, it is neither an offset to expenditure taxes nor to income taxes, except in that the more income expended to pay the motor vehicle taxes, the less is left to buy other taxable items.

2) Other Cancelling

1. Other possible offsetting dispersions are not definitional. A comparison of SLT and PYT, two of the most important revenue sources, was made to determine whether there is a cancelling effect. One would expect some tendency toward cancelling. At each income level, there are families of various sizes and at various stages of the life cycle.

a. Large families will tend to have heavy purchases and thus high sales tax, but low income tax because of large exemptions, and because of the greater likelihood of itemized deductions made worthwhile due to homeownership. Since food, a major consumption item for large families, is sales tax exempt, however, the tendency for large families to pay heavy sales tax is somewhat negated.[5]

b. Small families and single individuals tend to save relatively large amounts, thus paying small sales tax; they have fewer exemptions and deductions relatively, and thus pay relatively large PYT. Single

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[5]No significant differences in dispersion of SLT payments was found between the BI and ABI definitions.

TABLE 42

COMPARISON OF COEFFICIENTS OF VARIATION FOR SALES TAX AND PERSONAL INCOME TAX AND THE COMBINATION OF SALES TAX AND PERSONAL INCOME TAX (BROAD INCOME DEFINITION)

Income Level	Sales-Personal Income Combination	Sales	Personal Income
1. $2,000	83	84	471
2. $3,000	74#	79@	238#@
3. $4,000	59#	65@	214#@
4. $5,000	60#	66@	198#@
5. $6,000	49#	55@	159#@
6. $7,000	47#	53@	122#@
7. $8,000	47#	52@	103#@
8. $9,000	44*#	51*@	83#@
9. $10,000	42*#	55*	63#
10. $11,000	40*#	49*@	70#@
11. $12,000	40*#	54*	60#
12. $13,000	38*#	52*	53#
13. $14,000	35*#	53*@	44#@
14. $15,000	35*#	50*	50#
15. $16,000	35*	47*	42
16. $17,000	28*	45*@	33@

TABLE 42--Continued

Identification of significant differences between coefficients.

* Combination and Sales Tax
\# Combination and Personal Income Tax
@ Sales Tax and Personal Income Tax

SUMMARY[a]

Combination-Sales		Combination-Personal Income		Sales-Personal Income	
Combo>S	Significant	Combo>P	Significant	S>P	Significant
0	--	0	--	4	2
S>Combo	Significant	P>Combo	Significant	P>S	Significant
16	9	16	13	12	8

[a]"Combo>S" refers to the number of income levels at which the coefficient of variation for the combination is larger than that for the Sales Tax.

"Significant" refers to the number of those levels for which the difference between the coefficients is significant.

SIGNIFICANCE TESTS FOR OVERALL DIFFERENCES

	Sign Test	Rank-Sum Test
Combination-Sales	Significant	Significant
Combination-Personal Income	Significant	Significant
Sales-Personal Income	Significant	Significant

individuals particularly, are subject to high income taxes. The initial exemption is $1500. A married couple gets an additional $1500 exemption and split brackets.

c. Young families tend toward heavy purchases of durables, thus paying high SLT. Many of these purchases are debt financed. Incomes, and thus income tax payments may be relatively low.

d. Older families in earning years tend to save relatively large amounts. Sales tax payments are low relative to younger families, income tax payments higher.

e. Families and individuals outside the labor force often have nontaxable sources of income, thus relatively low PYT payments, but in some cases heavy purchases; for example, for medically related expenses.

To the extent that those paying relatively large income taxes pay relatively small sales taxes, the combination of the two should be more horizontally equitable than the individual taxes. Table 42 details comparison of SLT, PYT, and the SLT-PYT combination. By both significance tests, the combination is revealed significantly less dispersed than either SLT or PYT alone, confirming the hypothesis that the taxes do offset each other to some extent.

2. Two other pairs of taxes were compared in the same manner as SLT and PYT: CIG and ALC; and GAS and MVT. The hypothesis in these cases was not cancellation, but complementarity. That is, it is logical to suppose that the consumption of cigarettes and alcoholic beverages go

TABLE 43

COMPARISON OF COEFFICIENTS OF VARIATION FOR CIGARETTE TAX, ALCOHOLIC BEVERAGES TAXES AND THE COMBINATION OF CIGARETTE TAX AND ALCOHOLIC BEVERAGES TAXES (BROAD INCOME DEFINITION)

Income Level	Cigarette-Alcohol Combination	Cigarette	Alcohol
$2,000	158	141	440
$3,000	129	112@	438@
$4,000	107*	108@	223*@
$5,000	118*	100@	296*@
$6,000	95*	96@	212*@
$7,000	97*	97@	173*@
$8,000	91*	87@	179*@
$9,000	99*	88@	213*@
$10,000	96*	97@	173*@
$11,000	89*	90@	153*@
$12,000	93*	100@	143*@
$13,000	85*	96	123*
$14,000	93*	87@	153*@
$15,000	116	118	166
$16,000	89	93	133
$17,000	125	100	194

TABLE 43--Continued

Identification of significant differences between coefficients.

* Combination and Alcoholic Beverages Tax
\# Combination and Cigarette Tax
@ Alcoholic Beverage Tax and Cigarette Tax

SUMMARY[a]

Combination-Alcohol		Combination-Cigarette		Cigarette-Alcohol	
Combo>A	Significant	Combo>C	Significant	C>A	Significant
0	--	7	0	0	--
A>Combo	Significant	C>Combo	Significant	A>C	Significant
16	11	8	0	16	11

[a]"Combo>A" refers to the number of income levels at which the coefficient of variation for the combination is larger than that for the Alcoholic Beverages Tax. "Significant" refers to the number of those levels for which the difference between coefficients is significant.

SIGNIFICANCE TESTS FOR OVERALL DIFFERENCES

	Sign Test	Rank-Sum Test
Combination-Alcohol	Significant	Significant
Combination-Cigarette	Not Significant	Not Significant
Cigarette-Alcohol	Significant	Significant

hand in hand. If this is the case, the dispersion of the combination should be greater than that of either individually. And unless the combination in turn offsets other taxes, it should contribute to the inequity of the total. Similarly, the gasoline and motor vehicle taxes might be supposed complementary.

A comparison of the combination with CIG and ALC reveals that the combination is significantly less dispersed than ALC and not significantly differently dispersed from CIG (Table 43). Thus, the evidence does not support the hypothesis that the inequity of the combination should be greater than that of the individual taxes -- there are many non-smoking drinkers and vice versa. Nor, of course does it suggest that smokers are not drinkers and vice versa. (If that were so, the combination would be less dispersed than both individual taxes.)

It was noted in Chapter 7 that, if viewed as benefit levies, the GAS and MVT taxes together are a more accurate reflection of benefits received than either alone. Viewed as taxes for which equity is relevant, it at first seems logical to suppose that the two together should complement and thus be more inequitable than either alone. MVT relates to the value of the automobile stock owned by the individual; GAS to the gallons of gasoline consumed. It might be assumed that the most valued automobiles consume the most gasoline because of their larger size. If so, GAS and MVT should complement. The extent of depreciation of an automobile in its first years of life tends to negate this relationship, however. Large automobiles consume more gasoline, but a large automobile one or two

TABLE 44

COMPARISON OF COEFFICIENTS OF VARIATION FOR GASOLINE TAX, MOTOR VEHICLES TAXES AND THE COMBINATION OF GASOLINE TAX AND MOTOR VEHICLE TAXES (BROAD INCOME DEFINITION)

Income Level	Gasoline-Vehicle Combination	Gasoline	Vehicle
$2,000	136	164	146
$3,000	101	123	106
$4,000	93#	120#	94
$5,000	71#	90#@	75@
$6,000	69#	89#@	68@
$7,000	54#	75#@	56@
$8,000	56#	76#@	55@
$9,000	54#	73#@	54@
$10,000	53#	71#@	56@
$11,000	50#	69#@	51@
$12,000	54#	79#@	50@
$13,000	53#	76#@	48@
$14,000	51#	72#@	48@
$15,000	50#	72#@	50@
$16,000	49*#	77#@	37*@
$17,000	48	68#@	39@

TABLE 44--Continued

Identification of significant differences between coefficients.

* Combination and Motor Vehicle Taxes
\# Combination and Gasoline Tax
@ Motor Vehicle Taxes and Gasoline Tax

SUMMARY[a]

Combination-Gasoline		Combination-Vehicle		Gasoline-Vehicle	
Combo>G	Significant	Combo>V	Significant	G>V	Significant
0	--	7	1	0	--
G>Combo	Significant	V>Combo	Significant	V>G	Significant
16	13	8	0	16	13

[a]"Combo>G" refers to the number of income levels at which the coefficient of variation for the combination is larger than that for the Gasoline Tax.

"Significant" refers to the number of those levels for which the difference between coefficients is significant.

SIGNIFICANCE TESTS FOR OVERALL DIFFERENCES

	Sign Test	Rank-Sum Test
Combination-Gasoline	Significant	Significant
Combination-Vehicle	Not Significant	Not Significant
Gasoline-Vehicle	Significant	Significant

years old is worth less than a new smaller one. Further, gasoline consumption is related to distance driven, speed, and traffic conditions even more than to vehicle size. There may be some tendency for newer and thus more valuable vehicles to be driven farther than older ones. If so, again GAS and MVT should complement and the combination should be more inequitable than either individual tax. However, older vehicles are somewhat less efficient in their use of fuel than newer ones; to the extent that this is true, GAS payments should be inversely related to MVT payments. In sum, the conflicting arguments presented above suggest that the taxes should neither offset nor complement each other.

The combination of GAS and MVT payments was compared to the individual taxes (Table 44). The combination is revealed significantly more equitable than GAS alone, and not significantly different from MVT. This evidence does not support the initial hypothesis of complementarity.

3) Total Package Less Road User Charges

Further test was made to determine whether the gasoline-motor vehicle combination offsets other taxes in the package as a group. I can think of no a priori reason why offsetting should occur other than the already noted fact that gasoline expenditure and motor vehicle tax payments represent expenditures on alternative items, leaving less income to spend on cigarettes, alcoholic beverages, insurance, and items subject to the sales tax.

There is, however, an important reason for making the comparison. As noted in Chapter 3, the question as to whether the gasoline and vehicle

TABLE 45

EQUITY ORDER INCLUDING TOTAL TAXES
LESS ROAD USER CHARGES (TOT 2)
(BROAD INCOME DEFINITION)

Rank	Tax	Average Rank	Significance Test 1	Significance Test 2
1	Other business	1.44		
1	Total (TOT 2)	1.88	*	*
2	Corporate income	3.13	*	*
3	Sales	4.56		
3	Motor vehicle	4.75	*	*
4	Insurance	6.81		
4	Gasoline	7.31	*	*
5	Cigarette	8.13	*	*
6	Alcoholic beverages	9.94		
Unranked	Personal income	7.06		

TABLE 46

EQUITY ORDER POSITIONS OF
TOTAL MEASURES BY INCOME LEVELS
(BROAD INCOME DEFINITION)

Income Level	TOT 1	TOT 2
1. $2,000	3	3
2. $3,000	3	3
3. $4,000	3	3
4. $5,000	3	3
5. $6,000	3	2
6. $7,000	2	2
7. $8,000	2	2
8. $9,000	2	2
9. $10,000	2	2
10. $11,000	2	2
11. $12,000	2	1
12. $13,000	1	1
13. $14,000	1	1
14. $15,000	1	1
15. $16,000	1	1
16. $17,000	1	1

taxes are truly taxes and not user charges must be faced when the total tax package is being examined. Where the two fit into the equity order makes little difference. If not considered relevant for equity by the reader, the positions in the equity order may be ignored without changing the results for other taxes. However, including them in TOT 1 may result in a more, or less, equitable distribution of total tax payments than exclusion. That is, if GAS and MVT are considered user charges, does the equity of the total tax package appear greater? Taxes less road user charges (TOT 2) were totaled and fit into the equity order of Table 39. Like TOT 1, TOT 2 also ranks second, not significantly different from OBT. (See Table 45.) Direct comparison was also made between the two total measures using the sign and U tests. The two TOT measures are not significantly different from each other by either test. It must then be concluded that GAS and MVT do not contribute significantly to overall horizontal equity (or inequity) of the tax system. They do not, taken together, significantly offset, or add to, inequity of other taxes.

4) Relative Trend in Total Measures

Observing the relative position of the total measures across income classes reveals changes in the extent of cancelling. (See Table 46) Both TOT 1 and TOT 2 move from the third position at lower levels of income to first at higher levels. This fact in turn suggests that the equity of total packages should be greater at higher levels.

TABLE 47

COEFFICIENTS OF VARIATION OF TOTAL TAX PAYMENTS (TOT 1) BY INCOME LEVELS (BROAD INCOME DEFINITION)

Income Level	Coefficient of Variation	Succeeding Levels from which Significantly Different	Rank Order of Coefficients
1. $2,000	68.2	3 through 16	16
2. $3,000	58.5	3 through 16	15
3. $4,000	46.7	5 through 16	14
4. $5,000	41.9	6 through 16	13
5. $6,000	37.6	6 through 16	12
6. $7,000	30.9	10, 14, 15, 16	10
7. $8,000	32.1	10, 14, 15, 16	8
8. $9,000	30.6	16	11
9. $10,000	31.5	10, 14, 15, 16	6
10. $11,000	27.1		9
11. $12,000	30.8	16	5
12. $13,000	28.7		4
13. $14,000	28.0		7
14. $15,000	25.9		3
15. $16,000	25.7		2
16. $17,000	24.0		1

TABLE 48

COEFFICIENTS OF VARIATION OF
TOTAL TAX PAYMENTS LESS ROAD USER CHARGES (TOT 2)
BY INCOME LEVELS (BROAD INCOME DEFINITION)

Income Level	Coefficient of Variation	Succeeding Levels from which Significantly Different	Rank Order of Coefficients
1. $2,000	58.7	3 through 16	16
2. $3,000	55.7	3 through 16	15
3. $4,000	41.1	5 through 16	13
4. $5,000	42.7	5 through 16	14
5. $6,000	34.9	8, 10, 12 through 16	12
6. $7,000	33.0	10, 14, 15, 16	11
7. $8,000	32.8		10
8. $9,000	30.7		8
9. $10,000	31.4		9
10. $11,000	28.7		6
11. $12,000	30.7	16	5
12. $13,000	29.8	16	4
13. $14,000	28.9		7
14. $15,000	27.2		3
15. $16,000	25.9		2
16. $17,000	23.6		1

Equity Across Levels

That horizontal equity is greater at higher levels is spelled out explicitly in Table 47 which shows the coefficients of variation for TOT 1 and their descending rank order. As is suggested by Column 3 of the table, the income levels can be separated roughly into four groups or equity levels: Least equitable -- income at $2000 and $3000; second, $4000 through $6000; third, $7000 through $10,000; and most equitable -- $11,000 through $17,000. Similar results for the TOT 2 package are presented in Table 48.

The trend toward equity at higher levels of income can, of course, be explained by the behavior of individual taxes across levels, which is discussed in Chapters 4 through 7. Apparently, the key in the overall trend is again the sharp trend toward equity of PYT combined with its increasing importance in the total tax package. Trends toward equity are also observable in other taxes, particularly SLT and MVT. CYT shows no such tendency at all; nor is a trend observable for CIG or INS.

Equity Across Definitions

To this point in Chapter 8, only the broad income definition has been considered. In this section, first the horizontal equity of the total measures is compared under different definitions (question 4), and second, results for BI, discussed above, are compared with the results derived from the same tests made for other income definitions.

1) Totals Across Definitions

Table 49 shows the coefficients of variation for TOT 1 at all income levels under all four definitions; Table 50 contains the same statistics for TOT 2.

1. A comparison of TOT 1 under BI and TOT 1 under NI reveals no significant difference overall by either test. Only at one income level is TOT 1 significantly less dispersed using one definition rather than the other. A comparison of TOT 2 under the two definitions reveals similar results.

2. The impact of family size on horizontal equity can be seen by comparing both BI and NI with the same definitions adjusted for family size. Overall, by either significance test, there is no significant difference between either BI and ABI or NI and ANI. However, the adjusted definitions appear more equitable at low levels of income (levels 1-3), the unadjusted definitions at higher levels. This is true for both TOT 1 and TOT 2.

The family size adjustments make income taxes appear more equitable (see Chapter 4). Consumption taxes appear less equitable;[6] consumption is related to total income, thus larger families are likely to pay far more in consumption taxes than the smaller families with which they are compared. Since consumption taxes make up 60 per cent or more of total taxes at any level, it would not be surprising to find that the total tax package appeared less dispersed under the unadjusted

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[6]This is particularly true of OBT, but is observable with other taxes.

TABLE 49

TOTAL TAX PAYMENTS (TOT 1)
COEFFICIENTS OF VARIATION

Income Level		Adjusted Broad Income	Broad Income	Narrow Income	Adjusted Narrow Income
1A.	($1,000)	88.6 *	--	--	78.6 *
1.	($2,000)	53.9 *	68.2	59.1	52.5 *
2.	($3,000)	41.4	*58.5 *	53.5 *	*40.9
3.	($4,000)	42.6	46.7	44.0	39.1
4.	($5,000)	43.2	41.9	40.6 *	44.8
5.	($6,000)	42.6	37.6 *	34.2	*41.2
6.	($7,000)	40.1	*30.9	30.7	*39.3
7.	($8,000)	38.3	32.1	32.5	*44.7
8.	($9,000)	43.0	*30.6	29.6	*44.9
9.	($10,000)		31.5 *	28.2	
10.	($11,000)		27.1	27.3	
11.	($12,000)		30.8	*26.5	
12.	($13,000)		28.7	23.3	
13.	($14,000)		28.0	28.8	
14.	($15,000)		25.9	25.6	
15.	($16,000)		25.7	25.9	
16.	($17,000)		24.0	27.5	

Note: * identifies significant differences between coefficients at adjacent levels of income, or adjacent income definitions.

TABLE 49--Continued

SUMMARY

CROSS LEVEL[a]

Adjusted Broad		Broad		Narrow		Adjusted Narrow	
INC	SIGN	INC	SIGN	INC	SIGN	INC	SIGN
2	0	3	0	3	0	3	0
DEC	SIGN	DEC	SIGN	DEC	SIGN	DEC	SIGN
6	2	12	3	12	2	5	2

[a]INC refers to number of income levels at which coefficient of variation is larger than at next lower level of income.

DEC refers to number of income levels at which coefficient of variation is smaller than at next lower level of income.

SIGN refers to number of significant increases or decreases.

CROSS DEFINITION[b]

Adjusted Broad compared to Broad		Broad compared to Narrow		Adjusted Narrow compared to Narrow	
AB<B	SIGN	B<N	SIGN	AN<N	SIGN
3	1	5	0	3	1
AB>B	SIGN	B>N	SIGN	AN>N	SIGN
5	2	11	1	5	4

[b]AB<B refers to the number of levels at which the coefficient for the Adjusted Broad definition was smaller than that for the Broad definition. A smaller coefficient is associated with less dispersion, or greater equity.

definitions. This expected result clearly prevails for levels 5 through 8 for both TOT 1 and TOT 2. At levels 1 through 3, however, both total measures appear more equitable under the adjusted definitions. This result seems more difficult to explain, especially since PYT is relatively

TABLE 50

TOTAL TAX PAYMENTS LESS
ROAD USER CHARGES (TOT 2)
COEFFICIENTS OF VARIATION

Income Level	Adjusted Broad Income	Broad Income	Narrow Income	Adjusted Narrow Income
1A. ($1,000)	76.0 *	--	--	71.2 *
1. ($2,000)	51.4 *	58.7	53.4	49.9 *
2. ($3,000)	40.7	*55.7 *	*45.0	42.1
3. ($4,000)	44.5	41.1	44.1	40.7
4. ($5,000)	44.6	42.7 *	40.4 *	46.3
5. ($6,000)	44.4	*34.9	35.2	*43.3
6. ($7,000)	43.4	*33.0	31.8	*45.4
7. ($8,000)	40.6	32.8	33.4	*50.7
8. ($9,000)	45.0	*30.7	30.9	*49.7
9. ($10,000)		31.4	27.7	
10. ($11,000)		28.7	27.3	
11. ($12,000)		30.7	28.0	
12. ($13,000)		29.8	25.9 *	
13. ($14,000)		28.9	33.8	
14. ($15,000)		27.2	27.8	
15. ($16,000)		25.9	26.3	
16. ($17,000)		23.6	29.5	

Note: * identifies significant differences between coefficients at adjacent levels of income, or adjacent income definitions.

TABLE 50--Continued

SUMMARY

CROSS LEVEL[a]

Adjusted Broad		Broad		Narrow		Adjusted Narrow	
INC	SIGN	INC	SIGN	INC	SIGN	INC	SIGN
3	0	3	0	4	1	3	0
DEC	SIGN	DEC	SIGN	DEC	SIGN	DEC	SIGN
5	2	12	2	11	1	5	2

[a]INC refers to number of income levels at which coefficient of variation is larger than at the next lower level of income.
DEC refers to number of income levels at which coefficient of variation is smaller than at next lower level of income.
SIGN refers to number of significant increases or decreases.

CROSS DEFINITION[b]

Adjusted Broad compared to Broad		Broad compared to Narrow		Adjusted Narrow compared to Narrow	
AB<B	SIGN	B<N	SIGN	AN<N	SIGN
2	1	8	0	3	0
AB>B	SIGN	B>N	SIGN	AN>N	SIGN
6	3	8	1	5	4

[b]AB<B refers to the number of levels at which the coefficient for the Adjusted Broad definition was smaller than that for the Broad definition. A smaller coefficient is associated with less dispersion, or greater equity.

unimportant at these income levels (see Table 3). However, at these levels, the consumption taxes appear more equitable under the adjusted definitions than under the unadjusted. At low levels of income, SLT and OBT account for a large portion of total tax payments. Thus TOT 1 and

TOT 2 tend to be more equitable under the adjusted definitions.[7] That SLT is relatively equitable under the adjusted definitions at low levels can be explained by the fact that the tax exempts food, and food is the major consumption item at such levels. That OBT appears relatively equitable under the adjusted definition at those levels is harder to explain.

2) Equity Orders Across Definitions

Table 51 shows the overall equity order of taxes under each of the four definitions. The results are broadly similar under each definition. The most outstanding difference is that the CYT is unranked under NI and ANI, due to its extreme variation across levels under those definitions. This difference in CYT is basically methodological rather than substantive, as noted in Chapter 4.

3) Relative Positions of Total Packages

Table 52 shows the position of TOT 1 in the equity order under each definition. In no case is it revealed significantly more or less dispersed than OBT. Table 53 shows the position of TOT 2 in the equity order under each definition. Here, the total package is significantly more dispersed than OBT under NI, indicating relatively less cancelling.

Tests for cancelling were made for the CIG-ALC combination, the GAS-MVT combination, and the SLT-PYT combination under each definition. Results were similar under each definition for the first two mentioned combinations, as can be seen in Table 54. SLT-PYT test

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[7]The difference is significant only at level 2: for TOT 1 in both the BI-ABI and NI-ANI comparison; for TOT 2 in the BI-ABI comparison only.

TABLE 51

EQUITY ORDER -- ALL DEFINITIONS

Adjusted Broad Income			Significance		Broad Income			Significance	
Rank	Tax	Av. Rank	Test 1	Test 2	Rank	Tax	Av. Rank	Test 1	Test 2
1	Other business	1.33	*		1	Other business	1.06	*	*
2	Corporate income	2.67	*		2	Corporate income	2.38	*	*
3	Motor vehicle	3.78			3	Sales	3.56		
3	Sales	3.89	*	*	3	Motor vehicle	3.75	*	*
4	Insurance	6.11			4	Insurance	5.81		
4	Gasoline	6.44	*	*	4	Gasoline	6.31	*	*
5	Cigarette	7.56	*	*	5	Cigarette	7.13	*	*
6	Alcoholic beverages	8.89			6	Alcoholic beverages	8.94		
None	Personal income	4.33			None	Personal income	6.06		

TABLE 51--Continued

Narrow Income					Adjusted Narrow Income				
			Significance					Significance	
Rank	Tax	Av. Rank	Test 1	Test 2	Rank	Tax	Av. Rank	Test 1	Test 2
1	Other business	1.00	*	*	1	Other business	1.11	*	*
2	Sales	2.50	*		2	Sales	3.22		
3	Motor vehicle	3.38	*	*	2	Motor vehicle	3.44	*	*
4	Insurance	5.38	*		3	Gasoline	5.67	*	
5	Gasoline	6.19	*	*	4	Insurance	6.56		
6	Cigarette	7.25	*	*	4	Cigarette	7.11	*	*
7	Alcoholic beverages	8.88			5	Alcoholic beverages	8.67		
None	Personal income	5.94			None	Personal income	4.22		
None	Corporate income	4.38			None	Corporate income	5.00		

TABLE 52

EQUITY ORDER INCLUDING TOT 1 -- ALL DEFINITIONS

Adjusted Broad Income			Significance		Broad Income			Significance	
Rank	Tax	Av. Rank	Test 1	Test 2	Rank	Tax	Av. Rank	Test 1	Test 2
1	Total (TOT 1)	1.78			1	Other business	1.38		
1	Other business	2.00	*		1	Total (TOT 1)	2.00		*
2	Corporate income	3.33	*		2	Corporate income	3.06	*	*
3	Motor vehicle	4.78			3	Sales	4.56		
3	Sales	4.89	*	*	3	Motor vehicle	4.76	*	*
4	Insurance	7.11			4	Insurance	6.81		
4	Gasoline	7.44	*	*	4	Gasoline	7.31	*	*
5	Cigarette	8.56	*	*	5	Cigarette	8.13	*	*
6	Alcoholic beverage	9.89			6	Alcoholic beverage	9.94		
None	Personal income	5.22			None	Personal income	7.06		

TABLE 52--Continued

Narrow Income					Adjusted Narrow Income				
			Significance					Significance	
Rank	Tax	Av. Rank	Test 1	Test 2	Rank	Tax	Av. Rank	Test 1	Test 2
1	Other business	1.31			1	Other business	1.67		
1	Total (TOT 1)	1.81	*	*	1	Total (TOT 1)	1.67	*	*
2	Sales	3.50	*		2	Sales	4.22		
3	Motor vehicle	4.38	*	*	2	Motor vehicle	4.44	*	*
4	Insurance	6.38	*		3	Gasoline	6.67	*	
5	Gasoline	7.19	*	*	4	Insurance	7.56		
6	Cigarette	8.25	*	*	4	Cigarette	8.11	*	*
7	Alcoholic beverages	9.88			5	Alcholic beverages	9.67		
None	Personal income	6.94			None	Personal income	5.11		
None	Corporate income	5.25			None	Corporate income	5.89		

TABLE 53

EQUITY ORDER INCLUDING TOT 2 -- ALL DEFINITIONS

Adjusted Broad Income					Broad Income				
			Significance					Significance	
Rank	Tax	Av. Rank	Test 1	Test 2	Rank	Tax	Av. Rank	Test 1	Test 2
1	Other business	1.78			1	Other business	1.44		
1	Total (TOT 2)	2.00			1	Total (TOT 2)	1.88	*	*
1	Corporate income	3.33	*		2	Corporate income	3.13	*	*
2	Motor vehicle	4.78			3	Sales	4.56		
2	Sales	4.89	*	*	3	Motor vehicle	4.75	*	*
3	Insurance	7.11			4	Insurance	6.81		
3	Gasoline	7.44	*	*	4	Gasoline	7.31	*	*
4	Cigarette	8.56	*	*	5	Cigarette	8.13	*	*
5	Alcoholic beverages	9.89			6	Alcoholic beverages	9.94		
None	Personal income	5.22			None	Personal income	7.06		

TABLE 53--Continued

Narrow Income					Adjusted Narrow Income				
			Significance					Significance	
Rank	Tax	Av. Rank	Test 1	Test 2	Rank	Tax	Av. Rank	Test 1	Test 2
1	Other business	1.19	*		1	Other business	1.44		
2	Total (TOT 2)	1.94	*	*	1	Total (TOT 2)	1.89	*	*
3	Sales	3.50	*		2	Sales	4.22		
4	Motor vehicle	4.38	*	*	2	Motor vehicle	4.44	*	*
5	Insurance	6.38	*		3	Gasoline	6.67	*	
6	Gasoline	7.19	*	*	4	Insurance	7.56		
7	Cigarette	8.25	*	*	4	Cigarette	8.11	*	*
8	Alcoholic beverages	9.88			5	Alcoholic beverages	9.67		
None	Personal income	6.94			None	Personal income	5.11		
None	Corporate income	5.25			None	Corporate income	5.89		

TABLE 54

SUMMARY OF RESULTS FOR SELECTED TAX COMBINATIONS

Income Definition	Sales-Personal Income					
	Combo-SLS		Combo-PYT		SLS-PYT	
	Test 1	Test 2	Test 1	Test 2	Test 1	Test 2
Broad	*(16)	*	*(16)	*	*(12)	*
Narrow	*(16)	*	*(16)	*	*(14)	*
Adjusted Broad	*(8)	*	*(8)	-	-(4)	-
Adjusted Narrow	*(8)	*	*(8)	-	-(5)	-
	Gasoline-Motor Vehicle					
	Combo-GAS		Combo-MV		MV-GAS	
	Test 1	Test 2	Test 1	Test 2	Test 1	Test 2
Broad	*(16)	*	-(8)	-	*(16)	*
Narrow	*(16)	*	-(5)	-	*(16)	*
Adjusted Broad	*(9)	*	-(4)	-	*(9)	*
Adjusted Narrow	*(9)	*	-(4)	-	*(9)	*
	Cigarette-Alcohol					
	Combo-ALC		Combo-CIG		CIG-ALC	
	Test 1	Test 2	Test 1	Test 2	Test 1	Test 2
Broad	*(16)	*	-(7)	-	*(16)	*
Narrow	*(16)	*	-(6)	-	*(16)	*
Adjusted Broad	*(9)	*	-(4)	-	*(9)	*
Adjusted Narrow	*(9)	*	-(4)	-	*(9)	*

Details of each comparison under the BI definition are presented in Tables 42, 43, and 44 above.

Explanation of symbols:

* Significant difference between taxes or tax and combination.

\- No significant difference.

( ) Number of levels at which the coefficient of variation of the first mentioned tax was smaller than the coefficient of the second mentioned. For BI and NI, the maximum is 16. For ABI and ANI, the maximum is 9.

results were somewhat different across definitions. By Test 1, the combination was revealed significantly less dispersed than the individual taxes under all four definitions. By Test 2, however, the combination was not significantly more equitable than PYT under the adjusted definitions. Further, by either test, the SLT was not significantly less dispersed than PYT under the adjusted definitions. These results merely reflect the greater apparent equity of PYT when family size is taken into account.

4) Equity Across Levels

The trend toward greater overall horizontal equity at higher levels of income observable under BI is present, but less obvious, under NI. It disappears beyond the first two levels under either adjusted definition, (see Tables 49 and 50). The differences between the unadjusted and adjusted definitions are explicable, as mentioned above, by the fact that consumption taxes appear less equitable under adjusted definitions at income levels above $5000.

CONCLUSION

In this conclusion, three tasks are undertaken: the more significant results are summarized; certain limitations in the study are reiterated; and several possible avenues for further study are suggested.

Summary of Results

There is empirical evidence for the following six statements:

1. Inequities apparent in the dispersions of various taxes given income level, are offset in part by dispersions of other taxes. Thus, "cancelling inequities" exist, and the tax system as a whole is more equitable than its parts.

2. The tax system as a whole is more equitable horizontally at higher levels of income.

3. Taxes with broad bases are more equitable horizontally, evaluated by an income standard, than those with narrow bases, whether the basis for the broad tax is income or not. At many income levels, the sales tax and "other business taxes" (assigned to general consumption) were found less dispersed than the personal income tax.

4. The sales tax is not as inequitable as might be supposed.[1] Payments of these taxes with narrow bases, particularly the cigarette and alcoholic

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[1]See, for example, Reed R. Hansen, "An Empirical Analysis," p. 12.

beverages taxes are extremely dispersed at all income levels.

5. The motor vehicle and gasoline taxes do not contribute significantly to the overall equity or inequity of the total tax package. The dispersion of the whole does not change significantly when they are excluded.

6. The personal income tax is widely dispersed at low levels of income, but dispersion narrows significantly at higher levels. This tax is one of the most inequitable at low income levels, and among the most equitable at the highest levels considered here.

Limitations

Weaknesses in the study have been pointed out throughout. However, it is useful to summarize the more important limitations. The major limitations divide themselves into two categories: first, those involving weaknesses in the BLS data as it is used for the purposes here; and second, those relating to incidence and exporting assumptions. In addition, there is the inherent limitation in a horizontal equity study stemming from disagreement over the definition of equal circumstances. My definitions here, taken together, have some claim to general appeal perhaps, but it remains true that one can disagree in fundamental ways. Fundamentally different definitions are of course likely to produce significantly different empirical results.

The nature of the data necessitated a number of imputations, some of them quite crude. Particularly, there were several difficulties in assessing total income, the most important of which was the lack of

direct data on capital gains. There were difficulties in applying the taxes. For example, there is no data on the value of the automobile stock and insufficient data to make more than a crude imputation of that value. Thus the motor vehicle taxes could be applied only very inexactly.

A related point concerns the artificiality of separating the tax and benefit sides of the fiscal system, as is done here. First, benefits are in a broad sense income. Excluding them while including other items as income is thus arbitrary. Further, from a somewhat different viewpoint, the benefit side is as relevant as the tax side in assessing equity, even if benefit principle taxation is not considered. If two taxpayers with equal incomes are taxed very unequally, but also receive very unequal packages of benefits, the result may be horizontal equity -- equal treatment of equals. (Including all benefits in income produces a somewhat different result -- our two taxpayers are placed in different income classes, and the differential tax treatment becomes a question of vertical equity.)

I have not included the benefit side here because the data did not allow me to do so in any very meaningful way. The past dearth of empirical studies of horizontal tax burden has been the result of a lack of data. The BLS data, while less than ideal, at least provides a "handle" for some evaluation.

Even were the data perfect, theory and empirical evidence concerning incidence and exporting of state taxes are inadequate. Much work remains to be done. One of the strongest statistical results here, the relative equity of "other business taxes" reflects the weaknesses of incidence assumptions. This result is in part a consequence of treating this complex of taxes as a general consumption tax. Since the taxes are in fact selective in their impact, and since selectivity is unexplored and unaccounted for, any conclusions must be drawn with caution. At the least, however, the result is useful in pointing out the equity of a broad-based consumption tax.

Further Study

There are several directions in which research might logically be carried beyond what has been done here. First, using the same data and approach, a permanent income measure might be used as an equity standard. The taxes could be tested using a consumption or wealth standard of equity instead of income. A hypothetical wealth tax might be evaluated against the income standard. An attempt might be made to include the benefit side. However, as interesting (or uninteresting) as these avenues may be, they are all of minor importance relative to the need for more study of incidence and exporting of state taxes. Until further work is done on these important concepts, studies of state tax burdens, no matter how good are the data used, must necessarily produce somewhat tenuous results.

APPENDIX A

DEFINITION OF INCOME

This appendix presents details of the income definitions and family size adjustments used as bases for the study.

Narrow Income

The "narrow" definition of income includes only data directly available from the BLS survey, in two survey categories: "Money Income Before Taxes" and "Other Money Receipts." These are defined as follows:

Money Income Before Taxes

Total money income during the survey year of all family members from the sources listed below.

Wages and Salaries. -- All money earnings as an employee in the form of wages, salaries, tips, bonuses, commissions, and pay for military personnel on active or reserve duty, before deductions were made for taxes, savings bonds, social security, retirement plans, group life or health insurance plans, etc. Money earnings were adjusted to include the value of two nonmoney items--food and housing received as pay--and to exclude occupational expenses.

Occupational Expenses. -- Union dues and assessments; dues to business and professional associations; licenses, tools, supplies, and special equipment other than clothing required for the job; and expenses for travel or use of the family automobile on the job. All occupational expenses represent the net cost to the family after deduction of the amounts reimbursed by the employer; reimbursements in excess of actual expenses are considered as additions to income from wages and salaries.

Self-Employment Income. -- Net income (gross receipts minus expenses) from a profession or unincorporated business (including a farm), which was operated by the family during the survey year. Gross receipts include the value of all goods sold and services rendered. Expenses include costs of goods purchased, rent, heat, power, depreciation charges, wages and salaries paid, business taxes (not personal income taxes), etc. Net income includes the value of goods and services withdrawn from the business for family use; the retail value of such items was also recorded as family expenditure.

Income from Roomers and Boarders. --Refers to net income received by families having four or fewer roomers and boarders. Income from five or more boarders and roomers is classified as Self-Employment Income. Includes money received for the care of foster children. In calculating net income, only the value of food allocated to boarders was deducted from gross receipts.

Income from Rents. --Refers to the net income received by families having four or less rental properties (houses, apartments, stores, etc.). Income from five or more rental properties is classified as Self-Employment Income. Net income was calculated by deducting expenses for property taxes, insurance, mortgage interest, repairs and maintenance, utilities, and furnishings from gross receipts.

Profits from Stocks and Bonds. --The difference between the purchase price (including broker's fees) and the selling price (after deduction of broker's fees) of stocks and bonds which were bought and sold during the survey year.

Profits from Business Owned but not Operated. -- Return on investment in an unincorporated business or farm.

Interest. --Includes interest received (or credited to account) from bonds, savings accounts (in banks, credit unions, savings and loan associations), notes, mortgages, etc. Excludes interest accrued but not paid in the survey year on bonds, such as Series E U. S. Savings Bonds which were not cashed; but includes interest (i. e., the difference between the amount received and the purchase price) from Series E bonds which were cashed during the survey year.

Dividends. -- Cash dividends from stocks, cooperatives, and insurance policies (except veterans' insurance), dividends from stocks or mutual funds which were applied toward the purchase of additional shares; and dividends from insurance policies which were left on deposit or applied to premiums.

Public Unemployment and Social Security Benefits. -- Amounts received from social security pensions and survivors' benefits, and permanent disability insurance payments made by the Social Security Administration; railroad retirement and civil service retirement benefits (including payments by Federal, State, and local governments); unemployment benefits paid by government agencies, employers, labor unions, or other organizations; and periodic workman's compensation payments received by persons injured on the job.

Private Pensions and Retirement. -- Benefits paid by a former employer or labor union.

Private Insurance Annuities and Trust Funds. -- Regular periodic payments from annuities, estates, trust funds or insurance.

Public Social Assistance and Private Relief. -- Cash payments (or vouchers for the purchase of food at retail) through public programs such as old-age assistance, aid to dependent children, aid to the blind, or through private welfare agencies such as church or community chest organizations.

Gifts of Cash. -- Amounts received from persons outside the consumer unit for such occasions as birthdays, graduations, Christmas, wedding anniversaries, etc. Such gifts do not include regular contributions for support, inheritances, or occasional large gifts of money.

Military Allotments, Pensions, etc. -- All money receipts based on military service other than pay while on active or reserve duty. Includes mustering-out pay; reenlistment and State bonuses; war insurance refunds; dividends on veterans' insurance whether paid to the family or applied to premiums; retirement, survivor, and service-connected disability pay; educational benefits and other allowances; dependency allotments (excluding deduction from family member's pay); and quarters and subsistence allowances for housing, cost of living, separate rations, and clothing.

Other Money Income. -- Contributions for support (alimony, etc.) royalties, payments from disability insurance, excess of payments by health insurance over medical expenses, income from the sale of home grown food, receipts from riders in car pool, and all other income not included elsewhere.

Other Money Receipts

Inheritance and occasional large gifts of money less taxes, legal fees, and other expenses required to obtain such receipts; and net receipts from the lump-sum settlement of fire and accident

insurance policies, or as the beneficiary of policies on the lives of persons outside of the consuming unit. These amounts were recorded as other money receipts in order to differentiate "windfall" receipts from regular income and were not included with money income for family classification purposes. No record was made of gifts and inheritances in the form of real estate, securities, and other property unless they had been sold during the survey year. In that case the net amount received from the sale was recorded as Other Money Receipts.

Ideally, the definition of "narrow income" would also include realized capital gains, but, as noted above, except on assets both bought and sold during the survey year, such data is not available from the survey. Imputation involves rather crude assumptions and since one reason for using the narrow definition was to avoid imputation, capital gains are excluded.

Broad Income

The "broad" definition of income includes, in addition to the items listed in the narrow definition, two survey categories: "Value of Home Produced Food" and "Value of Items Received Without Expense," and three imputations: rental value of owner occupied housing; corporate retained earnings; and realized capital gains. The survey categories are defined:

Value of Home-Produced Food. --The retail value of food which the family raised for its own use.

Value of Items Received Without Expense. -- The figures represent the family's estimate of the money value of goods and services received as gifts from persons outside the consumer unit, or in exchange for trading stamps issued to consumers by retailers, or from public or private welfare agencies, and of all goods and services received as pay except food or rent. The values were nominal in some instances when the family had little or no knowledge

of the true value of the goods and services received, such as the cost of hospitalization and related services for an extended illness. No values were set on services customarily available without charges to the general public.

Rental Value of Owner Occupied Housing

To impute rental value, an estimate of house value had first to be obtained. The survey breaks house value into eleven classes and places a consumer into a class according to the homeowner's estimate of the value of his house. The classes are:

Less than $5000
$5000 - $9999
$10000 - $12499
$12500 - $14999
$15000 - $17499
$17500 - $19999
$20000 - $22499
$22500 - $24999
$25000 - $34999
$35000 - $49999
$50000 and Over

Class midpoints were used as house value estimates for the closed classes except for the less than $5000 class, for which $4000 was used. For the $50,000 and over class, $50,000 was used. Very few individuals in this study fall into this house value category since maximum income here is $17,340, and I assume that those who do have houses in the highest category have homes valued not much in excess of $50,000. For those homeowners who did not report house value, $14,000 was used. The figure is the approximate average value for 1960-62 calculated by the Survey Research Center.

Given estimated house value, and mortgage interest paid annually, which is available directly from the survey data, I follow the work of Okner in computing net imputed rent.[1] He found net imputed rent to be .061 times net equity. In his study he used a more conservative figure of .05 because Department of Commerce data suggest a much lower return. In his calculations he assumed an interest rate of .06. To impute rental value, I thus used the formula:

$$\text{net imputed rent} = .05 \left(x - \frac{rZ}{.06} \right)$$

where x = house value
r = interest rate
Z = debt outstanding

thus rZ = annual interest paid (data category)

and $\left(x - \frac{rZ}{.06} \right)$ = net equity

Capital Gains

Capital gains were imputed on the basis of dividends. Unfortunately, the data tape does not list dividends separately, but rather as a part of the broader category "Interest, dividends, profits from stocks and bonds, and owned but not operated businesses."

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[1] Benjamin A. Okner, Income Distribution and the Federal Income Tax, Michigan Governmental Studies No. 47 (Ann Arbor: Institute of Public Administration, University of Michigan, 1966), Appendix A, p. 103.

A finer breakdown of these income sources is available for aggregated data in BLS Report 237-93 which summarizes the findings of the Survey.[2] Using this aggregated data, dividends as a percentage of receipts from all four of those sources were calculated by after tax income class, as follows[3]:

After Tax Income	Dividends as % of Survey Category
under $1000	22%
$1000-$1999	23%
$2000-$2999	23%
$3000-$3999	37%
$4000-$4999	32%
$5000-$5999	47%
$6000-$7499	38%
$7500-$9999	42%
$10000-$14999	48%
$15000 and over	61%

These were further aggregated to:

under $3000	20%
$3000-$9999	40%
$10000-$14999	50%
$15000 and over	60%

These four percentages were applied to the sample according to after tax income. That this imputation is quite crude is obvious. How crude it is can be seen by looking at the aggregate data. The average dividend receipt for those with $2000-$2999 was 23% of the

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[2]Bureau of Labor Statistics, Consumer Expenditure and Income Detail of Expenditures and Income, Total United States, Urban and Rural 1960-61, BLS Report 237-43, Supplement 3, Part A.

[3]After tax income is used because the aggregated data is presented in this way. After tax income is for this study irrelevant except for making imputations such as these, based on aggregate data available in BLS Report 237-93.

total for the Survey category, or $20.57. However, only 8% of those in that after tax income class received dividends at all, and the average dividend received by those who received dividends was thus about $257. Most people in that after tax income class reporting income as "Interest, dividends, etc." had no dividend income. Most of those who did have dividends had dividends far in excess of 20%. Nonetheless, we attribute 20% of all income received in the category to dividends.

Once dividends were imputed, capital gains were imputed using the ratio of capital gains to dividends, for those who received dividends, by adjusted gross income class, calculated from the Statistics of Income 1961.[4] Statistics of Income reports: all capital gains reported, gross; all capital gains reported, net; and capital gains reported by those who also reported dividends, net. Assuming that the relationship between gross and net capital gains for all taxpayers holds for those who reported dividends, I calculated gross capital gains as a percentage of dividends by adjusted gross income class, and aggregated the classes to the following:

AGI	Gross capital gains/dividends
0-$1999	50%
$2000-$3499	60%
$3500-$5999	75%
$6000-$12999	90%
$13000 and over	100%

[4]U. S. Treasury, Internal Revenue Service, Statistics of Income, Individual Income Tax Returns, 1961.

The percentages were applied to the sample, using as a proxy for adjusted gross income the sum of five survey categories: "Wages and salaries," "Self employment income," "Income from rent, roomers and boarders," "Interest, dividends, profits from stocks and bonds, and owned but not operated businesses," and "Other money income."

Retained Earnings

Retained earnings were also imputed to consuming units on the basis of the imputed dividends. For fiscal 1961, corporate "distributions to stockholders other than in own stock" were found to be 39.5% of corporate "net income," based on data reported in Statistics of Income Corporation Income Tax Returns 1960-61. This figure was divided into imputed dividends for all consuming units.

Family Size Adjustment

The family size adjustments are based on "equivalent income" estimates done by the Bureau of Labor Statistics, derived from their 1950 Survey of Consumer Expenditures, and published in a "Technical Note" in the Monthly Labor Review, November 1960.[5] In their analysis, six family sizes, five family types (varying with age of oldest child), and four age-of-head categories were used. Their estimates were based on food consumption, and the estimates were in turn compared

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[5]"Estimating Equivalent Incomes or Budget Costs by Family Type," Monthly Labor Review (November, 1960), p. 1197.

with other studies based on saving and other types of expenditure. For our analysis, we assume that the values applying to families with age-of-head 35-55 were applicable to all consumers. The scale of equivalent incomes for that group (using a four person family with two children, older 6-16 as the base) in the BLS study is:

Size and Type	
One person	50
Two persons	
Husband and wife	66
One parent and child	68
Three persons	
Husband, wife, child under 6	80
Husband, wife, child 6-16	87
Husband, wife, child 16-18	102
Husband, wife, child 18 or over	98
One parent, 2 children	96
Four persons	
Husband, wife, 2 children (older under 6)	88
Husband, wife, 2 children (older 6-16)	100
Husband, wife, 2 children (older 16-18)	123
Husband, wife, 2 children (older 18 or over)	116
One parent, 3 children	120
Five persons	
Husband, wife, 3 children (oldest under 6)	99
Husband, wife, 3 children (oldest 6-16)	120
Husband, wife, 3 children (oldest 16-18)	139
Husband, wife, 3 children (oldest 18 or over)	131
One parent, 4 children	123
Six or more persons	
Husband, wife, 4 or more children (oldest under 6)	109
Husband, wife, 4 or more children (oldest 6-16)	137
Husband, wife, 4 or more children (oldest 16-18)	146
Husband, wife, 4 or more children (oldest 18 or over)	150
One parent, 5 or more children	131

For the present study, the above figures were adjusted to make the single consumer the base. Further adjustment had to be made because the family types available on the data tape do not conform to the types in the BLS equivalent income study. The following family sizes were used in the present study:

Size and Type	
Single consumer	1.00
Two persons	1.32
Three persons	
no children, or child under 12	1.74
child over 12	2.00
Four persons	
no children, or both children under 12 or over 18	2.00
oldest child over 12	2.40
Five persons	
no children, or all children under 12 or over 18	2.40
oldest child over 12	2.70
Six persons or more	
no children, or all children under 12 or over 18	2.70
oldest child over 12	3.00

These adjusted family sizes were divided into both "broad" income and "narrow" income, and the sample was divided into income classes conforming to each adjusted income definition.

APPENDIX B

DESCRIPTION OF THE SURVEY

This appendix presents a description of the Bureau of Labor Statistics Survey of Consumer Expenditures 1960-61, the basis for this study. The description is abridged from the "Handbook for Survey Users" available from the BLS.

Purpose and Scope

The 1960-61 nationwide Survey of Consumer Expenditures (CES) collected data on family expenditures, income and changes in assets and liabilities. The primary purpose of the survey in urban places was to obtain detailed expenditure data for revising the weights for the BLS Consumer Price Index (CPI), and selecting the items to be priced for that index (the "market basket"). Beyond the CPI revision, the survey was planned to provide data for many other important needs, and consequently its coverage was not limited to CPI urban wage earners and clerical workers. The overall CES urban sample was designed to represent the entire noninstitutional urban population. Moreover, for 1961 the survey was expanded to include rural families. (With the collection of the rural schedules a joint responsibility of the BLS and the U. S. Department of Agriculture.)

For the present study, the above figures were adjusted to make the single consumer the base. Further adjustment had to be made because the family types available on the data tape do not conform to the types in the BLS equivalent income study. The following family sizes were used in the present study:

Size and Type	
Single consumer	1.00
Two persons	1.32
Three persons	
no children, or child under 12	1.74
child over 12	2.00
Four persons	
no children, or both children under 12 or over 18	2.00
oldest child over 12	2.40
Five persons	
no children, or all children under 12 or over 18	2.40
oldest child over 12	2.70
Six persons or more	
no children, or all children under 12 or over 18	2.70
oldest child over 12	3.00

These adjusted family sizes were divided into both "broad" income and "narrow" income, and the sample was divided into income classes conforming to each adjusted income definition.

Sample Selection

Urban Sample

A three stage sample design was used to select a sample representing families and single consumers in the urban population. The first stage was the selection of the cities to be surveyed by a stratified sampling of Standard Metropolitan Statistical Areas (SMSA's) and individual urban places outside SMSA's. Two modes of stratification were used: the geographic areas constituting the four Census regions (Northeast, North Central, South, and West); and four population size strata (A, cities over 1,400,000; B, 250,000 to 1,400,000; C, 50,000 to 250,000; D, 2500 to 50,000). A total of 66 urban sample areas ("cities") were selected for the CES, to represent all urban places in the fifty states. Since the consumer expenditure surveys were conducted in two years (1961 and 1962, covering the years 1960 and 1961), the city sample was divided into two balanced subsamples, each representative of the U. S. urban population. In the 12 largest SMSA's (the A stratum cities), one-half the sample was surveyed in each year; in the other city-size classes, one-half the sample of cities was surveyed each year.

For the second stage, a sample of living quarter addresses was obtained in each city from the Comprehensive Housing Unit Survey (CHUS) made by BLS, or from listings recorded in the 1960 Census of Population and Housing. The CHUS, conducted in cities

with populations of 50,000 or more in 1960, and in places with populations of 2500 or more in 1961, was based on area block samples designed to represent all noninstitutional living quarters (including nontransient quarters in hotels, motels, and rooming houses) in the urban area. The 1960 sample for cities of less than 50,000 population was selected from Census listings of living quarter addresses, arranged by enumeration districts.

In the final stage, the addresses for the Consumer Expenditures Survey were drawn in each city from the CHUS or Census area samples of living quarter addresses, stratified by characteristics of the dwelling and household, with every nth address selected. This procedure yielded a master sample of 12,203 living quarter addresses. If more than one consumer unit resided at a living quarter address, each such unit was included in the sample, and was scheduled if it met eligibility requirements for the survey.

From both the BLS and Census arrays of addresses, an alternate sample was selected by picking the address following each address selected in the master sample. The designated alternate address was substituted if the master address could not be located; the unit was vacant; no one was home after at least two visits; or the occupant refused or was unable to give the information required to complete a nonresponse form.

Rural Sample

Within SMSA's

The first stage of the sample design utilized the 34 SMSA's selected for the urban sample. In the second stage, BLS conducted a Rural Housing Unit Survey (RHUS), with the samples drawn by first selecting stratified samples of Census Enumeration Districts (ED's) and within these ED's selecting subsamples of blocks or small segments. Listings were then made of all housing units in these segments, classifying them as "farm" or "nonfarm" (by Census definition), and as "farm operator" and "nonoperator." In the third stage, subsamples of rural nonfarm and rural farm applying a ratio based on Census data on rural farm and rural nonfarm households in each stratum.

Outside SMSA's

For the first stage the Department of Agriculture grouped counties by State Economic Areas into 126 strata of equal size. From each stratum one county was chosen at random with a probability proportional to its size. In the second stage, within each sample county a selection of rural segments was made separately from rural places (less than 2500 inhabitants) and the open country. Addresses of all housing units in these segments were listed and classified as farm and nonfarm. Farm operators were also identified. In the third stage, subsamples of nonfarm and farm housing unit addresses

were selected from the survey listings. Rural farm consumer units, and the relatively small number of rural nonfarm consumer units operating farms on which they did not live, were sampled at a heavier rate than other rural consumer units.

The Need for Weights

The sample for the urban CES was not designed to be self-weighting, except within individual primary sampling units (SMSA's or other urban places). The same group of SMSA's selected for the urban sample was utilized for the rural metropolitan segment, and the Department of Agriculture selected the primary sampling units for the rural population outside SMSA's. Aside from the various differential sampling rates for the urban population among individual SMSA's, unequal overall sampling rates were used for the urban, rural nonfarm, and rural farm components. Therefore, the sample is not self-weighting across urban areas or across any combination of the urban, rural nonfarm and rural farm segments. This means that the sample data cannot be pooled and simple averages, percentages, etc. computed from sample aggregates. Weighting procedures are outlined on page 8 of the Handbook.

Data Collection and Reporting Forms

The survey data were collected by personal interview. The information was obtained on a completely voluntary basis with a pledge that individual reports would be held confidential. The

names of the respondents were not recorded. Data for 1960 and 1961 were collected in the first half of 1961 and 1962 respectively. At the time the annual data were collected, detailed food expenditures covering the week preceding the interview were also obtained for the urban and rural nonfarm parts of the sample. The questionnaires used by the BLS interviewers had been pretested in three cities: Cincinnati, and Fairbanks and Anchorage, Alaska. Three forms were used by the BLS in the collection of urban data:

Schedule A - Household Record - used to determine the eligibility and membership in consumer units of the persons at each assigned address. It also served to report on nonresponse cases and vacant living quarters.

Schedule B - Annual Income, Savings and Expenditure Record - this was the main collection schedule, containing not only annual value data, but descriptive information pertaining to the family income and expenditures.

Schedule C - Food and Beverages, Personal Care and Household Supplies, and Tobacco Items purchased in a 7-day period - a detailed record of expenditures for the 7 days immediately preceding the interview.

The schedule used for the rural surveys were the same as those used in urban areas, except that Schedule B for rural families

contained some additional details on items of particular importance to farm operators, and Schedule C was not obtained for rural farm families.

Data Review

Before the schedules were forwarded to Washington from the field, they were given an initial edit to determine the completeness and consistency of the reporting and recording of the data. An Accounting Balance Difference (receipts minus disbursements) was calculated. Whenever necessary, respondents were reinterviewed. When the schedules arrived in Washington they were examined to be certain that they were complete and usable, and that entries conformed to survey concepts and methodology. The primary criterion for determining the acceptability of a schedule was the completeness and reasonableness of the reported expenditures, rather than the degree to which receipts and disbursements balanced.

Data Categories

Categories included on the tape for each consumer unit are listed below:

Characteristics

General identification

- Year of survey
- Region
- Stratum size
- Location and size of place
- Urbanization group
- Farm operator status
- City or State code

Schedule number
Expansion factor (weight)
Area classification

Characteristics of head of consumer unit

Sex
Race
Education:
  Code
  Actual years of schooling
Marital status
Age:
  Code
  Actual age
Occupation
Industry
Class of work (private or government)

Consumer unit characteristics

Number of persons:
  Average number
  Number of persons under 18 years
  Number of persons 65 years and over
  Family size code
Family type:
  Part-year membership
  Relationship of family members
  Age of children of head
Earners:
  Total number of earners
  Number of full-time earners
  Earner composition
Family income:
  Before personal taxes
  After personal taxes
Income change:
  Between survey year (SY) and SY minus 1
  Between SY minus 1 and SY minus 2
  Between SY and SY plus 1
Reason for change in income
  Between survey year (SY) and SY minus 1
  Between SY minus 1 and SY minus 2
  Between SY and SY plus 1
Income-savings ratio
Housing characteristics:
  Tenure during all of survey year

Tenure at end of survey year
Change in occupancy status and type of rental housing
Year of home purchase
Market value of owner-occupied housing, end of survey year
Monthly rent paid, end of survey year
Housekeeping arrangement
Auto ownership, end of survey year (actual number of cars owned)

Expenditures for current consumption
Food, total
Food prepared at home
Food away from home
Alcoholic beverages
Tobacco
Housing, total
Shelter, total
Rented dwelling
Owned dwelling, total
Interest on mortgages
Taxes due in survey year
Property insurance
Repairs and replacements
Other expenses
Owned vacation home, cabin, etc.
Lodging out of home city
Other real estate
Fuel, light, refrigeration and water, total
Solid and petroleum fuels
Gas and electricity
Water, sewage, garbage and trash collection
Ice, water softening services, freezer rentals, etc.
Household operations, total
Telephone and telegraph
Other household services
Household supplies
Housefurnishings and equipment, total
Household textiles
Furniture, total
Living room
Dining room
Bedroom
Kitchen, porch, garden, other
Floor coverings
Major appliances, total
Refrigerators, home freezers
Washing machines, clothes dryers, combinations
All other

Small appliances
Housewares, total
Insurance on furnishings, equipment, and apparel
Other
Clothing, clothing materials, and clothing services, total
Men and boys, 18 years and over, total
Outerwear
Underwear, nightwear, hosiery
Footwear
Hats, gloves, and accessories
Expenditures not allocated
Boys, 16 and 17 years, total
Outerwear
Underwear, nightwear, hosiery
Footwear
Hats, gloves, and accessories
Boys, 2 thru 15 years, total
Outerwear
Underwear, nightwear, hosiery
Footwear
Hats, gloves, and accessories
Expenditures not allocated
Women and girls, 18 years and over, total
Outerwear
Underwear, nightwear, hosiery
Footwear
Hats, gloves, and accessories
Expenditures not allocated
Girls, 16 and 17 years, total
Outerwear
Underwear, nightwear, hosiery
Footwear
Hats, gloves, and accessories
Expenditures not allocated
Girls, 2 thru 15 years, total
Outerwear
Underwear, nightwear, hosiery
Footwear
Hats, gloves, and accessories
Expenditures not allocated
Children, under 2 years
Clothing materials
Clothing upkeep

- Transportation, total
  - Automobile purchase
  - Automobile operation
    - Gasoline, motor oil, lubrication, washing, etc.
    - Tires, tubes, batteries, other equipment
    - Operating expenses not allocated (for above 2 lines only)
    - Repairs and parts, not covered by insurance
    - Insurance
    - Registration and other
  - Public transportation, car pools, other
- Medical care, total
  - Prepaid care (premiums)
  - Direct expenses, total
    - For hospitalized illness
    - Physicians' services outside hospital
    - Dental services
    - Eye care, including glasses
    - Other practitioners
    - Drugs and medicines
    - Medical appliances, supplies, other
- Personal care, total
  - Services
  - Supplies
- Recreation, total
  - Television
  - Radio, phonographs, musical instruments, etc.
  - Spectator admissions
  - Participant sports (equipment, fees, dues)
  - Club dues, hobbies, pets, toys, recreation out of home city, other
- Reading
- Education
  - Tuition and fees
  - School books, supplies, equipment
  - Music and other special lessons, other
- Miscellaneous personal consumption expenditures

Personal insurance, total

- Life, endowment, annuity, etc.:
  - Veterans
  - Group (deducted from pay)
  - Other
- Mutual aid
- Disability income
- Other personal insurance
- Social security, railroad and government retirement
- Private retirement

Gifts and contributions, total (cash, goods, services)
- To persons not in family
- To organizations

Net change in assets and liabilities
- Net change in assets
  - Cash in bank, on hand, and money owed to family
  - Purchase, improvement, and sale of:
    - own dwelling
    - other real property
  - Investment in business
  - Stocks and bonds
  - Sale of personal property
  - Settlement or surrender of insurance policies
  - Other assets
- Net change in liabilities
  - Mortgage on own dwelling
  - Mortgage on other real property
  - Money owed to banks, insurance companies, etc.
  - Money owed on purchase of:
    - Automobile
    - Housefurnishings and equipment
    - Other goods and services
  - Money owed on rent, taxes, and other liabilities

Balancing difference

Money income after personal taxes, total
- Money income before personal taxes, total
  - Wage and salary earnings
  - Self-employment income
  - Income from rent, roomers, boarders
  - Interest, dividends, profits from stocks and bonds and owned but not operated businesses
  - Public unemployment or Social Security benefits
  - Private pensions, retirement, insurance annuities, and trust funds
  - Public social assistance and private relief
  - Receipt of cash gifts
  - Military allotments, pensions, etc.
  - Other money income
- Personal taxes

Other money receipts

Value of items received without expense

Value of home produced food

APPENDIX C

CALIFORNIA FISCAL SYSTEM

This appendix lists and briefly describes the main sources of revenue in the California fiscal system as it was in 1961.[1] The following revenue sources are included in the study.

1. Cigarette Tax

Tax is 1 1/2 mills per cigarette or 3¢ per standard package. Other tobacco products are not taxed.

2. Alcoholic Beverage Taxes

Beer:	$1.24 per 31 gal. bbl. or 4¢ per gallon
Wine:	1¢ per gallon (14% or less alcohol)
	2¢ per gallon (over 14% alcohol)
	30¢ per gallon (sparkling wine)
Distilled spirits:	$1.50 per gallon (100 proof or less)
	$3.00 per gallon (over 100 proof)

Licenses:	Six types of initial retail licenses with fees varying from $25 to $6000
	38 classes of annual licenses for production and sale ranging from $10 to $828 per year

3. Gasoline Tax

6¢ per gallon of motor fuel distributed

7¢ per gallon of fuel used to propel motor vehicles except such fuel as is subject to motor fuel tax. The 7¢ rate covers diesel fuel.

4. Sales and Use Taxes

Sales tax -- 3% of gross receipts from retail sales of tangible personal property.

Use tax -- 3% of sales price of tangible personal property purchased for storage, use or consumption.

Major Exemptions

1) Food for consumption off premises

2) Motor vehicle fuels

3) Newspapers and periodicals

4) Prescription medicines (exemption effective January 1, 1962. Considered taxable in this study.)

5) The following services, subject to sales tax in many states are exempt in California: gas, electricity, water, telephone, admissions, transient lodging, public transportation, laundry, and dry cleaning services.

5. Motor Vehicle Taxes and Fees

Registration:	$8 for all vehicles	
License fee:	2% of market value on vehicles subject to registration	
Weight fees:	$12 to $318 on commercial vehicles Weight is measured by "unladen weight."	
Motor vehicle transportation license tax:	1 1/2% of gross receipts of commercial vehicles	
Operators fees:	$3	No account of operators fees is taken in this study

Exemptions:

1) Those who transport their own property

2) Receipts from operations wholy within a city or two or more contiguous cities.

6. Personal Income Tax

Base: Income from all sources less: gifts, inheritances, life insurance proceeds paid on death, workman's compensation and other accident and injury payments, interest on government securities (of the United States and California only), up to $1000 of military compensation, one half of long term capital gains, Social Security benefits.

Business Deductions: Base less business deductions is Adjusted Gross Income. Deductions are allowed for:

1) Trade and business expenses

2) Depreciation, depletion, and amortization

3) Losses on sales or exchanges

4) Entertainment, travel and transportation costs

5) Employee's reimbursed expenses

Exemptions:

1) Married couples filing jointly and heads of households		$3000
2) Single persons		$1500
3) Each dependent other than wife		$600
4) Blind	(additional)	$600
5) Estates		$1000
6) Trusts		$100

Personal Deductions:

A. Standard Deduction

1) Married couples and heads of households -- 10% of Adjusted Gross Income (AGI) up to a maximum of $1000.

2) Other taxpayers -- 10% of AGI up to a maximum of $500.

B. Major Itemized Deductions

1) Contributions up to 20% of AGI

2) Medical expenses in excess of 3% of AGI. The 3% floor is removed for taxpayers over 65. A 5% floor existed to January 1, 1961.

3) All taxes except personal income taxes

4) Interest paid

5) Bad debts

6) Casualty losses

7) Alimony paid

8) Political contributions up to $100

Rates:	1st $2500 of taxable income	1%
	2nd $2500	2%
	3rd $2500	3%
	4th $2500	4%
	5th $2500	5%
	6th $2500	6%
	7th $2500 and over	7%

Brackets for married couples filing jointly are twice as wide.

7. Corporation Income Taxes

Bank and corporation franchise tax: Applies to business and public utility corporations with a rate of 5.5% of net income derived from business transacted in California. A sales, payroll, property formula is used to determine the extent of business transacted in California.

Corporate Income tax: 5.5% of net income derived from sources within the state of corporations not taxable under the Bank and Corporation Franchise Tax.

8. Insurance Company Tax

The tax is 2.35% of gross premiums less reinsurance, return premiums, and dividends. Fraternal life insurance and hospitalization insurance groups are exempt as is self insurance. A "principal office" real estate tax deduction reduces the effective rate of tax on many companies. Overall effective tax rate is reduced by about .1%. See the Report Pt. 4 p. 42 ff.

The following revenue sources are excluded from the study:

9. Corporate Organization and Qualification Fees

Domestic -- graduated from $15 for $25,000 or less, to $100 for $1 m. capital stock authorized; over $1 m., $100 plus $500 per $500,000 or fraction thereof in excess of $1 m.

Increase in capital stock -- $5 per $50,000 or fraction thereof

Foreign -- $450

These fees were excluded because of small yield (c. .5%)

10. Pari-mutual Tax

Marginal rates 5% through 8% in five brackets on dollar volume handled in parimutual pool.

This tax was excluded because of the impossibility of imputing it given the data available in the Survey. Gambling losses are included in the Survey category: Club Dues, Hobbies, Pets, Toys, Recreation out of Home City, Other. Gambling gains are included in the Survey category: Other Money Receipts, together with inheritances, gifts, etc. No reasonable way exists to separate gambling. Most consumers probably do not gamble at all, thus assigning a percentage to gambling would be unreasonable. (Yield: c. 1.6%)

11. Severance Tax

Tax per bbl. of oil produced and cubic feet of natural gas produced, determined annually and based on estimate of annual consumption cost. This tax was excluded because of the small yield. (c. .04%)

12. Inheritance and Estate Taxes

Inheritance: rates 2% to 24% of market value of property transferred at death with exemptions ranging from $50 to $12000 for various classes of beneficiaries.

Estate: Amount by which maximum Federal credit exceeds California inheritance tax, as measured by net estate as defined by Federal law. These taxes were excluded because of the difficulty in separating inheritances from the Survey category: Other Money Receipts. The taxes probably fall mainly on those with incomes greater than the study considers. (Yield: c. 3.3% with gift tax)

13. Gift Tax

Rates the same as inheritance tax rates, and exemption the same with minor exceptions. Measured by market value at time of transfer. This tax was excluded because of its small yield and the difficulty in separating the taxable component from nontaxable components in the Survey.

14. Private Car Tax

A tax on railroad cars owned by private individuals and companies other than railroad companies. This tax was excluded because of its small yield. (c..1%)

15. Unemployment and Disability Compensation Tax

Employees -- 1.1% of first $7400 of wages, for disability benefits.

Employers -- 2.2% to 3.5% of first $3800 of wages paid to each employee in the calendar year, the percentage varying with years of service of the employee.

This tax was not included because it is not essentially a tax, but rather a form of insurance. The revenues are not included in the general fund and are not included in Table 1.

16. Other Revenues

Licenses and examination fees collected by professional and vocational registration agencies, hunting and fishing licenses, and other licenses and fees provide most of the remaining state revenue.

APPENDIX D

CIGARETTE TAX

This appendix discusses the calculations made in arriving at the cigarette tax burden.

1. The data list consumer expenditures on Tobacco which includes cigarettes, cigars, pipe tobacco, lighters, pipes, and all other smokers supplies. The tax applies only to cigarettes. Cigarettes are assumed to make up 87% of the data category for all consumers. The figure is the average percentage of domestic expenditures on tobacco products devoted to cigarettes for the years 1960-62. It was calculated from Tobacco Situation, December, 1966.[1] Smokers' supplies are not considered in the calculation. Such a calculation, of course, masks inequities that exist between smokers of cigarettes and smokers of nontaxed products.

2. The average price per package of 20 cigarettes is assumed to be 27¢ for 1961. This figure was arrived at by dividing domestic cigarette consumption by expenditures on cigarettes.[2]

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[1] U. S. Department of Agriculture, Economic Research Service, Tobacco Situation (December, 1966), Table 32, p. 62.

[2] Data from Ibid., Table 1, p. 6 and Table 32, p. 52.

3. Using the above assumptions, cigarette tax payment is calculable. At 27¢ per package, the 3¢ per package tax is 11% of the purchase price. Each consumer's tobacco expenditure is multiplied by (.87 x .11) or .10 to determine the amount of cigarette tax payment.

APPENDIX E

ALCOHOLIC BEVERAGE TAXES

This appendix describes the procedure used to estimate the alcoholic beverage taxes paid by the consuming units in the sample.

1. The data category Alcoholic beverages includes beer, ale, liquors, and wine served at home or consumed in restaurants, bars, and other eating and drinking places. Quite different tax rates apply to the various components, so an estimate of their relative importance is necessary.

2. It is assumed that 70 per cent of expenditures in the data category represent home consumption and 30 per cent away from home consumption for all consumers. This division is based on that used in the CPI, derived from the same data used in the present study.[1] A breakdown by income class is available from the BLS Survey of Consumer Expenditures 1950, but little or no pattern emerges. Considering the age of the 1950 data, and the fact that reporting errors on alcoholic beverage expenditures are notoriously large, I decided that using the more detailed breakdown added very little useful refinement.

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[1] Gloria P. Green, "Relative Importance of CPI Items," Monthly Labor Review, Vol. 88 (November, 1965), p. 1346.

3. At home consumption is broken down into beer, wine, and liquor.

a. For those with after tax incomes of less than $10,000, the breakdown is assumed to be: 58 per cent beer, 35 per cent liquor, and 7 per cent wine. The division between beer and other beverages is based on the CPI.[2] The breakdown between liquor and wine is based on relative industry value added.[3]

b. For consumers with incomes greater than $10,000, at home consumption is assumed to be: 28 per cent beer, 65 per cent liquor, and 7 per cent wine. This estimate acknowledges what evidence there is that high income individuals consume more liquor relative to beer than lower income consumers. The BLS 1950 Survey breaks down consumption in detail. The Life Magazine Study of Consumer Expenditures divides consumption between beer, and wine and liquor. The consistency between the two sets of data is minimal. Both report substantially higher liquor consumption in the $10,000 and over income classes than in lower classes, however.[4] Our figures are higher for beer than either of the studies, in deference to the fact that the current CPI weight for beer relative to other beverages is higher than the figures for nearly all income levels in either study.

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[2] Ibid.

[3] Census of Manufacturing 1963, Vol. II, Industry Statistics.

[4] 1950 Survey: Beer 9%; wine 7%; liquor 84%. Life Survey: Beer 25%; wine and liquor 75%.

c. Away from home consumption is assumed to be 75 per cent liquor and 25 per cent beer. This breakdown is used by the California Revenue Study and by Hickman.[5] It is unsubstantiated.

4. To convert the per gallon taxes on alcoholic beverages to percentages, average prices had to be calculated.

a. The average price of all types of liquor for home consumption was assumed to be $4.60 per bottle (fifth). Several steps were involved in arriving at this figure. First the average Michigan prices for 10 types of liquor was calculated.[6] These 10 prices, weighted by the importance of the types nationally[7] were averaged. The resulting average Michigan price was $4.50. This price was checked against the national average by comparing Michigan prices for 18 leading brands of whiskey with the prices that prevailed (in 1963) in the 10 leading liquor consuming states.[8] Michigan prices were found to be generally cheaper, but reasonably

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[5]Report, Part 2; W. H. Hickman, "Distribution of the Burden of California Sales and Other Excise Taxes."

[6]Calculated from revenues and case sales of state operated stores by type of liquor for fiscal year 1961 reported in Michigan Liquor Control Commission, Financial Report for the Month of June, 1961 and for the Fiscal Year Ending June, 1961. Table 31, p. 25.

[7]Distilled Spirits Institute, Distilled Spirits Industry Annual Statistical Review, 1961 (Washington, D.C.), Table 33, p. 28. "Distilled Spirits Entering Trade Channels."

[8]New York State, Moreland Commission on the Alcoholic Beverage Control Law, Report and Recommendations, No. 3, "Mandatory Resale Price Maintenance" (January 21, 1964), Appendix D, p. 40.

representative of national averages. (They were between 13¢ and 22¢ cheaper by type of whiskey.) On the basis of this information $4.60 was chosen as the liquor price.

b. The average price of wine is assumed to be $4.80 per gallon. This figure was arrived at in a manner similar to that for liquor, using Michigan Liquor Control Commission data. It was not checked against national prices.

c. The average price of beer is assumed to be $4.00 per case of 24 12-ounce bottles (2.25 gallons). This figure is estimated by the author.

d. The average price of beer sold for on-premises consumption is assumed to be $6.75 per case of 24 bottles. The average price of liquor is assumed to be $54.00 per gallon. These prices were calculated from the ratio of on-sale to off-sale prices in 1950 as reported in the California Revenue Study.[9]

5. Alcoholic beverage license fees made up 25.7 per cent of revenues collected in California for beverage taxes and licenses. It is assumed that these fees are paid by consumers in direct proportion to the amount of beverage tax that they paid.

6. Using the above assumptions, alcoholic beverage tax payment is calculable. At $4.60 per bottle, the tax is 6.5 per cent of the purchase price of liquor consumed at home. At $4.00 per case, the tax on beer

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[9]Report, Part 2, p. 74.

is 2.25 per cent of the purchase price; at $4.80 per gallon, and assuming an average tax of 1 1/2¢ per gallon, the tax on wine is .31 per cent of the purchase price; at $54.00 per gallon, the tax is 2.8 per cent of the cost of liquor consumed away from home; at $6.75 per case, the tax on beer is 1.3 per cent of the purchase price. Combining these percentages with the consumption weights in 2 and 3 above and multiplying the results by 1.26 (from 5 above) yields a tax burden of 4.0 per cent of alcoholic beverage expenditures for those with after tax income of less than $10,000, and a burden of 5.2 per cent for those with incomes in excess of $10,000.

APPENDIX F

SALES TAX

This appendix describes the assumptions made in arriving at the sales tax burden that falls directly on consumers.

The following data categories are assumed entirely taxable:

1. Food away from home
2. Alcoholic beverages
3. Tobacco
4. Solid and Petroleum fuels
5. Household supplies
6. House furnishings and equipment, total (except for the subcategory Insurance on furnishings, equipment and apparel assumed nontaxable)
7. Clothing, clothing materials, and clothing services, total (except for the subcategory Clothing upkeep, which is assumed nontaxable)
8. Automobile operation -- tires, tubes batteries, other equipment
9. Medical care -- drugs and medicines
10. Personal care -- supplies
11. Recreation, total -- television
12. Recreation, total -- radio, phonographs, musical instruments, etc.

13. Education -- school books, supplies, equipment

The following data categories are assumed partially taxable:

1. Housing, total -- owned dwelling, total -- repair and replacement The category is assumed to include 50 per cent taxable materials. The assumption is based on a similar assumption made by the California Revenue Study. Assumed tax: 1.5 per cent

2. Housing total -- owned vacation home, cabin, etc. An average of 28 per cent of this category is repair and replacement[1] and as in 1, 50 per cent is assumed to be taxable materials.

Tax as a percentage of expenditure: .42 per cent

3. Automobile purchase -- The data category lists automobile purchase net of trade-in, but the sales tax in California applies to the purchase price gross of trade-in. The trade-in as a percentage of total auto expenditure in 1960-61 was 31 per cent for new car purchases and 21 per cent for used car purchases.[2] Since many deals did not involve trade-ins, the average trade-in was in fact larger, but I ignored this fact and assumed that all consumers traded in, receiving these percentage allowances. The average net outlay for new cars in 1961 was $1980, for used cars $630.[3] I assumed that any consumer

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[1] BLS Report, 237-93.

[2] Survey Research Center, University of Michigan, Survey of Consumer Finances 1963, p. 47, Table 3-6; Survey of Consumer Finances 1965, Table 4-1.

[3] Ibid.

whose expenditure for automobile purchase was greater than $1200 bought a new car, and thus received a trade-in allowance of 31 per cent. Any consumer whose expenditure was less than $1200 was assumed to have bought a used car.

Tax as a percentage of expenditure (purchase greater than $1200): 3.93%

Tax as a percentage of expenditure (purchase less than $1200): 3.63%

4. Automobile operation -- repairs and parts not covered by insurance

43 per cent of the category is assumed to be nontaxable labor. The figure was calculated from 1963 Census of Business by subtracting payrolls plus an allowance for proprietors from the receipts of all automobile repair shops.[4] An arbitrary allowance of 12 per cent was made for overhead. The remaining 45 per cent is assumed to be taxable parts.

Tax as a percentage of expenditure: 1.35 per cent

5. Medical care, total -- eye care, including glasses

Assumed one third taxable. This assumption was made in the California Revenue Study.

Tax as a percentage of expenditure: 1.0 per cent

6. Medical care, total -- medical appliances, supplies, other.

This category includes appliances and supplies which are taxable and various services, notably those of nurses, which are not.

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[4]Vol. VII, Selected Services, Area Statistics, Part 1, p. 1-8, Table 2.

The taxable portion varies considerably by income class. I assume that for those with incomes after tax of less than $10,000, 40 per cent of the category is taxable, while for those with incomes of greater than $10,000, 25 per cent is taxable.[5]

Tax as a percentage of expenditure: 1.2 per cent (income under $10000)
.75 per cent (income over $10000)

7. Recreation, total -- participant sports, (equipment, fees, dues) Arbitrarily assumed to be 50 per cent taxable.

Tax as a percentage of expenditure: 1.5 per cent

8. Recreation, total -- club dues, hobbies, pets, toys, recreation out of home city, other. All items but the first are in part taxable. Club dues make up about 30 per cent of the total.[6] Thus 70 per cent is assumed taxable.

Tax as a percentage of expenditures: 2.1 per cent

9. Reading -- Newspapers and magazines are exempt from the California tax, but other reading material is not. The taxable portion of the category does not exceed 30 per cent for any after tax income class.[7] I assume the category is 20 per cent taxable for all after tax income classes above $3000. This assumption follows than made in the California Revenue Study.

Tax as a percentage of expenditure: .6 per cent

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[5]Based on BLS Report 237-93.

[6]BLS Report 237-93.

[7]Ibid.

10. Miscellaneous personal consumption expenditures -- Most of the items in this category are untaxable. The category includes: all expense tours, certain interest payments, bank service charges, legal expenses, fines, funeral expenses, money lost or stolen, money allowances to children, marriage license and related fees, expenses for raising food for family use, and other unallocated expenses. The category is arbitrarily assumed to be 5 per cent taxable.

Tax as a percentage of expenditure: .15 per cent

APPENDIX G

GASOLINE TAX

This appendix describes the method used to allocate gasoline tax to consumers on that gasoline purchased directly by them.

1. Gasoline is included in the survey category "Gasoline, motor oil, lubrication, washing, etc." Gasoline expenditures average 86 per cent of this category for all income classes.[1]

2. The average price per gallon of gasoline is assumed to be 31¢. This figure is reported in Petroleum Facts and Figures.[2]

3. The 6¢ per gallon tax is 19 per cent of the purchase price. Each consumer's expenditure for "gasoline, etc." is thus multiplied by .86 x .19 = .16 to determine gasoline tax payment.

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[1] BLS Report 237-93.

[2] American Petroleum Institute, Petroleum Facts and Figures, 1965 edition (New York, 1965), p. 248.

APPENDIX H

MOTOR VEHICLE TAXES ON CONSUMERS

This appendix details the method by which motor vehicle fees and taxes on private automobiles were assigned to consumers.

1. Value of automobile is not available from the data unless the consumer purchased a car during the survey year. Since the motor vehicle tax is 2 per cent of the market value (plus $8), value had to be imputed for cars not bought during the survey.

2. Imputation was based on unpublished data made available to me by William C. Dunkleberg of the Survey Research Center at the University of Michigan. Dunkleberg related the following 21 variables to value of automobile stock, using 1966 data:

House value
*Total income
Size of place of residence
*Family size
Number of major earners in family unit
*Age of head
Savings
Stocks
Bonds
Region of residence
Race
*Number of cars owned
Price class, first car
Education of head
Remaining installment debt
Size of mortgage
Farm or nonfarm
Self employed or not

Occupation
Proportion of income earned by wife
Proportion of income earned by others

Four of the variables (starred above) which were important in explaining the value of automobile stock, and for which data were available on the BLS tape, were chosen from the Dunkleberg variables for use in this study: Income (defined as total money income), Family size, Age of head, and Number of cars owned. His calculations showed the grand mean automobile stock value to be $1120, and this value was initially assigned to each consuming unit. The adjusted deviations were in turn used to modify the initially assigned value as follows:

Income Class

Under $1000	subtract $187 from the grand mean
$1000-$2999	subtract $271
$3000-$5999	subtract $154
$6000-$7499	subtract $71
$7500-$9999	add $60
$10000-$14999	add $224
$15000 and over	add $475

Family Size

1	add $88
2 and 3	add $44
4	subtract $33
5 through 7	subtract $144
8 or more	subtract $254

Age of Head

18 - 34	add $75
35 - 64	add $32
65 - 74	subtract $158
75 and over	subtract $200

Number of Cars	
0	subtract $1120
1	subtract $348
2	add $404
3	add $959
4 or more	add $2153

3. For any consuming unit, if the value of the automobile stock imputed as above was found to be less than $100, a value of $100 was arbitrarily assigned.

4. If the consumer bought a car during the survey year, and owned only that car, the purchase price was used as the value of the auto stock. If he owned other cars, the value of the newly purchased car was subtracted from the value of the auto stock as imputed above, and the result added to the value of the newly purchased car. If the result of the subtraction was less than $100 times the number of cars over one, $100 per car was arbitrarily assigned to the additional cars.

5. The motor vehicle tax was assigned by adding $8 times the number of cars to .02 times the value of the automobile stock as calculated above.

APPENDIX I

PERSONAL INCOME TAX

This appendix outlines the procedures used in calculating the state personal income tax for each consumer. Incidence of the tax is assumed to be 100% on consumers, before the Federal offset is considered.

1. Tax Base

It is assumed that each consumer earns all of his income instate. The tax base includes the following items, (detailed definitions are contained in Appendix A.)

1) Wages and Salaries (less Occupational Expenses)

2) Self-Employment Income

3) Income from Rents, Roomers, and Boarders

4) Private Pensions, Retirement, Insurance Annuities, and Trust Funds

5) Interest, Dividends, Profits from Stocks and Bonds, and Owned but not Operated Businesses

6) One half the long term capital gains imputed to the taxpayer

7) Military Allotments, Pensions, etc. in excess of $1000. This is in accordance with California law.

8) 90% of the category, Other Money Income. This category includes untaxable insurance proceeds as well as a variety of taxable items.

2. Exemptions

If the Survey lists a taxpayer as married, it is assumed that he filed a joint return, and a $3000 exemption is subtracted from the tax base; otherwise, $1500 is subtracted from the tax base. All additional family members are assumed to be dependent, and a $600 exemption is allowed for each one. No allowance was made for heads of households who also in fact receive a $3000 exemption.

3. Deductions

For each taxpayer, both the standard deduction and itemized deductions were calculated, and the most advantageous method was used in computing the tax. Only four itemized deductions were used:

1) Gifts and Contributions - to Organizations

2) Medical Care in excess of 3% of the tax base

3) Owned Dwelling - Interest on Mortgages

4) Taxes, including:

Property taxes - Survey category Owned Dwelling - Taxes Due in Survey Year.

Gasoline taxes - The tax as calculated in Appendix G above multiplied by 1.67. The Federal gasoline tax of 4¢ per gallon is deductible; thus the deduction for gasoline tax is .67 larger than state gasoline tax payment.

Sales taxes - The tax as calculated in Appendix F above, multiplied by 1.33 to take account of the 1¢ local sales tax which applied throughout California.

The standard deduction for married taxpayers was calculated by multiplying the tax base by .10 if it was less than $10,000. Otherwise the deduction is $1000. For other taxpayers, the deduction was calculated at 10% up to a maximum of $500.

4. Rates

The rate schedule as listed in Appendix C was applied to the taxpayer's taxable income, defined as base less exemptions and deductions.

5. Federal Offset

A portion of the state personal income tax is in effect shifted to the Federal government if the taxpayer itemizes his deductions when calculating his Federal tax. I assume here that if itemizing is advantageous for state tax purposes, as calculated above, it is also advantageous for Federal purposes. In order to calculate the effect of the offset, it is assumed that all taxpayers who itemize are in the 22% marginal Federal personal income tax bracket. This assumption is not far from reality for most of the taxpayers considered here with the possible exception of a small number of single taxpayers. The maximum tax base is $17,340. Minimum deductions and one exemption total $2334, bringing the maximum possible taxable income to $15,006. The marginal Federal tax rate for single taxpayers on $15,006 in 1961 was 47%. However for a married taxpayer, the maximum taxable income is $14,394 ($15,006 - $600) and the marginal rate is only 30%. Most taxpayers included will have additional dependents and nontaxable sources of income which will decrease marginal rates

applying to them. The following tax burdens are reduced by .22 for each taxpayer assumed to itemize deductions: gasoline tax, sales tax, personal income tax, alcoholic beverages tax, and cigarette tax.

APPENDIX J

BUSINESS VEHICLE TAXES

This appendix discusses the methodology used in computing, and allocating the burdens of motor vehicle and gasoline taxes and fees that are paid initially by users of business vehicles.

Motor Vehicle Taxes

This complex of taxes includes the basic registration fee of $8, paid on every vehicle; additional registration fees based on weight, ranging from $12 to $318; the license fee of 2% of vehicle market value; the motor vehicle transportation license tax which is 1 1/2% of gross receipts for long distance carriers; and various other fees and permits except operators licenses. The latter have not been considered in this study.

There are five steps in allocating motor vehicle taxes. First, the proportion of total motor vehicle tax revenue collections from commercial vehicles must be determined; second, one must assign the tax by type of vehicle; third, an incidence assumption must be made; fourth, assumptions on exporting must be made; and finally, one must decide on a basis for allocating the tax to consumers. I will discuss these in turn.

1. To determine the amount of revenue received from commercial

vehicles, I first assume that all trucks are operated commercially, all cars privately. This assumption is modified somewhat in 3, below. For 1961, California registration and license fee collections from trucks were $63,317,000, as reported in Highway Statistics 1961[1]. In addition, $25,438,000 were collected from trucks under the gross receipts tax, as certificate or permit fees, and as miscellaneous receipts.

Registration and license payments on trailers were $18,325,000. I assume that $9 million was paid on commercial trailers while the remainder was paid on the 549 thousand noncommercial trailers registered in California in that year.

Thus the total tax collections from commercial vehicles was assumed to be:

$63,317,000
25,438,000
9,000,000
$97,755,000

2. The 1963 Census of Transportation[2] lists the proportion of total trucks in California which were of various types, from which I estimated the approximate number of each type.

Light trucks (10,000 or less lbs. Gross Vehicle Weight)	84.5%
Medium (10,000 - 19,500 lbs. GVW)	6.0%
Light - Heavy (19,501 - 26,000 lbs. GVW)	5.8%
Heavy - Heavy (over 26,000 lbs. GVW and all combinations)	3.7%
	100.0%

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[1]U. S. Bureau of Public Roads, Highway Statistics 1961, Table MV-2, p. 22.

[2]U. S. Bureau of Census, Vol. II, "Truck Inventory and Use Survey" (California), p. 217.

Estimated number of trucks:

Light	943,000
Medium	67,000
Light-Heavy	65,000
Heavy-Heavy	41,000
Total[3]	1,116,000

Based on Highway Statistics 1964, "Road User and Property Taxes on Selected Motor Vehicles" it is assumed that:

Light trucks pay	$50/year in taxes and fees
Medium	$110/year
Light-Heavy	$150/year
Heavy-Heavy	$600/year

Combining these figures with the estimates of number of trucks, revenue allocations by type of vehicle for 1961 are:

Light trucks	$47m.
Medium	$ 7m.
Light-Heavy	$10m.
Heavy-Heavy	$25m.
Trailers	$ 9m. (entirely allocated to Heavy-Heavy category in subsequent calculation)
TOTAL	$98m.

3. According to the Census of Transportation[4] 50 per cent of light trucks in California are employed primarily in personal uses: defined

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[3] Ibid.

[4] Ibid.

as commuting, doing jobs around home and summer home, using for recreational trips, etc. Thus, one half of the tax on light trucks is assumed to be borne by private individuals, and is not considered further. The remaining $74 million fall initially on commercial vehicles and is assumed to be shifted 100 per cent to consumers.

4. A certain portion of the tax is shifted to out of state consumers. It is assumed that the portion borne by those out of state is equal to the proportion of interstate hauls made by trucks dispatched in California. Census of Transportation figures for the United States as a whole show that 3.2 per cent of Light-Heavy vehicles and 36.1 per cent of Heavy-Heavy vehicles usually made hauls of more than 200 miles one way. Since a number of major instate routes in California are more than 200-mile hauls, it is arbitrarily assumed that a smaller portion of the hauls--none of the Light-Heavy, and 25 per cent of the Heavy-Heavy--are made interstate. Thus, 25 per cent of $34 m. or $9 m. is assumed exported to outstate consumers and the remaining $65 m. paid on commercial trucks is shifted to instate consumers.

5. The $65 million is allocated to general consumption. Consumption in California in 1961 is estimated to be $36.9 billion (see Appendix L). Business vehicle taxes are .18 per cent of that figure. The percentage is applied to each consumer.

Gasoline Tax

The procedure followed in allocating the gasoline tax paid by commercial vehicles is similar to that used for the motor vehicle taxes, described above. First, the revenues collected from commercial vehicles were calculated. Second, the revenues were assigned by type of truck. The incidence and exporting assumptions used for the motor vehicle taxes were also used for the gasoline tax, and the tax was assigned to general consumption in the same manner in the two cases.

1. To determine the amount of revenue received from commercial vehicles, I again begin by assuming that all trucks are operated commercially, all cars privately. Using the information below, assuming the following relationship holds, it is found that $85 m. was collected from California trucks in 1961.

$$\frac{\text{no. trucks (U.S.)}}{\text{no. vehicles (U.S.)}} : \frac{\text{truck consumption (U.S.)}}{\text{vehicle consumption (U.S.)}} :$$

$$\frac{\text{no. trucks (California)}}{\text{no. vehicles (California)}} : \frac{\text{truck consumption (California)}}{\text{vehicle consumption (California)}}$$

Trucks (U.S.)	16.4 million
Vehicles (U.S.)	76.4 million
Trucks (California)	1.1 million
Vehicles (California)	8.1 million
Gasoline consumption (U.S.)	59.3 billion
Gasoline consumption by trucks (U.S.)	16.4 billion gallons
Gasoline consumption (California)	5.9 billion gallons

Gasoline tax receipts (California) $357 million

Source: U. S. Bureau of Public Roads, Highway Statistics 1961.

2. To allocate the tax collections by truck type, the distribution of truck sizes discussed in the section on Motor Vehicle Taxes above was used, together with the following information:

	average distance/year[5]	miles/gallon[6]
Light	11,000 miles	12
Medium	11,500	8
Light-Heavy	13,000	5
Heavy-Heavy	23,000	5

Heavy-Heavy trucks were assumed to pay the diesel fuel tax of 7¢ per gallon. All other trucks were assumed to pay 6¢ per gallon. The results:

	Tax paid
Light	$54 million
Medium	6 m.
Light-Heavy	11 m.
Heavy-Heavy	14 m.
TOTAL	$85 million

[5]Based on Census of Transportation, Vol. II, "Truck Inventory and Use Survey" "California," p. 223.

[6]Based on U. S. Bureau of Public Roads, Road User and Property Taxes on Selected Motor Vehicles, 1964.

3. As with the motor vehicle taxes, one half of the tax falling on light trucks, $27 million, was disregarded as applying to vehicles used for personal use. The remaining $58 million was assumed to fall on commercial vehicles, and in turn be shifted to consumers.

4. 25 per cent of the gasoline tax on Heavy-Heavy trucks, or $4 million was assumed exported. The remaining $54 million was assumed to fall on instate consumers.

5. Using estimated total consumption of $36.9 billion, the gasoline tax on commercial vehicles is .15 per cent of consumption. That figure is applied to each consumer's total consumption.

APPENDIX K

SALES TAX ON BUSINESS

A certain portion of the sales tax falls on goods bought by business. In this appendix, the calculations made in allocating the burden of this portion of the sales tax are detailed. There were five steps involved in allocating the burden. First, the dollar revenue collected was estimated; second, the revenue was allocated by industry; third, an incidence assumption was made; then, exporting assumptions were made, and finally, the tax was allocated to individuals. These steps are discussed in turn below, and summarized in the table in 6.

1. The estimate of revenue collections is that of the Report.[1] It was calculated by assuming that the residual unaccounted for after direct consumption purchases and government purchases were estimated was the amount paid by business.

1961 sales tax collections	$711,049,726
Direct burden (consumers)	$471,335,814
Burden allocated to government	$ 43,580,721
Indirect burden (business)	$196,133,192

[1]Appendix 3, p. 78.

2. The revenue was allocated to industry division according to California employment by division. I reason that the sales tax falls largely on equipment such as office machinery, vehicles, etc. which is correlated with the number of employees.

3. The tax is assumed shifted 100 per cent to consumers.

4. The exporting assumptions are aggregates of those used for the corporation income tax (Appendix L). $154.2 million is assumed to fall on instate consumers, or 78.6 per cent of total revenue collected from business.

5. The tax is allocated to general consumption. Total California consumption was $36.9 billion in 1961. $154.2 million is .42 per cent of that figure. The percentage is applied to each taxpayer's total consumption.

6. The following table summarizes the calculation.

Industry	(1) 1961 Employment*	(2) Per cent	(3) Sales tax (2) x Total	(4) Exporting (instate burden)	(5) Burden on instate consumers (3) x (4)
Agriculture	444 (th.)	8.5	$16,671 (th.)	75%	$12,503 (th.)
Mining	32	.6	1,177	80	941
Construction	358	6.9	13,533	100	13,533
Manufacturing	1346	25.9	50,798	55	27,939
Trans. and Commun.	369	7.1	13,925	88	12,254
Trade	1314	25.2	49,426	100	49,426
Finance	292	5.6	10,983	90	9,885
Services	1050	20.2	39,619	70	27,731
Total (nongovernment)	5206	100.0	$196,133		$154,212

or 78.6 per cent of total collections

*California Statistical Abstract 1962, Economic Development Agency of the State of the State of California, 1962, Table H-2, p. 63.

APPENDIX L

CORPORATION INCOME TAX

This appendix describes the assumptions and calculations used in allocating the burden of the corporation income tax. Four steps were followed: the tax collections were allocated to industry division, then (in many cases) to two digit industry; incidence assumptions were made for each industry; exporting assumptions were made for each industry, for both that portion of tax falling on consumers and that portion the incidence of which is assumed to be on stockholders; and finally, the tax was assigned to individual consuming units according to total consumption and to stockholders according to dividends received. These steps are discussed below.

Given the present state of knowledge, no one knows who "pays" a corporate profits tax, even the Federal one which falls on firms throughout the country, much less state ones for which the problems of the untaxed competition and the exporting dimension are particularly significant. There is little or no work, empirical or theoretical on the incidence of a regional profits tax, and very little work on the extent of exporting of such a tax.[1] Past tax burden studies have used one

[1] The work of Charles E. McLure, "The Interstate Exporting of State and Local Taxes: Estimates for 1962," National Tax Journal, Vol. XX (March, 1967), p. 49, is a start toward filling the empirical gap, but no more than a start. The gap remains very wide.

(or occasionally several) arbitrarily chosen figures for incidence and exporting and proceeded from that point. The only advance made in the present study is to choose a larger number of figures in an attempt to take some account of the obvious interindustry differences in incidence and exporting. No testable theories of either are developed here. In fact, neither the incidence nor the exporting assumptions are directly calculated. Rather the numbers used are informed opinions based on examination of a number of key variables.

Tax Collections

Tax collections in California for fiscal 1961 were $272,718,000. These were allocated to individual industry divisions and to two digit industries in proportion to net profit figures reported in the California Statistical Abstract, 1962. The breakdown by two digit industry is confined to those industries for which profit figures are available. Column 1 of Tables 55 and 56 show tax collections by industry.

Incidence

Manufacturing

Two variables were considered in assigning incidence of the profits tax on manufacturing industries: first, the degree to which California is self sufficient in the products of a given industry, -- the "independence" measure; and second, the degree of concentration of production among establishments -- the "concentration" measure. The "independence" measure was calculated using data from the

TABLE 55

MANUFACTURING INDUSTRIES--
INCIDENCE AND EXPORTING ASSUMPTIONS

	Tax collections 1961 ($th)	Incidence (%) consumers	stockholders
Food and beverages	$14,100	70	30
21 Tobacco			
Textiles	800	10	90
Apparel	1,450	5	95
Lumber	2,240	35	65
Furniture	720	20	80
Paper and Allied Products	2,730	55	45
Printing and Publishing	4,220	70	30
Chemicals	10,000	65	35
Petroleum and Coal Products	540	95	5
Rubber and Plastics	1,480	40	60
Leather	200	10	90
Stone, Clay and Glass	4,460	80	20
Primary Metal	5,280	65	35
Fabricated metal	6,610	60	40
Machinery ex. electrical	7,110	25	75
Electrical machinery and equipment	8,260	30	70
Transportation equipment	17,850	55	45
Scientific Instruments	3,230	25	75
39 Miscellaneous			
19 Ordinance			
Other mfg (39; 19; 21)	2,500	70	30
Total	$94,000		

TABLE 55--Continued

Exporting-consumers		Exporting--stockholders					
instate (%)	outstate (%)	instate (%)	outstate (%)	Tax on instate consumers (% of total)	Tax on instate stockholders (% after offset)	Tax on instate consumers (amount) ($th)	Tax on instate stockholders (amount) ($th)
60	40	52	48	42	8	$5,922	$1,128
50	50	67	33	5	30	40	240
30	70	96	4	2	46	29	667
50	50	65	35	18	21	403	470
55	45	98	2	11	39	79	280
70	30	39	61	39	9	1,065	245
80	20	85	15	56	13	2,363	549
55	45	30	70	36	5	3,600	500
70	30	18	82	67	0	361	0
40	60	42	58	16	13	237	192
60	40	80	20	6	36	12	72
95	5	47	53	76	5	3,390	223
50	50	30	70	33	5	1,742	264
60	40	75	25	36	15	2,379	992
35	65	52	48	9	20	639	1,422
35	65	30	70	11	11	909	909
55	45	21	79	30	5	5,355	892
40	60	45	55	10	17	323	549
50	50	80	20	35	12	875	300
					Total	$29,722	$9,894
					≈	$29,700	$9,900

TABLE 56

NON-MANUFACTURING INDUSTRIES--
INCIDENCE AND EXPORTING ASSUMPTIONS

	Tax collections 1961 ($th)	Incidence (%) consumers	stockholders
Agriculture	$ 2,560	0	100
Mining	13,280		
Petroleum and gas	12,300	20	80
Other	960	0	100
Construction	7,330	10	90
Services	13,530		
Motion pictures	2,700	90	10
Amusement services	1,890	35	65
Personal services	910	10	90
Business services	4,150	35	65
Other	3,880	10	90
Trade	35,850		
Wholesale	22,550	10	90
Retail	13,300	10	90
Finance, insurance, real estate	57,400		
Banks	23,400	90	10
Credit agencies or banks	12,600	65	35
Real estate	15,500	0	100
Investment cos, insurance agts, etc.	5,800	35	65
Public Utilities	48,900		
Transportation	6,900	10	90
Communication	21,100	100	0
Electricity and gas	18,000	100	0
Other	2,850	10	90

TABLE 56--Continued

Exporting--consumers		Exporting--stockholders					
instate (%)	outstate (%)	instate (%)	outstate (%)	Tax on instate consumers (% of total)	Tax on instate stockholders (% after offset)	Tax on instate consumers (amount) ($th)	Tax on instate stockholders (amount) ($th)
75	25	100	0	0	50	$0	$1,280
80	20	55	45	16	22	1,970	2,710
95	5	100	0	0	50	0	480
100	0	96	4	10	43	730	3,152
13	87	62	38	12	3	320	81
90	10	96	4	32	31	600	586
100	0	100	0	10	45	90	410
70	30	91	9	25	30	1,040	1,245
90	10	92	8	9	41	350	1,591
100	0	86	14	10	39	2,260	8,795
100	0	62	38	10	28	1,330	3,724
80	20	48	52	72	2	16,800	468
100	0	59	41	65	10	8,170	1,260
100	0	100	0	0	50	0	7,750
100	0	80	20	35	26	2,030	1,508
75	25	52	48	8	32	550	2,208
90	10	18	82	90	0	19,000	0
90	10	15	85	90	0	16,200	0
100	0	66	34	10	30	290	855
					Total	$71,730	$39,103

Census of Transportation 1963. The following information is given for each shipper group in that study:

1) Total tons shipped -- U.S.

2) Per cent of 1) destined for Pacific Region (Washington, Oregon, California)

3) Total tons shipped from Pacific Region

4) Per cent of 3) destined for Pacific

Shipper groups were adjusted to conform to industry classes. Then, the independence measure for each industry class was calculated as:

$$[3) \times 4)] \div [1) \times 2)]$$

This variable is the percentage of total tons received in the Pacific Region which originated there--i.e. the extent to which the Pacific Region is self-sufficient. The hypothesis behind the variable is that the more independent the region is, the less subject firms are to untaxed competition, and thus the more likely they are to be able to shift the tax to consumers. California dominated the production of the Pacific Region in all but two industries; thus it is assumed that to the extent that the Pacific Region is "independent," California is also "independent." In the two industries: Paper and Allied Products, and Lumber and Wood Products except Furniture, California firms probably receive significant competition from untaxes sources within the Region, and account is taken of this fact in assigning an incidence figure.

The "concentration" measure considered was the percentage of national production from large establishments. The distribution of establishments by size was compared with the distribution in California. The hypothesis is that the greater the production concentration, the greater the opportunity for tax shifting. Establishment concentration was used rather than firm concentration for reasons of data availability. No size distribution of firms for California is available.

The actual numbers used were decided upon by using the independence measure directly as a starting point, modifying it in turn following examination of industry concentration. Using the independence measure itself as an incidence measure has no particular validity, any more than does using a concentration measure, or some other number not calculated by observing changes in profit rates following changes in tax rates. It is, however, convenient. The numbers are not unreasonable in the light of previous studies in which incidence assumptions were made, and I contend that the differences between industries in the opportunity for shifting a tax are crudely accounted for by use of the figures.

Nonmanufacturing

The data used in making decisions on incidence for manufacturing industries is not available for nonmanufacturing industries. Thus, the incidence assumptions were based on even less information. Briefly the breakdown of assumptions is as follows: first, for utilities under commission jurisdiction, incidence is 100 per cent

on consumers, since taxes are included in the rate base. For sectors in which large local firms, nationally owned, with little non-corporate competition dominate production--Banking, and Motion Pictures, incidence is assumed to be 90 per cent on consumers. For sectors with many small firms and strong non-corporate competition--agriculture, mining other than oil and gas, and real estate, incidence is assumed to be 100 per cent on shareholders. In sectors with many small firms and strong non-corporate competition, but with some segments having significant degrees of market power--Construction, Personal Services, Other Services, the trade sectors, Other Utilities, incidence is assumed to be 90 per cent on stockholders, 10 per cent on consumers. The same assumption was made for the Transportation sector, in which there is strong interstate competition. The Petroleum and Gas industry is dominated by large firms but subject to strong outstate competition. A split of 80 per cent shareholders, 20 per cent consumers is used. For Credit Agencies, one third is allocated to stockholders, two thirds to consumers. For the three remaining industries, incidence is assumed to be one third on consumers and two thirds on stockholders.

Exporting

Manufacturing -- Consumers

The key variable considered in making assumptions on exporting in manufacturing industries was the proportion of goods

in each industry originating in California which remained there. The Census of Transportation 1963 gives a percentage distribution of regions of destination of goods originating in the Pacific Region for each shipper group. The percentage of goods originating in the Pacific which is destined for the Pacific was multiplied by .75 (the proportion of Pacific Region population residing in California). The assumptions behind the variable are first, that the same portion of goods originating in California are destined for the Pacific as the portion of goods originating in the region as a whole and destined to remain in it. Thus, if 51 per cent of good X produced in the Pacific Region is shipped to another part of the Pacific Region, I assume that 51 per cent of good X produced in California remains in the Pacific Region. Second, that 75 per cent of all goods destined for the Pacific Region are destined for California. Thus, in the example, 38.3 per cent of good X is assumed to be unexported (.51 x .75).

This variable, rounded to the nearest 5 per cent was used directly in many cases. I believe that its use is more defensible than are the figures used for incidence, since the export variable does get directly at the proportion of goods shipped out of state.

Other variables were also examined and modifications in the export assumption were incorporated in cases in which California does not dominate Pacific Region production (70 per cent or more) -- Lumber and Wood Products, except Furniture, and Paper and Allied

Products, and for those industries in which distances of shipment (as reported in the Census of Transportation) were usually short, indicating that more product remains instate than the export variable suggests -- Stone Clay and Glass, and Fabricated Metal Products, In the non-California dominated industries, it was felt that California would do less exporting than the measure indicated.

Nonmanufacturing -- Consumers

The data used for manufacturing industries is not available for nonmanufacturing industries. The estimates here are thus merely opinions as to product use by outstate consumers, based on information obtained from a large number of sources. For eight out of the 19 sectors, including Wholesale and Retail Trade, Construction, and Personal Services, it is suggested that use of the output by out of state residents is negligible. For 10 other sectors, it ranges up to 30 per cent. For motion pictures, a California dominated industry, the tax is assumed to fall only 13 per cent on instate consumers (proportion of national movie receipts collected in California in 1963).

Stockholders

The figures in Columns 6 and 7 of each table are exporting assumptions before the Federal offset is taken into account. The burden on instate stockholders was calculated by assuming that firms with assets of $50 m. or more are nationally owned, and firms with assets of less than $50 m. are entirely locally owned. Using national

data, net income for firms with greater than $50 m. in assets was calculated as a percentage of total net income.[2] The national distribution is assumed to apply to California. Californians are assumed to have 10.4 per cent ownership of nationally owned corporations.[3] Thus the burden on instate stockholders is the tax falling on corporations smaller than $50 m. in assets plus 10.4 per cent of the tax on corporations with more than $50 m. in assets. For example, large firms (greater than $50 m. in assets) earned 37 per cent of net income earned nationally in the Textile industry in 1961; 63 per cent was earned by small firms. I assume that California stockholders pay 68 per cent of the tax allocated to the Textile industry in 1 above, and allocated to stockholders as in 2 above. They pay all of the tax on earnings of small firms and 10.4 per cent of the tax on the earnings of large firms.

Incidence and Exporting

The next step is to combine incidence and exporting assumptions together with the Federal offset. The way in which this was done is best shown by example. For the Food and Beverage Industry (Table L-1), incidence is assumed to be 70 per cent on consumers. Instate consumers pay 60 per cent of this, or 42 per cent of the total tax. (Column 8 of each table.) Incidence is 30 per cent on

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[2]Statistics of Income, Corporation Income Tax Returns 1960-61.

[3]This is the percentage of dividends accruing to Californians as reported in the SOI, Individual Income Tax Returns 1961.

stockholders. Of this, 52 per cent is on instate stockholders, so that those investors appear to pay 17 per cent of the tax. However, the Federal tax base is reducible by the amount of state tax paid. Assuming a Federal tax rate of 50 per cent, one half of the tax is actually "shifted to the Federal government" so the effective state tax on instate stockholders is not 17 per cent but about 8 per cent. (Column 9 of both tables.) A similar procedure was followed for all industry sectors.

Allocating Tax Burden to Individuals

Consumers

The tax was assigned to consumers by total consumption, as follows:*

Personal income in U. S. 1961	$416,432 m.
Consumption in U. S. 1961	$338,058 m.
Personal Income in California 1961	$ 45,586 m.

$$\frac{\text{Consumption (U. S.)}}{\text{Income (U. S.)}} = 81 \text{ per cent}$$

.81 (Income - California) = $36.925 m.

*Data from Survey of Current Business, July, 1962, p. 8.

Tax collections from instate consumers (see Tables):

Manufacturing	$29,700 th.
Nonmanufacturing	$71,700 th.
Total	$101,400 th.

$$\frac{\text{Tax collections}}{\text{Consumption (California)}} = .27 \text{ per cent}$$

Each consumer's total consumption was multiplied by .27 per cent. The result is the estimated tax burden on the family units in their capacity as consumers. A similar procedure was used to allocate the burdens of the sales tax on business purchases, and the motor vehicles taxes on businesses.

Stockholders

The tax was assigned to stockholders as follows:

Dividends accruing to Californians 1961[4]	$1,079,481 th.
Tax collections from instate stockholders (See Tables):	
Manufacturing	$9,900 th.
Nonmanufacturing	$39,100 th.
	$49,000 th.

$$\frac{\text{Tax collections}}{\text{Dividends}} = 4.5 \text{ per cent}$$

Each consumer's dividends were multiplied by 4.5 per cent. The results of the burden on consumption and the burden on dividends were added to yield the total burden of the corporate income tax on each consumer.

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[4]Statistics of Income, Individual Income Tax Returns 1961, p. 88.

APPENDIX M

INSURANCE TAX

This appendix outlines the methodology used in computing the insurance tax burden.

1. The insurance company tax of 2.35 per cent falls on the gross premiums of all business done in California.

2. Incidence of the tax is assumed to be 100 per cent on the consumer.

3. The following data categories are multiplied by .0235 to determine insurance tax payment:

   a. Owned dwelling, total -- property insurance

   b. Insurance on furnishings, equipment and apparel

   c. Automobile operation -- insurance

   d. Life, endowment, annuity, etc. -- veterans

   e. Life, endowment, annuity, etc. -- group

   f. Life, endowment, annuity, etc. -- other

   g. Other personal insurance.

APPENDIX N

TABLES OF DISTRIBUTIONS OF TAXPAYMENT

This appendix contains bracketed percentage distributions of tax payments at each income level, for each of the nine taxes, using the narrow, broad adjusted and narrow adjusted income definitions. Tables of distributions using the broad definition are contained in the body of the text.

TABLE 57

DISTRIBUTION OF PERSONAL INCOME TAX PAYMENTS
BY INCOME LEVEL (NARROW INCOME)

Income Level	BRACKETS (% LESS THAN OR EQUAL TO) 0	$10	$20	$30	$40	$50	$60	$70	$80
($2,000)	88.2	11.8							
($3,000)	83.5	9.1	7.3						
($4,000)	78.2	8.6	6.1	7.1					
($5,000)	51.6	29.6	4.8	4.6	9.4				
($6,000)	32.2	31.5	28.9	2.8	1.0	.3	3.0	.3	
($7,000)	16.1	28.4	31.1	16.5	1.4	.3	.8	1.6	2.2
($8,000)	6.8	13.0	32.2	23.7	17.2	2.0	1.4	.6	.6
($9,000)	1.5	8.2	17.9	23.9	27.2	13.8	--	1.5	1.5
($10,000)	2.2	2.2	8.4	23.6	24.0	20.4	9.3	4.0	.9
($11,000)	1.4	.5	6.2	10.0	18.7	13.4	16.3	12.9	11.5
($12,000)	1.3	2.7	2.7	10.0	10.7	14.8	10.7	12.8	11.4
($13,000)	--	1.6	.8	--	7.6	11.8	15.1	12.6	13.4
($14,000)	1.3	--	--	1.3	--	--	8.0	10.7	9.3
($15,000)	1.2	1.2	--	--	1.2	2.5	--	2.5	9.9
($16,000)	4.6	--	--	--	--	1.5	6.2	1.5	1.5
($17,000)	--	2.3	--	--	--	--	--	--	2.3

TABLE 57--Continued

$90	$100	$110	$120	>$120	Sample Size	Min. $	Max. $	Mean $	Mean Income
					110	0	4	.32	.00016
					164	0	12	1	.00033
					197	0	22	3	.00075
					351	0	39	7	.00140
					394	0	64	9	.00150
.3	.3				366	0	92	15	.00214
.3	--	2.3			354	0	105	22	.00275
--	.8	.8	.4	2.6	268	0	138	32	.00356
--	.4	.9	.4	3.1	225	0	142	39	.00390
3.8	.5	1.0	1.0	2.9	209	0	211	53	.00482
8.1	7.4	2.0	2.0	3.3	149	0	249	60	.00500
8.4	8.4	5.0	5.0	10.1	119	2	250	76	.00585
20.0	9.3	6.7	6.7	26.7	75	0	496	112	.00800
11.1	11.1	9.9	9.9	39.5	81	0	347	118	.00787
4.6	12.3	12.3	12.3	43.1	65	0	219	119	.00744
4.7	4.7	9.3	7.0	69.8	43	9	418	162	.00953

TABLE 58

DISTRIBUTION OF PERSONAL INCOME TAX PAYMENTS BY INCOME LEVEL (BROAD INCOME ADJUSTED)

Income Level	BRACKETS (% LESS THAN OR EQUAL TO)								
	0	$10	$20	$30	$40	$50	$60	$70	$80
$1000	100.0								
$2000	91.6	6.8	1.1	--	.4				
$3000	22.7	42.5	26.1	8.0	.7				
$4000	7.0	7.3	32.0	32.6	11.7	7.6	.9	.6	--
$5000	1.7	4.3	8.5	17.0	26.8	12.8	9.8	6.0	4.7
$6000	--	.7	5.8	8.0	18.2	10.2	13.9	7.3	5.1
$7000	.9	2.7	3.6	2.7	7.2	12.6	13.5	9.9	10.8
$8000	--	--	4.3	2.9	1.4	1.4	5.8	4.3	2.9
$9000	6.7	--	4.4	4.4	--	2.2	--	4.4	6.7

TABLE 58--Continued

$90	$100	$110	$120	>$120	Sample Size	Min. $	Max. $	Mean $	Mean Income
					206	0	0	0	---
					263	0	31	1	.00050
					414	0	37	8	.00267
--	--	.3			316	0	109	22	.00550
2.0	1.7	1.7	1.3	.9	235	0	130	42	.00840
5.1	3.7	5.8	5.8	10.2	137	.45	187	66	.01100
4.5	5.4	2.7	1.8	21.6	111	0	354	85	.01214
13.0	5.8	13.0	11.6	33.3	69	12	299	111	.01387
4.4	13.3	6.7	4.4	42.2	45	0	355	124	.01377

TABLE 59

DISTRIBUTION OF PERSONAL INCOME TAX PAYMENTS BY INCOME LEVEL (NARROW INCOME ADJUSTED)

Income Level	BRACKETS (% LESS THAN OR EQUAL TO) 0	$10	$20	$30	$40	$50	$60	$70	$80
$1000	100.0								
$2000	82.3	14.8	1.1	1.5	.4				
$3000	11.9	29.8	39.8	13.8	3.3	.3	.8	--	.3
$4000	3.2	3.5	23.2	36.6	14.3	11.5	2.2	3.2	.3
$5000	.9	2.4	3.3	14.7	24.2	21.8	5.2	3.3	8.1
$6000	.9	--	2.7	4.4	7.1	13.3	15.9	15.0	4.4
$7000	1.1	1.1	1.1	2.3	3.4	3.4	5.7	13.8	14.9
$8000	--	--	--	2.4	--	2.4	4.8	2.4	2.4
$9000	5.6	2.8	--	--	5.6	--	-	2.8	2.8

TABLE 59--Continued

$90	$100	$110	$120	>$120	Sample Size	Min. $	Max. $	Mean $	Mean Income
					243	0	0	0	---
					271	0	31	1	.0005
					369	0	76	12	.0040
.3	--	.6	.3	.6	314	0	152	29	.00725
4.3	2.4	4.3	3.8	1.4	211	0	165	50	.01000
7.1	6.2	5.3	4.4	13.3	113	0	185	74	.01233
4.6	8.0	5.7	4.6	29.9	87	0	299	105	.01500
11.9	11.9	9.5	9.5	42.9	42	27	403	138	.01725
--	2.8	1.4	1.4	75.0	36	0	672	166	.01844

TABLE 60

DISTRIBUTION OF CORPORATION INCOME TAX PAYMENTS BY INCOME LEVEL (NARROW INCOME)

Income Level	BRACKETS (% LESS THAN OR EQUAL TO)						
	$5	$10	$15	$20	$25	$30	$35
1. ($2,000)	26.4	60.0	10.9	1.8	.9		
2. ($3,000)	6.7	70.1	17.1	3.7	.6	1.8	
3. ($4,000)	4.6	46.2	34.5	8.6	2.0	1.0	.5
4. ($5,000)	--	25.9	53.3	13.4	3.4	.6	.6
5. ($6,000)	--	10.7	50.5	27.2	8.6	1.8	--
6. ($7,000)	--	5.2	36.3	39.9	11.7	3.0	.8
7. ($8,000)	.3	1.7	23.2	42.6	19.8	6.2	2.5
8. ($9,000)	.8	2.2	12.3	36.6	30.2	9.3	4.9
9. ($10,000)	--	.4	9.8	28.0	31.6	16.9	7.1
10. ($11,000)	1.0	1.9	6.7	26.3	29.2	21.5	5.7
11. ($12,000)	--	1.3	4.0	14.8	27.5	31.5	11.4
12. ($13,000)	.8	.8	2.5	11.8	28.6	21.8	16.8
13. ($14,000)	--	--	1.3	10.7	9.3	24.0	17.3
14. ($15,000)	--	1.2	1.2	2.5	13.6	21.0	23.5
15. ($16,000)	--	--	--	3.1	10.8	23.1	24.6
16. ($17,000)	--	--	4.7	7.0	14.0	9.3	25.6

TABLE 60--Continued

$40	$45	$50	>$50	Sample Size	Min. $	Max. $	Mean $	Mean Income
				110	2	22	7	.0035
				164	4	29	9	.0030
--	--	--	2.5	197	2	95	12	.0030
.6	.2	.1	2.0	351	5	105	14	.0028
.4	.1	.1	.8	394	5	132	15	.0025
1.1	.3	.2	1.4	366	6	119	17	.0024
1.1	.7	.7	1.1	354	5	158	20	.0025
1.5	.2	.2	1.9	268	3	80	21	.0023
1.3	.9	.9	3.1	225	8	109	24	.0024
1.0	1.7	1.7	2.4	209	3	88	24	.0022
2.7	.7	.6	5.6	149	9	166	29	.0024
5.9	3.0	2.0	5.9	119	-23	240	32	.0025
13.3	5.3	4.0	14.7	75	15	244	96	.0033
14.8	6.2	4.9	11.1	81	6	222	41	.0027
10.8	4.6	4.6	18.5	65	15	161	44	.0028
16.3	4.7	2.3	16.3	43	11	343	46	.0027

TABLE 61

DISTRIBUTION OF CORPORATION INCOME TAX PAYMENTS BY INCOME LEVEL (BROAD INCOME ADJUSTED)

	BRACKETS (% LESS THAN OR EQUAL TO)						
Income Level	$5	$10	$15	$20	$25	$30	$35
$1000	49.5	40.3	8.7	.5	.5	.5	
$2000	8.4	36.1	39.2	14.4	1.5	.4	
$3000	1.2	16.4	38.2	28.5	12.8	2.4	.2
$4000	1.0	15.2	22.8	24.7	18.7	11.4	2.9
$5000	.4	11.5	22.1	18.7	17.9	14.0	7.2
$6000	--	6.6	12.4	21.2	19.7	11.7	11.7
$7000	.9	2.7	9.9	9.0	22.5	16.2	10.8
$8000	--	4.7	10.1	14.5	20.3	20.3	7.3
$9000	--	--	6.7	22.2	13.3	2.2	11.1

TABLE 61--Continued

$40	$45	$50	>$50	Sample Size	Min. $	Max. $	Mean $	Mean Income
				206	1	28	6	.0060
				263	2	26	11	.0055
--	.1	.1		414	4	42	15	.0050
1.6	.7	.3	1.0	316	3	72	18	.0045
4.7	1.3	.8	1.3	235	4	58	21	.0042
5.8	4.4	3.7	2.9	137	7	92	25	.0042
6.3	5.4	4.5	11.7	111	5	111	31	.00443
5.8	2.9	2.9	11.6	69	5	183	31	.00388
8.9	6.7	6.6	22.2	45	11	97	39	.00433

TABLE 62

DISTRIBUTION OF CORPORATION INCOME TAX PAYMENTS BY INCOME LEVEL (NARROW INCOME ADJUSTED)

	BRACKETS (% LESS THAN OR EQUAL TO)						
Income Level	$5	$10	$15	$20	$25	$30	$35
$1000	41.2	46.9	8.6	2.1	--	1.2	
$2000	4.1	33.6	40.6	14.8	5.2	1.1	--
$3000	1.9	12.2	30.4	31.7	14.9	4.9	1.9
$4000	1.0	8.6	22.6	26.4	20.7	13.6	4.5
$5000	--	12.8	17.5	19.0	17.5	10.9	8.1
$6000	--	6.2	13.3	18.6	15.0	14.2	10.6
$7000	--	2.3	11.5	11.5	13.8	16.1	12.6
$8000	--	4.8	7.1	19.0	14.3	21.4	7.1
$9000	2.8	5.6	11.1	13.9	--	16.7	--

TABLE 62--Continued

$40	$45	$50	>$50	Sample Size	Min. $	Max. $	Mean $	Mean Income
				243	1	29	6	.0060
--	--	--	.7	271	3	132	13	.0065
.3	.9	.5	.5	369	4	61	17	.00567
1.0	.2	.1	1.9	314	2	81	20	.0050
6.6	1.9	1.4	4.3	211	5	166	24	.0048
9.7	2.7	2.6	7.1	113	5	260	30	.0050
4.6	4.6	3.4	19.5	87	9	253	40	.00571
7.1	4.8	2.3	11.9	42	5	406	44	.0055
5.6	5.6	2.8	36.1	36	3	360	51	.0057

TABLE 63

DISTRIBUTION OF SALES TAX PAYMENTS
BY INCOME LEVEL (NARROW INCOME)

Income Level	BRACKETS (% LESS THAN OR EQUAL TO) $20	$40	$60	$80	$100	$120	$140
1. ($2,000)	63.6	31.8	3.6	--	--	--	.9
2. ($3,000)	38.4	40.2	14.6	3.1	3.1	.6	--
3. ($4,000)	23.4	42.1	18.3	9.1	3.0	3.0	.5
4. ($5,000)	14.5	41.0	22.8	10.3	4.8	3.4	2.0
5. ($6,000)	6.1	34.3	30.7	14.0	6.4	4.3	2.8
6. ($7,000)	4.9	29.8	31.1	15.8	10.4	4.4	1.6
7. ($8,000)	2.5	22.0	32.2	17.5	11.3	7.9	2.5
8. ($9,000)	4.1	14.6	27.2	25.4	12.3	6.3	4.1
9. ($10,000)	.9	11.6	27.6	24.9	12.0	6.7	7.6
10. ($11,000)	2.9	10.5	23.4	22.5	16.3	8.6	7.7
11. ($12,000)	.7	8.1	20.8	19.5	16.1	11.4	9.4
12. ($13,000)	.8	6.7	27.7	18.5	21.0	11.8	7.6
13. ($14,000)	--	8.0	14.7	16.0	14.7	13.3	16.0
14. ($15,000)	2.5	--	11.1	21.0	14.8	18.5	12.3
15. ($16,000)	--	4.6	9.2	23.1	16.9	18.5	7.7
16. ($17,000)	--	7.0	14.0	20.9	23.3	18.6	9.3

TABLE 63--Continued

$160	$180	$200	>$200	Sample Size	Min. $	Max. $	Mean $	Mean Income
				110	.49	123	19	.00950
				164	5	117	29	.00967
.5				197	3	142	38	.00950
.6	.3	.3		351	4	183	45	.00900
1.3	--	.3		394	8	184	53	.00883
1.9				366	11	157	55	.00786
1.7	.9	.6	.9	354	8	265	64	.00800
3.0	1.9	.7	.4	268	4	215	70	.00778
5.3	1.3	.9	1.3	225	7	231	77	.00770
5.7	1.0	.5		209	14	239	78	.00709
8.7	3.4	.7	1.3	149	20	233	89	.00742
5.0	.8			119	18	164	80	.00615
5.3	5.3	1.3	5.3	75	21	267	102	.00729
6.2	3.7	3.7	6.2	81	13	259	107	.00713
6.2	4.6	6.2	3.1	65	24	258	104	.00650
4.7	--	2.3		43	27	196	89	.00524

TABLE 64

DISTRIBUTION OF SALES TAX PAYMENTS
BY INCOME LEVEL (BROAD INCOME ADJUSTED)

	BRACKETS (% LESS THAN OR EQUAL TO)						
Income Level	$20	$40	$60	$80	$100	$120	$140
$1000	61.1	30.0	5.8	1.9	--	.5	--
$2000	24.0	38.0	20.2	8.7	5.7	1.9	.8
$3000	11.6	32.4	26.1	13.8	8.9	4.3	2.4
$4000	11.4	22.8	27.2	17.1	9.2	5.7	1.9
$5000	10.6	18.7	24.7	15.7	11.9	8.1	4.3
$6000	6.6	20.4	21.9	12.4	16.1	10.9	2.9
$7000	6.3	18.9	10.8	20.7	14.4	9.0	7.2
$8000	4.3	23.2	18.8	11.6	20.3	10.1	7.2
$9000	8.9	17.8	13.3	20.0	6.7	11.1	15.6

TABLE 64--Continued

$160	$180	$200	>$200	Sample Size	Min. $	Max. $	Mean $	Mean Income
--	--	--	.5	206	.15	210	20	.02000
.8				263	.49	150	39	.01950
.5				414	5	157	50	.01667
2.5	1.0	.3	1.0	316	5	212	59	.01475
2.6	1.3	1.3	.9	235	6	241	65	.01300
5.8	1.5	1.5	--	137	9	200	70	.01167
5.4	.9	1.8	4.5	111	6	258	81	.01157
2.9	--	--	1.4	69	8	235	72	.00900
4.4	2.2			45	9	177	76	.00844

TABLE 65

DISTRIBUTION OF SALES TAX PAYMENTS
BY INCOME LEVEL (NARROW INCOME ADJUSTED)

	BRACKETS (% LESS THAN OR EQUAL TO)						
Income Level	$20	$40	$60	$80	$100	$120	$140
$1000	61.7	25.5	8.2	1.7	2.1	--	.4
$2000	20.7	34.3	25.8	10.3	5.2	1.5	1.1
$3000	12.2	24.4	27.6	15.7	10.8	4.6	2.2
$4000	8.0	19.4	28.0	18.2	8.6	7.6	4.8
$5000	10.4	18.0	20.4	14.2	14.7	8.1	5.7
$6000	4.4	16.8	19.5	14.2	10.6	16.8	8.0
$7000	4.6	16.1	20.7	11.5	9.2	15.0	9.2
$8000	7.1	9.5	19.0	21.4	19.0	7.1	4.8
$9000	13.9	19.4	16.7	13.9	13.9	11.1	2.8

TABLE 65--Continued

$160	$180	$200	>$200	Sample Size	Min. $	Max. $	Mean $	Mean Income
--	--	--	.4	243	.15	210	22	.02200
.7	.4			271	.49	176	42	.02100
1.6	.3	.3	.3	369	5	265	55	.01833
2.9	1.6	--	1.0	314	10	247	65	.01625
3.8	2.4	1.0	1.4	211	4	227	71	.01420
4.4	2.7	.9	1.8	113	14	259	81	.01350
5.7	2.3	2.3	3.4	87	11	243	86	.01229
7.1	2.4	--	2.4	42	8	222	80	.01000
5.6	--	--	2.8	36	4	211	68	.00756

TABLE 66

DISTRIBUTION OF OTHER BUSINESS TAXES PAYMENTS
BY INCOME LEVEL (NARROW INCOME)

	BRACKETS (% LESS THAN OR EQUAL TO)						
Income Level	$5	$10	$15	$20	$25	$30	$35
1. ($2,000)	24.5	64.5	10.0	.0	.9		
2. ($3,000)	3.0	54.9	36.0	4.9	.6	--	.6
3. ($4,000)	1.5	29.4	49.2	15.7	2.5	1.0	--
4. ($5,000)	.6	13.1	47.0	29.3	7.7	1.1	.9
5. ($6,000)	--	3.6	32.2	39.8	17.8	5.3	.8
6. ($7,000)	--	3.6	19.1	42.1	23.8	8.5	2.2
7. ($8,000)	--	1.7	10.5	30.5	37.3	14.7	3.4
8. ($9,000)	.4	1.9	5.2	20.5	38.8	23.9	7.1
9. ($10,000)	--	1.3	4.4	15.1	33.8	24.9	12.4
10. ($11,000)	--	2.4	5.7	14.4	30.1	22.5	16.7
11. ($12,000)	--	--	4.0	6.7	24.8	26.8	22.8
12. ($13,000)	--	1.7	.8	7.6	21.0	28.6	18.5
13. ($14,000)	--	--	1.3	8.0	16.0	12.0	24.0
14. ($15,000)	--	1.2	--	2.5	12.3	18.5	21.0
15. ($16,000)	--	--	3.1	6.2	6.2	16.9	20.0
16. ($17,000)	--	2.3	2.3	2.3	14.0	18.6	14.0

TABLE 66--Continued

$40	$45	$50	>$50	Sample Size	Min. $	Max. $	Mean$	Mean Income
				110	3	23	7	.0035
				164	4	31	10	.0033
.5				197	2	38	12	.0030
.3	--	.3		351	2	37	14	.0028
.3				394	6	50	17	.0028
.5	--	--	.3	366	6	54	19	.0027
1.1	.3	.3	.3	354	6	56	21	.0026
1.9	--	.4		268	4	46	23	.0026
5.3	2.2	.4		225	9	46	25	.0025
6.2	1.0	.5	.5	209	6	54	25	.0023
10.7	2.7	.3		149	11	48	28	.0026
15.1	5.0	1.7	--	119	7	47	29	.0022
17.3	10.7	2.6		75	14	53	33	.0024
19.8	12.3	9.9	2.5	81	8	53	34	.0023
29.2	9.3	1.5	7.7	65	11	66	34	.0021
14.0	25.6	2.3	4.6	43	9	52	33	.0019

TABLE 67

DISTRIBUTION OF OTHER BUSINESS TAXES PAYMENTS BY INCOME LEVEL (BROAD INCOME ADJUSTED)

Income Level	BRACKETS (% LESS THAN OR EQUAL TO) $5	$10	$15	$20	$25	$30	$35
$1000	36.9	46.1	16.0	--	--	.5	.5
$2000	7.2	26.2	34.6	22.8	7.6	1.5	
$3000	.7	12.8	24.9	33.3	17.9	8.7	1.2
$4000	.6	10.8	20.6	21.5	19.0	13.0	10.1
$5000	.9	9.8	17.4	17.9	16.6	17.4	8.1
$6000	--	7.3	4.6	16.8	19.0	16.8	9.5
$7000	--	2.7	13.5	13.5	14.4	18.9	10.8
$8000	--	4.4	7.2	24.6	24.6	8.7	14.5
$9000	--	--	15.6	13.3	24.4	11.1	6.7

TABLE 67--Continued

$40	$45	$50	>$50	Sample Size	Min. $	Max. $	Mean $	Mean Income
				206	1	34	7	.0070
				263	3	28	13	.0065
.2	.2			414	4	42	17	.0057
2.5	.6	.9	.3	316	3	54	20	.0050
8.5	1.3	1.3	.9	235	5	54	22	.0044
8.0	5.1	1.5	1.5	137	6	61	24	.0040
11.7	5.4	4.5	4.5	111	6	68	28	.0040
4.4	5.8	1.4	4.4	69	7	65	25	.0031
13.3	4.4	4.4	6.7	45	10	74	28	.0031

TABLE 68

DISTRIBUTION OF OTHER BUSINESS TAXES PAYMENTS BY INCOME LEVEL (NARROW INCOME ADJUSTED)

Income Level	BRACKETS (% LESS THAN OR EQUAL TO) $5	$10	$15	$20	$25	$30	$35
$1000	30.5	49.4	16.0	2.9	.8	--	.4
$2000	4.8	24.4	33.6	25.8	8.5	1.9	.7
$3000	1.4	9.5	20.3	29.5	24.9	10.6	2.4
$4000	.3	6.7	13.7	25.5	22.5	16.9	8.9
$5000	.9	11.4	16.1	13.3	21.8	11.8	7.1
$6000	--	2.7	18.6	9.7	19.4	10.6	15.0
$7000	--	3.4	12.6	14.9	12.6	14.9	9.2
$8000	--	7.1	2.4	19.0	21.4	9.5	16.7
$9000	--	11.1	16.7	25.0	11.1	11.1	2.8

TABLE 68--Continued

$40	$45	$50	>$50	Sample Size	Min. $	Max. $	Mean $	Mean / Income
				243	1	34	7	.0070
--	--	.4		271	3	50	14	.0070
.8	.3	--	.3	369	4	56	18	.0060
4.1	1.0	.6		314	2	48	22	.0055
9.0	3.8	3.3	1.4	211	2	53	23	.0046
9.7	8.8	3.5	1.8	113	6	58	26	.0043
13.8	6.9	2.3	9.2	87	6	60	28	.0040
9.5	7.1	--	7.1	42	7	72	28	.0035
5.6	5.6	2.8	8.3	36	7	62	24	.0027

TABLE 69

DISTRIBUTION OF CIGARETTE TAX PAYMENTS
BY INCOME LEVEL (NARROW INCOME)

Income Level	BRACKETS (% LESS THAN OR EQUAL TO) 0	$5	$10	$15	$20	$25	$30
1. ($2,000)	46.4	17.3	13.6	10.9	6.4	1.8	3.6
2. ($3,000)	30.5	18.9	20.7	18.8	5.5	3.7	1.8
3. ($4,000)	33.0	14.7	17.3	21.8	6.6	2.5	3.0
4. ($5,000)	26.4	16.2	16.2	23.3	8.3	5.4	2.0
5. ($6,000)	25.7	14.0	17.8	20.6	9.9	5.1	3.8
6. ($7,000)	27.6	11.5	20.0	18.9	7.9	6.8	4.4
7. ($8,000)	19.2	8.8	21.2	25.2	9.9	8.2	3.7
8. ($9,000)	23.1	10.1	22.0	22.4	7.8	6.7	5.6
9. ($10,000)	20.9	7.6	17.8	25.4	10.7	6.7	6.2
10. ($11,000)	24.4	13.4	16.3	17.7	11.9	7.2	4.8
11. ($12,000)	28.2	12.1	17.5	18.8	10.1	6.0	4.7
12. ($13,000)	28.6	10.9	18.5	18.5	8.4	6.0	2.5
13. ($14,000)	20.0	6.7	17.3	32.0	8.0	6.7	2.7
14. ($15,000)	23.5	8.6	17.3	16.0	8.6	12.3	7.4
15. ($16,000)	16.9	12.3	20.0	21.5	12.3	6.2	7.7
16. ($17,000)	20.9	16.3	16.3	18.6	4.6	9.3	7.0

TABLE 69--Continued

$35	$40	>$40	Sample Size	Min. $	Max. $	Mean $	Mean / Income
--	--	--	110	0	28	5	.0025
--	--	--	164	0	29	7	.0023
.5	.5	--	197	0	39	7	.0018
1.4	.3	.3	351	0	40	8	.0016
1.5	1.5	.3	394	0	47	9	.0015
.5	1.4	1.1	366	0	54	9	.0013
2.0	1.1	.8	354	0	50	11	.0014
1.5	.4	.4	268	0	44	10	.0011
1.8	.9	2.2	225	0	47	11	.0011
1.4	1.0	1.9	209	0	44	10	.0009
.7	.7	1.3	149	0	60	9	.0008
2.5	2.5	1.7	119	0	44	10	.0008
2.7	--	4.0	75	0	42	12	.0009
2.5	1.2	2.5	81	0	40	12	.0008
--	--	3.1	65	0	46	11	.0007
2.3	2.3	2.3	43	0	42	11	.0006

TABLE 70

DISTRIBUTION OF CIGARETTE TAX PAYMENTS
BY INCOME LEVEL (BROAD INCOME ADJUSTED)

Income Level	BRACKETS (% LESS THAN OR EQUAL TO) 0	$5	$10	$15	$20	$25	$30	$35	$40	>$40	Sample Size	Min. $	Max. $	Mean $	Mean / Income
$1000	32.5	33.0	10.7	13.6	4.9	1.5	1.5	1.5	--	1.0	206	0	42	6	.0060
$2000	31.6	17.1	14.1	20.6	7.6	4.2	1.9	.8	1.5	.8	263	0	40	8	.0040
$3000	27.1	13.5	20.8	20.3	8.9	5.3	3.1	.7	.2	.2	414	0	40	8	.0027
$4000	24.4	8.9	16.8	24.7	10.1	7.0	5.4	2.2	--	.6	316	0	76	10	.0025
$5000	29.4	9.4	17.4	17.4	8.9	7.2	5.1	1.3	2.1	1.7	235	0	41	10	.0020
$6000	25.5	16.1	22.6	12.4	12.4	5.8	3.6	.7	--	.7	137	0	46	9	.0015
$7000	30.6	10.8	14.4	16.2	10.8	9.0	4.5	1.8	.9	.9	111	0	78	10	.0014
$8000	29.0	15.9	11.6	24.6	8.7	1.4	5.8	1.4	1.4	--	69	0	39	9	.0011
$9000	33.3	13.3	15.6	13.3	13.3	2.2	6.7	--	2.2	--	45	0	36	9	.0010

TABLE 71

DISTRIBUTION OF CIGARETTE TAX PAYMENTS
BY INCOME LEVEL (NARROW INCOME ADJUSTED)

Income Level	BRACKETS (% LESS THAN OR EQUAL TO) 0	$5	$10	$15	$20	$25	$30	$35	$40	>$40	Sample Size	Min. $	Max. $	Mean $	Mean / Income
$1000	34.2	27.2	15.6	13.6	5.4	1.2	2.5	--	--	.4	243	0	41	5	.0050
$2000	33.2	11.8	15.5	22.1	8.1	3.7	3.0	.4	1.8	.4	271	0	43	8	.0040
$3000	25.5	13.6	18.4	19.8	8.9	7.3	4.3	1.1	.5	.5	369	0	44	9	.0030
$4000	26.4	9.9	21.7	19.4	8.6	7.0	3.5	.6	1.3	1.6	314	0	76	10	.0026
$5000	29.9	11.4	13.7	19.4	7.6	8.1	5.7	1.4	1.4	1.4	211	0	44	10	.0020
$6000	23.9	18.6	20.4	21.2	6.2	3.5	1.8	.9	--	3.5	113	0	46	9	.0015
$7000	33.3	8.0	12.7	11.5	5.7	12.7	6.9	4.6	4.6	--	87	0	38	12	.0017
$8000	31.0	9.5	19.0	19.0	2.4	9.5	7.1	--	2.4	--	42	0	36	10	.0013
$9000	38.9	2.8	13.9	22.2	16.7	2.8	2.8	--	--	--	36	0	30	8	.0009

TABLE 72

DISTRIBUTION OF ALCOHOLIC BEVERAGE TAX PAYMENTS BY INCOME LEVEL (NARROW INCOME)

Income Level	BRACKETS (% LESS THAN OR EQUAL TO) 0	$2.5	$5	$7.5	$10	$15	$20	$25	$30
($2,000)	66.4	24.6	2.7	.9	1.8	2.7	--	--	--
($3,000)	62.2	28.0	4.9	.6	1.2	1.8	.6	.6	--
($4,000)	52.3	25.9	10.2	2.5	3.0	3.6	1.0	1.5	--
($5,000)	39.9	29.0	13.4	6.3	3.1	4.0	1.7	.6	.6
($6,000)	33.1	37.6	13.7	7.4	3.6	2.0	1.5	.3	.5
($7,000)	33.3	34.2	12.6	5.7	4.4	5.2	1.9	.8	1.1
($8,000)	26.8	31.1	15.8	9.9	4.2	5.9	1.5	2.3	.6
($9,000)	27.2	27.6	14.9	8.6	7.1	5.2	2.6	2.6	1.1
($10,000)	20.9	35.1	15.1	7.6	7.1	6.2	3.1	2.7	.9
($11,000)	26.3	32.0	15.3	7.7	4.8	7.2	2.4	2.4	1.4
($12,000)	28.9	24.1	18.8	8.7	5.4	6.0	2.7	3.4	1.3
($13,000)	18.5	29.4	16.8	8.4	8.4	8.4	4.2	2.5	.8
($14,000)	20.0	21.3	13.3	8.0	12.0	13.3	1.3	4.0	1.3
($15,000)	24.7	16.0	11.1	8.6	4.9	12.3	8.6	3.7	2.5
($16,000)	16.9	26.2	10.8	6.2	3.1	20.0	9.2	1.5	4.6
($17,000)	18.6	16.3	14.0	7.0	9.2	11.6	7.0	4.7	7.0

TABLE 72--Continued

$35	$40	$45	$50	>$50	Sample Size	Min. $	Max. $	Mean $	Mean Income
--	.9	--	--	--	110	0	37	1	.0005
--	--	--	--	--	164	0	25	1	.0003
--	--	--	--	--	197	0	22	2	.0005
.3	--	.3	--	.9	351	0	83	3	.0006
--	--	.3	--	--	394	0	44	2	.0003
.3	--	--	.3	.3	366	0	75	3	.0004
.6	.6	.8	--	--	354	0	40	4	.0005
1.5	.4	.4	.4	.4	268	0	81	5	.0006
.9	--	--	--	.4	225	0	66	5	.0005
--	.5	--	--	--	209	0	37	4	.0004
--	--	--	.7	--	149	0	49	5	.0004
.8	.8	--	--	.8	119	0	149	7	.0005
1.3	--	--	--	4.0	75	0	64	8	.0006
--	2.5	2.5	--	2.5	81	0	83	10	.0007
--	--	1.5	--	--	65	0	43	8	.0005
2.3	--	2.3	--	--	43	0	40	9	.0005

TABLE 73

DISTRIBUTION OF ALCOHOLIC BEVERAGES TAX PAYMENT BY INCOME LEVEL (BROAD INCOME ADJUSTED)

Income Level	BRACKETS (% LESS THAN OR EQUAL TO) 0	$2.5	$5	$7.5	$10	$15	$20	$25	$30
$1000	71.4	21.4	4.4	1.0	1.0	.5	.5	--	--
$2000	51.7	31.2	4.6	4.6	3.4	2.3	1.1	.4	.4
$3000	36.5	36.0	12.3	6.5	1.9	4.1	1.2	.7	--
$4000	31.3	33.2	11.7	6.0	4.4	7.3	3.5	.6	.9
$5000	25.1	27.2	13.6	11.1	4.7	7.7	4.3	1.3	.9
$6000	22.6	24.1	15.3	10.2	5.8	11.0	4.4	3.7	1.5
$7000	19.8	25.2	15.3	4.5	9.9	11.7	6.3	3.6	.9
$8000	21.7	29.0	8.7	14.5	1.5	4.3	7.2	5.8	1.5
$9000	13.3	22.2	17.8	2.2	8.9	13.3	6.7	2.2	6.7

TABLE 73--Continued

$35	$40	$45	$50	>$50	Sample Size	Min. $	Max. $	Mean $	Mean / Income
--	--	--	--	--	206	0	17	1	.0010
--	.4	--	--	--	263	0	37	2	.0010
.5	--	--	.2	--	414	0	50	3	.0010
.6	--	--	.3	--	316	0	50	4	.0010
1.3	--	1.3	--	1.7	235	0	82	6	.0012
.7	--	.7	--	--	137	0	44	6	.0010
.9	--	.9	--	.9	111	0	59	7	.0010
--	4.3	--	--	1.5	69	0	82	8	.0010
2.2	2.2	--	--	2.2	45	0	81	10	.0011

TABLE 74

DISTRIBUTION OF ALCOHOLIC BEVERAGE TAX PAYMENTS BY INCOME LEVEL (NARROW INCOME ADJUSTED)

Income Level	BRACKETS (% LESS THAN OR EQUAL TO) 0	$2.5	$5	$7.5	$10	$15	$20	$25	$30
$1000	72.1	21.4	2.9	.8	1.2	1.6	--	--	--
$2000	53.5	28.4	6.3	4.1	3.3	1.1	1.8	.7	.4
$3000	33.1	35.8	10.8	8.4	4.1	4.1	1.6	1.4	.3
$4000	31.2	27.7	14.7	7.3	5.4	5.7	3.2	2.9	1.3
$5000	30.3	23.7	12.8	8.5	4.3	7.6	3.3	2.4	1.4
$6000	20.3	31.0	14.2	7.1	2.7	13.3	--	6.2	2.7
$7000	20.7	32.2	6.9	4.6	8.0	11.5	6.9	3.5	3.5
$8000	14.3	21.4	11.9	7.1	2.4	16.7	9.5	4.8	4.8
$9000	30.6	11.1	5.6	8.3	8.3	8.3	11.1	--	2.8

TABLE 74--Continued

$35	$40	$45	$50	>$50	Sample Size	Min. $	Max. $	Mean $	Mean Income
--	--	--	--	--	243	0	12	1	.0010
--	.4	--	--	--	271	0	37	2	.0010
.3	--	.3	--	--	369	0	40	3	.0010
.6	--	--	--	--	314	0	33	4	.0010
1.4	--	1.4	--	2.8	211	0	83	7	.0014
--	.9	.9	--	.9	113	0	135	7	.0013
--	--	1.1	1.1	--	87	0	50	7	.0010
2.4	2.4	--	--	2.4	42	0	64	11	.0014
2.8	--	5.6	2.8	2.8	36	0	81	12	.0013

TABLE 75

DISTRIBUTION OF INSURANCE TAX PAYMENT
BY INCOME LEVEL (NARROW INCOME)

Income Level	BRACKETS (% LESS THAN OR EQUAL TO) 0	$5	$10	$15	$20	$25	$30
1. ($2,000)	21.8	68.1	8.2	1.8			
2. ($3,000)	20.1	71.9	6.7	.6	--	--	.6
3. ($4,000)	7.6	67.0	20.8	3.6	1.0		
4. ($5,000)	6.8	57.3	29.3	4.6	1.7	.3	
5. ($6,000)	4.3	49.5	34.5	8.9	2.0	.8	
6. ($7,000)	3.3	43.2	39.1	11.7	1.3	.8	--
7. ($8,000)	2.3	30.8	44.1	16.7	4.8	.6	.8
8. ($9,000)	1.9	27.2	37.7	23.9	4.9	2.2	1.1
9. ($10,000)	1.3	22.7	39.1	24.0	7.8	2.7	1.8
10. ($11,000)	1.0	17.7	42.6	24.0	7.2	4.3	1.4
11. ($12,000)	.7	14.1	33.6	25.5	18.8	4.0	.7
12. ($13,000)	.8	16.8	26.1	26.1	19.3	4.2	3.4
13. ($14,000)	--	18.7	29.3	18.7	18.7	2.7	4.0
14. ($15,000)	3.7	7.4	30.9	30.9	9.9	8.6	2.5
15. ($16,000)	1.5	18.5	24.6	13.8	13.8	15.4	4.6
16. ($17,000)	--	23.3	14.0	30.2	18.6	7.0	4.7

TABLE 75--Continued

$35	>$35	Sample Size	Min. $	Max. $	Mean $	Mean Income
		110	0	13	2	.0010
		164	0	26	2	.00067
		197	0	17	4	.0010
		351	0	24	4	.0008
		394	0	25	6	.0010
.3	.3	366	0	36	6	.00086
		354	0	29	7	.00088
1.1		268	0	34	8	.00089
.4	.4	225	0	49	9	.00090
--	1.9	209	0	77	10	.00091
1.3	1.3	149	0	79	12	.0010
3.4	--	119	1	31	12	.00092
4.0	4.0	75	0	51	13	.00093
2.5	3.7	81	0	42	13	.00087
--	7.7	65	0	73	15	.00094
--	2.3	43	2	38	12	.00071

TABLE 76

DISTRIBUTION OF INSURANCE TAX PAYMENTS
BY INCOME LEVEL (BROAD INCOME ADJUSTED)

Income Level	BRACKETS (% LESS THAN OR EQUAL TO) 0	$5	$10	$15	$20	$25	$30	$35	>$35	Sample Size	Min. $	Max. $	Mean $	Mean / Income
$1000	38.3	57.8	2.9	1.0						206	0	12	1	.0010
$2000	11.0	67.3	18.3	2.7	.8					263	0	20	3	.0015
$3000	4.8	43.7	36.0	10.9	3.1	1.2	.2			414	0	26	6	.0020
$4000	3.5	33.5	37.7	18.7	3.2	1.0	1.0	1.3	.3	316	0	46	8	.0020
$5000	4.7	36.2	28.5	13.6	11.9	3.8	.4	.4	.4	235	0	38	8	.0016
$6000	2.9	27.7	32.8	13.1	10.2	6.6	2.2	2.2	2.2	137	0	40	10	.00167
$7000	4.5	19.8	28.8	21.6	11.7	7.2	2.7	--	3.6	111	0	73	12	.00171
$8000	1.4	30.4	27.5	13.0	8.7	10.1	4.3	4.3	--	69	0	35	11	.00138
$9000	2.2	33.3	38.9	13.3	11.1	8.9	--	--	2.2	45	0	45	10	.00111

TABLE 77

DISTRIBUTION OF INSURANCE TAX PAYMENT
BY INCOME LEVEL (NARROW INCOME ADJUSTED)

Income Level	BRACKETS (% LESS THAN OR EQUAL TO) 0	$5	$10	$15	$20	$25	$30	$35	>$35	Sample Size	Min. $	Max. $	Mean $	Mean / Income
$1000	29.6	66.7	2.9	.8						243	0	11	1	.0010
$2000	10.7	60.1	23.6	3.7	1.1	.4	--	--	.4	271	0	47	4	.0020
$3000	5.1	39.3	38.5	11.9	4.1	.8	.3			369	0	29	6	.0020
$4000	2.2	30.6	41.7	15.0	6.1	2.2	1.0	.3	1.0	314	0	38	8	.0020
$5000	5.2	33.6	29.9	17.1	7.1	3.8	1.4	1.0	1.0	211	0	79	9	.0018
$6000	1.8	25.7	24.8	23.9	9.7	7.1	3.5	.9	2.7	113	0	63	11	.00183
$7000	4.6	32.2	20.7	13.8	12.6	6.9	3.4	4.6	1.1	87	0	40	11	.00157
$8000	--	23.8	33.3	11.9	9.5	4.8	7.1	2.4	7.1	42	1	65	13	.00163
$9000	8.3	27.8	19.4	22.2	5.6	8.3	2.8	--	5.6	36	0	123	14	.00156

TABLE 78

DISTRIBUTION OF GASOLINE TAX PAYMENTS
BY INCOME LEVEL (NARROW INCOME)

Income Level	BRACKETS (% LESS THAN OR EQUAL TO)										
	0	$10	$15	$20	$25	$30	$35	$40	$45	$50	$60
$2,000	49.1	14.5	10.0	5.5	3.6	5.5	2.7	4.5	--	1.8	.9
$3,000	43.9	11.6	7.3	7.3	7.3	4.9	6.1	2.4	1.2	1.2	1.8
$4,000	30.0	7.6	7.1	7.1	8.1	4.6	5.1	5.6	6.1	4.1	6.6
$5,000	19.1	6.8	5.4	7.7	7.7	8.8	10.3	6.3	5.1	4.8	7.7
$6,000	11.2	5.8	6.3	7.1	8.1	8.4	11.2	7.4	6.3	5.8	10.7
$7,000	10.9	5.2	4.9	7.9	5.7	9.6	8.2	10.1	7.9	6.3	9.8
$8,000	11.6	4.8	4.0	6.5	8.2	7.6	9.0	7.6	7.3	5.7	9.6
$9,000	10.1	4.5	3.4	4.5	9.3	7.5	5.6	9.7	10.1	5.6	11.2
$10,000	5.3	4.4	2.2	6.7	5.3	8.0	8.9	6.7	9.8	5.8	10.2
$11,000	10.0	2.4	4.3	2.4	7.2	6.2	10.0	5.3	7.2	10.5	8.6
$12,000	8.1	1.3	3.4	5.4	2.7	8.1	8.7	4.0	8.1	6.0	16.1
$13,000	8.4	4.2	5.0	3.4	6.7	5.9	3.4	4.2	6.7	8.4	13.4
$14,000	13.3	8.0	6.7	1.3	10.7	8.0	4.0	5.3	4.0	6.7	6.7
$15,000	11.1	4.9	2.5	3.7	2.5	7.4	4.9	7.4	8.6	6.2	14.8
$16,000	15.4	1.5	6.2	4.6	--	7.7	3.1	3.1	7.7	9.2	10.8
$17,000	16.3	--	4.7	9.3	4.7	9.3	7.0	2.3	9.3	4.7	11.6

TABLE 78--Continued

$70	$80	$100	$120	$140	>$140	Sample Size	Min. $	Max. $	Mean $	Mean Income
1.8	--	--	--	--	--	110	0	66	10	.0050
1.2	1.8	--	.6	.6	.6	164	0	142	15	.0075
3.5	2.0	1.5	.5	--	.5	197	0	206	24	.0080
5.1	1.4	1.7	1.1	.3	.6	351	0	163	29	.0073
4.3	3.8	2.3	.5	.5	.3	394	0	149	34	.0057
3.3	3.3	3.6	1.9	.5	.8	366	0	194	36	.0051
7.6	4.2	2.8	2.0	1.1	.3	354	0	174	37	.0046
6.0	5.2	4.1	1.9	1.1	.4	268	0	175	40	.0044
7.1	7.1	5.3	3.6	1.3	2.2	225	0	282	47	.0047
7.2	6.2	6.7	3.8	1.0	1.0	209	0	199	45	.0041
8.1	6.7	6.7	3.4	2.7	.7	149	0	163	48	.0040
6.7	5.0	10.9	5.0	.8	1.7	119	0	166	49	.0038
8.0	10.7	1.3	4.0	1.3	--	75	0	128	38	.0027
2.5	7.4	8.6	6.2	--	1.2	81	0	147	46	.0031
7.7	9.2	3.1	6.2	1.5	3.1	65	0	178	48	.0030
9.3	2.3	2.3	4.7	--	2.3	43	0	176	40	.0024

TABLE 79

DISTRIBUTION OF GASOLINE TAX PAYMENTS
BY INCOME LEVEL (BROAD INCOME ADJUSTED)

Income Level	BRACKETS (% LESS THAN OR EQUAL TO)										
	0	$10	$15	$20	$25	$30	$35	$40	$45	$50	$60
$1000	57.8	13.6	6.3	2.4	6.3	4.9	3.4	.5	1.5	.5	1.0
$2000	28.9	6.5	5.7	7.6	8.0	6.1	8.0	4.9	4.9	6.5	5.7
$3000	16.9	6.8	4.8	8.0	7.0	8.7	8.0	8.0	6.5	5.1	9.2
$4000	13.3	8.9	3.5	5.7	5.4	7.0	9.2	10.1	6.6	7.9	4.1
$5000	14.5	5.5	6.0	6.4	7.2	4.7	6.0	8.5	8.1	7.7	8.5
$6000	16.8	6.6	3.7	2.2	5.8	5.1	5.8	9.5	10.2	5.1	11.7
$7000	14.4	1.8	4.5	8.1	7.2	5.4	7.2	4.5	7.2	6.3	12.6
$8000	15.9	7.2	2.9	8.7	--	8.7	5.8	5.8	4.4	8.7	10.1
$9000	17.8	11.1	2.2	4.4	4.4	11.1	2.2	4.4	4.4	4.4	8.9

TABLE 79--Continued

$70	$80	$100	$120	$140	>$140	Sample Size	Min. $	Max. $	Mean $	Mean / Income
.5	.5	--	--	.5	.5	206	0	142	9	.0090
4.2	.4	1.1	.8	--	.8	263	0	170	25	.0125
3.6	1.2	3.4	1.9	.5	.5	414	0	153	32	.0107
5.4	6.6	4.4	.9	.3	.6	316	0	173	36	.0090
3.8	5.1	4.3	2.1	.9	.9	235	0	155	37	.0074
3.7	5.8	3.7	1.5	1.5	1.5	137	0	178	38	.0063
9.0	5.4	3.6	.9	1.8	--	111	0	135	39	.0056
5.8	11.6	--	1.5	2.9	--	69	0	136	38	.0048
6.7	8.9	4.4	--	4.4	--	45	0	125	38	.0042

TABLE 80

DISTRIBUTION OF GASOLINE TAX PAYMENTS
BY INCOME LEVEL (NARROW INCOME ADJUSTED)

Income Level	BRACKETS (% LESS THAN OR EQUAL TO)										
	0	$10	$15	$20	$25	$30	$35	$40	$45	$50	$60
$1000	49.4	13.6	9.9	8.2	5.8	4.9	1.2	.8	2.1	.4	1.6
$2000	28.8	6.6	7.0	6.6	8.1	6.3	6.6	5.9	4.8	3.7	6.3
$3000	14.6	5.4	4.1	9.2	9.5	8.1	6.8	8.7	7.3	4.6	8.1
$4000	14.0	2.9	5.1	2.0	5.7	9.2	8.0	6.7	6.4	6.4	10.2
$5000	17.5	6.2	5.7	5.2	4.3	7.1	6.2	5.7	6.2	8.1	8.1
$6000	12.4	6.2	7.1	7.1	6.2	7.1	6.2	8.0	7.1	8.9	8.0
$7000	17.2	4.6	2.3	5.7	3.5	6.9	9.2	3.5	6.9	6.9	11.5
$8000	11.9	7.1	7.1	2.4	4.8	11.9	2.4	7.1	7.1	--	16.7
$9000	19.4	8.3	5.6	2.8	--	5.6	8.3	5.6	11.1	11.1	5.6

TABLE 80--Continued

$70	$80	$100	$120	$140	>$140	Sample Size	Min. $	Max. $	Mean $	Mean Income
.4	.8	.4	--	.4	--	243	0	125	11	.0110
4.1	1.5	2.2	.7	.4	.4	271	0	175	25	.0125
5.4	2.4	3.0	1.9	.3	.5	369	0	153	33	.0110
6.7	4.5	3.8	1.9	1.3	.3	314	0	149	37	.0092
5.7	4.7	3.8	2.8	1.4	1.4	211	0	166	38	.0076
4.4	6.2	2.7	.9	.9	.9	113	0	178	36	.0060
4.6	5.7	6.9	2.3	2.3	--	87	0	128	40	.0057
9.5	7.1	--	2.4	2.4	--	42	0	123	39	.0049
5.6	2.8	8.3	--	--	--	36	0	93	35	.0039

TABLE 81

DISTRIBUTION OF MOTOR VEHICLE TAXES PAYMENTS BY INCOME LEVEL (NARROW INCOME)

		BRACKETS (% LESS THAN OR EQUAL TO)						
Income Level		0	$10	$20	$30	$30	$50	$60
1.	($2,000)	49.1	--	26.4	10.0	8.2	5.5	--
2.	($3,000)	39.6	.6	28.7	14.0	6.1	9.1	.6
3.	($4,000)	28.9	2.0	20.3	24.4	4.6	17.8	.5
4.	($5,000)	16.5	1.7	24.2	29.1	4.0	17.9	3.1
5.	($6,000)	9.4	.3	24.1	31.5	4.6	22.1	2.0
6.	($7,000)	9.8	.8	20.5	34.2	2.5	24.3	3.8
7.	($8,000)	6.3	1.5	3.5	47.6	2.3	27.6	3.7
8.	($9,000)	8.2	1.1	3.7	48.1	2.2	22.0	6.7
9.	($10,000)	4.4	.4	2.2	33.8	4.9	27.1	13.8
10.	($11,000)	4.3	5	1.4	37.3	3.8	19.1	17.2
11.	($12,000)	2.0	--	1.3	34.9	2.7	21.5	16.8
12.	($13,000)	3.4	--	--	36.1	3.4	21.8	17.6
13.	($14,000)	5.3	--	1.3	20.0	8.0	21.3	17.3
14.	($15,000)	4.9	--	2.5	18.5	7.4	13.6	25.9
15.	($16,000)	1.5	--	3.1	6.2	18.5	4.6	40.0
16.	($17,000)	11.6	--	--	7.0	39.5	2.3	30.2

TABLE 81--Continued

$70	$80	$90	$100	>$100	Sample Size	Min. $	Max. $	Mean $	Mean Income
.9					110	0	62	12	.0060
1.2					164	0	64	16	.0053
1.0	.5				197	0	71	20	.0050
1.7	1.1	.5			351	0	93	24	.0048
4.8	.8	.5			394	0	86	28	.0056
2.5	.3	.6	.5	.3	366	0	100	29	.0048
3.4	.9	.9	1.1	1.1	354	0	124	34	.0043
4.9	1.1	.8	.7	.4	268	0	100	33	.0037
6.2	2.7	.7	.6	3.1	225	0	139	41	.0041
7.7	4.8	.7	.7	2.4	209	0	133	42	.0038
12.1	4.0	1.2	1.1	1.3	149	0	110	45	.0038
8.4	6.7	1.3	1.2		119	0	100	44	.0034
12.0	8.0	3.4	3.3		75	0	100	47	.0034
8.6	11.1	3.0	2.9	2.5	81	0	120	49	.0033
7.7	13.8	1.6	1.5	1.5	65	0	103	52	.0033
--	7.0	--	--	2.3	43	0	106	40	.0024

TABLE 82

DISTRIBUTION OF MOTOR VEHICLE TAXES PAYMENTS BY INCOME LEVEL (BROAD INCOME ADJUSTED)

Income Level	BRACKETS (% LESS THAN OR EQUAL TO) 0	$10	$20	$30	$40	$50	$60	$70
$1000	55.8	3.4	32.0	1.9	3.4	2.4	.5	--
$2000	27.4	1.9	39.5	13.3	3.0	10.3	1.9	2.7
$3000	13.5	.7	15.9	36.5	3.1	24.1	3.4	1.7
$4000	10.4	1.9	4.7	42.7	1.6	25.3	4.4	5.4
$5000	11.1	.4	3.8	50.6	1.7	12.3	7.2	7.2
$6000	11.7	--	1.5	33.5	8.8	13.9	16.8	4.4
$7000	11.7	--	4.5	26.1	9.9	6.3	27.0	5.4
$8000	11.6	--	--	31.9	11.6	11.6	26.1	1.4
$9000	6.7	--	4.4	28.9	6.7	8.9	31.1	4.4

TABLE 82--Continued

$80	$90	$100	>$100	Sample Size	Min. $	Max. $	Mean $	Mean Income
--	.5			206	0	81	9	.0090
				263	0	68	18	.0090
.2	.4	.3		414	0	98	27	.0090
1.3	1.0	1.0	1.3	316	0	130	33	.0083
3.4	.7	.7	.8	235	0	118	33	.0066
5.8	1.1	1.1	1.5	137	0	100	38	.0063
5.4	.9	.9	1.8	111	0	123	39	.0056
4.3	--	--	1.4	69	0	104	37	.0046
4.4	--	--	4.4	45	0	105	42	.0047

TABLE 83

DISTRIBUTION OF MOTOR VEHICLE TAXES PAYMENTS BY INCOME LEVEL (NARROW INCOME ADJUSTED)

Income Level	BRACKETS (% LESS THAN OR EQUAL TO) 0	$10	$20	$30	$40	$50	$60	$70
$1000	49.4	2.9	34.2	2.1	4.9	3.3	1.2	1.6
$2000	26.2	1.5	31.7	20.3	2.2	13.3	1.9	2.6
$3000	11.1	.3	11.4	42.0	3.8	23.3	2.7	4.1
$4000	10.5	.6	7.6	42.0	1.6	23.9	6.4	4.1
$5000	13.7	.5	3.8	41.7	4.3	13.7	13.7	3.3
$6000	8.0	--	.9	31.0	10.6	6.2	27.4	6.2
$7000	9.2	--	1.1	32.2	11.5	10.3	21.8	9.2
$8000	7.1	--	--	35.7	16.7	4.8	23.8	4.8
$9000	13.9	--	2.8	27.8	25.0	8.3	11.1	2.8

TABLE 83--Continued

$80	$90	$100	>$100	Sample Size	Min. $	Max. $	Mean $	Mean Income
--	.2	.2		243	0	81	12	.0120
--	.2	.2		271	0	91	20	.0100
.8	.2	.1	.3	369	0	124	29	.0097
1.0	.7	.6	1.0	314	0	133	33	.0083
1.9	1.2	1.2	1.0	211	0	110	33	.0066
7.1	1.9	.9	.9	113	0	103	41	.0059
2.3	1.2	1.1		87	0	89	38	.0054
2.4	1.2	1.2	2.4	42	0	103	40	.0050
5.6	1.4	1.4		36	0	92	34	.0038

APPENDIX O

STATISTICAL MEASURES

This appendix lists formulae used in calculating various statistics used in this study.

Coefficient of Variation

1. Formula for the coefficient of variation:

$$V = \frac{\sigma}{\bar{x}} 100$$

where σ = standard deviation
$\bar{x}$ = mean

2. Formula for the standard error of the coefficient of variation:

$$\sigma_V = \frac{V}{\sqrt{2n}} \sqrt{1 + \frac{2V^2}{10^4}}$$

Derivation of the standard error formula can be found in: L. T. C. Tippett, The Methods of Statistics, 4th ed. (New York: John Wiley and Sons, Inc., 1952), pp. 124-126.

3. Formula for the standard error of the difference between two coefficients is given by:

$$\sigma_{\text{difference}} = \sqrt{\sigma_{V_1}^2 + \sigma_{V_2}^2}$$

where σ_{V_1} and σ_{V_2} are the standard errors of the coefficients. This formula assumes the samples are uncorrelated. If they are correlated, a less stringent measure may be used. Throughout

this paper, no correlation is assumed.

See: Herbert Arkin and Raymond R. Colton, Statistical Methods, (New York: Barnes and Noble, Inc., 1956), p. 122.

Sign Test (Significance Test #1)

The sign test involves testing the null hypothesis that the probability of a positive change in a variable is as likely as a negative change. For example, the test is applied to compare, for a given tax and definition, each coefficient of variation with the coefficient at the next highest income level. Consistent changes in the same direction indicate a significant trend. The test of the null hypothesis is based on the statistic:

$$Z = \frac{x - np}{\sqrt{np(1-p)}}$$

where x = number of successes
n = number of trials
p = probability of success, which is assumed to be .5

The statistic, z, is compared to critical values. The decision concerning significance is made at the .05 level. The sign test is non-parametric--it necessitates no assumption concerning the distribution of the sample tested.

See: John E. Freund, Modern Elementary Statistics, 3rd ed. (Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1967), pp. 316-320.

U Test (Significance Test #2)

This test is based on rank sums, that is, two sets of data are combined according to size and the test is based on the sum of the ranks assigned to either sample. The null hypothesis is that of two data sets

are drawn from the same population--thus they should have approximately similar ranks. The test of the null hypothesis is based on the statistic:

$$U = n_1 + n_2 + \frac{n_1 (n_1 + 1)}{2} - R_1$$

where n_1 = size of the first sample

n_2 = size of the second sample

R_1 = sum of the ranks assigned to values in the first sample

the mean of U can be calculated

$$\mu_U = \frac{nn_2}{2}$$

where $n = n_1 + n_2$

The standard deviation of U can be calculated:

$$\sigma_U = \sqrt{\frac{nn_2 (n + n_2 + 1)}{12}}$$

Then:

$$Z = \frac{U - \mu_U}{\sigma_U}$$

The statistic, z, is compared to critical values at the .05 level of significance.

Like the sign test, the U test is non-parametric. It necessitates no assumption concerning the distribution of the sample tested.

See: Freund, Modern Elementary Statistics, pp. 320-323.

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