Lifetime Incidence and the Distributional Burden of Excise Taxes

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Although theoretical papers have noted the potentially important distinction between annual and lifetime tax burdens, with one exception the lifetime perspective is absent in empirical studies of tax incidence.[1] Calculations based on annual income may provide particularly unreliable guidance on a central tax policy issue of the early 1990s: the incidence of excise taxes. Conventional wisdom holds that these taxes are regressive, falling most heavily on the poorest households. This has long been one of the central objections to proposals for raising excise taxes. Nevertheless, the evidence for this view may depend critically on the time horizon in incidence studies. Joseph Pechman writes:

> ...whether regressivity of [sales and excise] taxes with respect to income would remain for accounting periods

longer than one year is not known. It seems clear, however, that the regressivity shown at the lowest income levels on the basis of annual figures would be moderated, if not completely eliminated, over the longer period. [p. 51]

There is relatively little systematic evidence, however, evaluating this conjecture.[2]

The present paper begins by documenting the unsurprising proposition that household income measured over long horizons is less variable than annual household income. This implies that low-income households in one year have some chance of being higher-income households in other years. Thus, even if the share of income consumed by lowest-income groups is higher than that for higher-income groups, excise taxes or taxes on consumption more generally may be less regressive than calculations based on annual income suggest. Section II explores the differences between the annual and lifetime incidence by considering the incidence of excise taxes on gasoline, alcohol, and tobacco. It shows that expenditure on these items as a share of total consumption is much more equally distributed than expenditure as a share of annual income. If households base their spending plans on their expected lifetime income, then consumption provides a more accurate measure of lifetime resources than does annual income. From a longer-

[1]The general equilibrium incidence model of Charles Ballard et al. (1985), as well the tax burden calculations of Joseph Pechman (1985), allocate households to categories based on annual income. The study that does consider lifetime issues (James Davies et al., 1984), finds that the choice of time interval has important effects on the estimated distribution of Canadian taxes. Theoretical treatments of lifetime tax issues include David Levhari and Eytan Sheshinski (1972) and E. John Driffill and Harvey Rosen (1983).

[2]Two recent papers (Frank Sammartino, 1988, and Richard Kasten and Sammartino, 1988) recognize the potential importance of this annual income bias. They compare expenditures on particular commodities to total expenditures, and examine the incidence of taxes on a number of products not discussed in this paper.

horizon perspective, these taxes are therefore much less regressive than is usually thought.

I. Do Lifetime and Annual Incidence Differ?

Many studies provide detailed information on the tax burdens facing households at different points in the annual income distribution. If households stay at the same position in the income distribution over long periods of time, then these calculations provide reasonable indications of longer-term tax burdens as well. Data on income dynamics, however, suggest a surprising degree of instability in the annual income distribution.

Table 1 presents data on movements up and down the income distribution by individuals in the *Panel Study of Income Dynamics* (*PSID*). The entries are transition probabilities relating an individual's location in the distribution in 1971 to the same individual's position in 1978. A randomly chosen individual had a 41 percent chance of being in the same income quintile in these two years. The chance that an individual in the lowest-income quintile in 1971 would be there again in 1978 was .54, significantly higher than the one-in-three chance that an individual near the middle of the income distribution would remain in the same quintile.

Transition data may overstate the true incidence of mobility since survey data on household income are subject to measurement error. The magnitude of the overstatement may be small, however. John Bound and Alan Krueger (1988) find that only 15 percent of the cross-sectional variation in reported income in the *Current Population Survey* is due to noise. Duncan and Daniel Hill (1985) report similarly encouraging results for the *PSID*. Both studies also find important positive correlation between the measurement errors for earnings in adjacent years (.43 in Duncan and Hill), undermining the common claim that much of the year-to-year variation in reported earnings is due to measurement error.

Substantial instability in the income distribution is confirmed by evidence from other studies using other data sets. Frank Hanna (1948), analyzing Wisconsin income data

TABLE 1—FAMILY INCOME MOBILITY OVER
A SEVEN-YEAR INTERVAL

1971 Income Quintile	Probability of 1978 Income Quintile:				
	1	2	3	4	5
1	.54	.20	.13	.10	.03
2	.20	.31	.27	.14	.08
3	.09	.19	.30	.30	.13
4	.04	.10	.19	.34	.34
5	.04	.07	.11	.21	.58

Notes: Income quintile 1 refers to the lowest-income quintile. This table is drawn from Greg Duncan and James Morgan (1981, Table 1.1).

from the 1929 to 1935 period, finds markedly less inequality in the distribution of total income over the period than in the distribution of annual income. Paul Taubman (1977) examines mobility in the NBER-Thorndike/Hagen data set that reports earnings in 1969 and 1955 for a sample of 4600 men aged 18–26 in 1943. This homogeneous sample controls for lifecycle variation in earnings, but Taubman nevertheless finds that an individual's chance of falling in the same earnings decile in 1955 and 1969 is only 22 percent. Lee Lillard (1977) uses the same data and estimates the Gini coefficient for annual income to be .28, significantly larger than the estimate of .19 for the present value of lifetime earnings.[3]

Since studies using annual income data find that the burden of the U.S. tax system is roughly proportional to income except at the top and bottom of the income distribution, mobility into and out of these parts of the income distribution has the largest effect on incidence studies. Martha Hill's (1981) study of the *PSID* sample finds that one-third of

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[3]Comparisons of the inequality in lifetime and annual earnings hinge critically on the assumed persistence of the component of individual earnings that cannot be explained by observable individual attributes. Roger Gordon (1984) finds very little difference between the interpersonal distribution of human wealth and annual earnings, presumably because of differences in his stochastic specification. A detailed discussion of individual wage histories and their random components is found in the *Report of the Consultant Panel on Social Security...* (1976), which reports an autocorrelation coefficient of approximately .50 for an individual's wages at the beginning and end of a decade, after correcting for economywide growth trends.

the individuals who were in poverty had not been in poverty the previous year. Taubman's results show less mobility: 39 percent of individuals in the lowest-earning decile in 1955, as well as 44 percent of those in the highest decile, were in the same decile again in 1969.

Even modest mobility is sufficient to alter basic incidence results, particularly regarding excise taxes. Davies et al. find that the average burden of Canadian sales and excise taxes for the lowest-income decile falls from 27 percent when annual income is the benchmark to 15 percent with lifetime incidence (the average across all groups is 13 percent). For the highest-income decile, the excise tax burden rises from 8.5 percent with annual incidence to 12 percent with lifetime incidence. For the progressive corporate income tax, lifetime incidence reduces the burden on top decile households from 10 to 5 percent and raises the burden on the lowest decile from 1 to 2 percent.

Focusing on lifetime incidence introduces two considerations that annual incidence calculations omit. First, lifetime incidence incorporates predictable lifecycle patterns in earnings, asset accumulation, and consumption, yielding more sensible inferences with respect to the distribution of tax burdens. For example, consider the gasoline excise tax burden on two city-dwelling households with no current gasoline expenditures, one a young couple and the other two elderly pensioners. While the annual incidence framework might imply identical burdens on the two households, the lifetime approach correctly imputes a higher burden to the younger couple because they are likely to move to the suburbs and become substantial gasoline consumers in future years.

Second, lifetime incidence averages over many years, reducing the importance of variation in annual earnings due to unemployment or changes in family status. In practice this effect is more important than the lifecycle effect in estimating the distribution of excise tax burdens. For many low-income households, current income provides an unreliable indication of lifetime economic status. Pechman attempts to correct for this problem in measuring tax burdens on the

lowest-income decile. His reported tax burdens for the lowest decile (first through tenth percentiles) are based on households in the *sixth* through tenth percentiles.

II. Excise Tax Increases from the Lifetime Incidence Perspective

The current policy debate surrounding excise taxes on gasoline, tobacco, and alcohol provides an excellent illustration of the differences between annual and lifetime incidence measures. Table 2 presents the share of gasoline, tobacco, and alcohol expenditures in annual income (excluding in-kind transfers) and in annual consumption for households at various points in the income and expenditure distribution. Provided households adhere to the basic tenets of the lifecycle-permanent income hypothesis by setting consumption in relation to lifetime resources rather than current income, total expenditure provides a better measure of long-term household well-being than annual income.

I follow Pechman in assuming that excise taxes are fully reflected in consumer prices. The distribution of expenditures across households therefore determines the incidence of the tax. The burden on low-income or low-consumption households would be reduced if the analysis recognized the indexed nature of most transfer payments, which provide increased income in response to tax-induced price changes.

The results in the upper panel of Table 2 show expenditures on each good as a share of pre-tax income and support the general view that excise taxes are regressive. Low-income households spend a much higher fraction of their income on these commodities than do higher-income households. For both gasoline (col. 1) and alcohol (col. 3), expenditures as a fraction of income are more than five times larger for the bottom quintile of the income distribution than for the top quintile. Tobacco tax burdens are even more uneven: the income shares differ by a factor of ten. These results reflect a ratio of total expenditures to income excluding in-kind benefits of well above unity for low-income households.

TABLE 2—INCOME AND EXPENDITURE SHARES
OF GASOLINE, ALCOHOL, AND
TOBACCO SPENDING, 1984

Quintile	Gasoline	Alcohol	Tobacco
Income: Percent of Income Before Taxes			
1	15.0	4.6	4.6
2	7.0	1.9	2.0
3	5.3	1.4	1.3
4	4.3	1.1	0.9
5	2.8	0.9	0.5
Expenditure: Percent of Total Current Expenditures			
1	6.0	1.6	2.2
2	7.2	1.7	2.0
3	7.1	1.8	1.7
4	6.6	1.6	1.3
5	3.9	1.2	0.7

Source: U.S. Department of Labor, BLS *Consumer Expenditure Survey Results from 1984* (1986), and unpublished tabulations. In each case quintile 1 refers to the lowest quintile. Current expenditures equal total expenditures less pension, retirement, and Social Security contributions.

TABLE 3—LIFECYCLE PATTERNS IN THE
EXPENDITURE SHARES

Age Group	Percentage of Current Expenditures for			Current Expenditures/ Pre-Tax Income
	(1)	(2)	(3)	
< 25	6.2	1.2	3.0	.99
25–34	5.1	1.1	1.7	.80
35–44	5.0	1.1	1.3	.79
45–54	5.7	1.2	1.3	.81
55–64	5.4	1.2	1.3	.74
65–74	5.0	1.1	1.1	.91
75 +	3.2	0.6	0.8	.89

Source: U.S. Department of Labor (1986, Table 3).
Note: Col. 1 denotes Gasoline and Motor Oil; Col. 2 is Alcoholic Beverages; Col. 3 is Tobacco.

The statistics are based on quintile averages and conceal important horizontal inequities in the consumption of these goods. Sammartino (1987) reports that only 52 percent of families with before-tax incomes of less than $5000 in 1985 purchased gasoline, compared with more than 99 percent of families with incomes of more than $20,000. Gasoline expenditures are therefore well above 15 percent of annual income for some low-income households. Similar issues arise on a smaller scale for alcohol and tobacco purchases.

A completely different pattern emerges when total current expenditures, rather than annual income, are used to calibrate the incidence of taxes on these commodities. These data are reported in the lower panel of Table 2, with households again divided into quintiles but now using total expenditures as a basis for classification. For the lowest consumption quintile, gasoline and motor oil expenditures account for 6.0 percent of total outlays, slightly less than the shares for the three middle quintiles of the consumption distribution. For the highest quintile, the expenditure share for gasoline declines to 3.9 percent. The divergence across different parts of the consumption distribution is much smaller, however, than the variation in

spending as a share of income. Alcohol expenditures display a similar compression, varying only between 1.2 and 1.8 percent of total spending across different groups. For tobacco, however, even using the consumption metric, the excise tax appears regressive: the expenditure share of the least-well-off quintile is three times that for the highest expenditure class.[4]

The striking difference between the distributional burdens that emerge from incidence calculations in the annual and lifetime frameworks could be due either to lifecycle variation in the consumption-to-income ratio (C/Y), or to short-run fluctuations in annual income. Table 3 addresses the relative importance of these two factors by presenting the consumption-income ratio and the fraction of expenditures devoted to different taxed commodities by age group. While there is some evidence of a lifecycle pattern in consumption-to-income ratios, with young households exhibiting higher average propensities to consume than older ones, the variation in C/Y across age groups is much smaller than the variation across income groups in Table 2. The share of total expenditures devoted to gasoline, alcohol, and tobacco is also quite stable across age groups. Although the elderly consume less of each of these commodities than do younger house-

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[4]Edgar Browning and William Johnson (1979) also note that expenditure shares on these goods do not vary a great deal, but they stratify households by income rather than expenditures in making these comparisons.

TABLE 4—AGE-SPECIFIC EXPENDITURE SHARES, 1985[a]

Age Group	Expenditure Quintile				
	1	2	3	4	5
Expenditure Share for Gasoline					
< 25	7.1	7.1	7.0	6.4	2.3
25–34	8.2	7.0	7.3	6.0	3.3
35–44	6.3	8.0	6.5	6.8	4.0
45–54	4.8	8.9	8.3	7.4	4.3
55–64	7.0	8.3	6.7	5.5	4.0
> 65	5.2	4.8	5.8	5.2	2.6
Expenditure Share for Alcohol					
< 25	3.9	3.4	2.2	2.9	0.8
25–34	2.0	2.1	2.3	1.9	1.4
35–44	1.6	2.0	1.6	1.5	1.0
45–54	1.2	1.0	1.3	1.6	1.2
55–64	1.2	1.6	1.7	1.7	1.0
> 65	0.4	1.2	1.2	1.2	1.0
Expenditure Share for Tobacco					
< 25	1.6	1.3	1.9	1.1	0.5
25–34	2.2	2.3	1.7	1.1	0.6
35–44	4.2	2.0	1.7	1.4	0.7
45–54	4.3	2.8	2.1	1.6	0.8
55–64	2.9	2.2	1.8	1.6	0.5
> 65	1.2	1.5	1.1	0.9	0.3

Source: Author's calculations based on 1985 *Consumer Expenditure Interview Survey,* first-quarter data. Expenditures are defined as in CES and include some contributions to retirement programs. In each case quintile 1 denotes the lowest-expenditure quintile.

[a] Shown in percent.

holds, there is very little variation in the budget shares of these goods for households headed by individuals between the ages of 25 and 74.

The small variation in expenditure shares across age groups is matched by limited dispersion within age groups.[5] Table 4 disaggregates households by age and consumption quintile and shows little variation in the age-specific shares of expenditure devoted to gasoline, alcohol, and tobacco. This is particularly evident for the lowest four-fifths of the expenditure distribution. Tobacco expenditures are an exception to this rule: even using the consumption basis for incidence, tobacco taxes appear to be regressive since the expenditure share is approximately three times as large for those in the bottom consumption quintile as for those in the top quintile. In every age group, the share of expenditures devoted to tobacco declines with household status. The effects are weaker

[5]Stratifying within age groups based on before-tax income yields the same pattern of high C/Y ratios at low incomes and low values at high incomes, that was observed in the entire population.

for both alcohol and gasoline. For alcohol, especially among younger age groups, the least-well-off may devote twice as much of their total budget to alcohol as their better-off counterparts. The expenditure share for gasoline varies less. For each of these commodities, however, the variation in expenditure shares is smaller than the variation in expenditure to income ratios suggested by Table 2. The results may also understate the burden on top-quintile consumers, since they tend to be making transitory purchases of durable goods, and therefore overstate regressivity.

The differences between incidence calculated from income and from consumption have implications beyond the analysis of excise taxation. A recurrent issue in the tax base debate is the regressivity of consumption taxes, due to the higher expenditure-income ratio at low-income levels. Classifying households by consumption rather than income, however, eliminates the apparent disparity. The ratio of expenditures to before-tax, in-kind exclusive income for households in the lowest-income quintile in the 1984 *Consumer Expenditure Survey* is 3.17. For households in higher quintiles, the ratios are 1.3, .98, .84, and .69, respectively. When classified by consumption quintiles, however, the ratios are quite different. From lowest-consumption quintile to highest, they are .79, .82, .80, .82, and 1.05. These calculations suggest the need for further study on the lifetime burden of consumption taxes.

III. New Directions for Incidence Research

Failure to distinguish between lifetime and annual incidence overstates the degree of inequality in tax burdens between groups, suggesting that progressive taxes are more progressive and regressive taxes more regressive than a lifetime analysis would suggest. The illustrative calculations presented here suggest that for studying the incidence of excise taxes, these biases may be substantial.

These findings suggest three research directions. First, stochastic models of the income distribution need to be linked with more traditional incidence approaches. The rapid advance in computing power in the

last decade makes it possible to envision general equilibrium models of tax incidence where random elements of household income are explicitly simulated. Second, further research is needed on the inequality of lifetime and annual incomes. The increasing availability of longitudinal data, such as the fourteen-year match of the *Panel Survey of Income Dynamics* and the recently released IRS taxpayer panel, facilitates such work. Finally, the lifetime incidence approach with its emphasis on mobility draws attention to classes of households with a conspicuous *lack* of mobility. Retired individuals, for example, may not experience the same variation in income flows that younger households face. For the elderly, the burden of some excise taxes may therefore be greater than for other households with similar consumption, although Kasten and Sammartino (1988) suggest this is not the case for the gasoline, tobacco, and alcohol excises. Additional research is needed to identify low-mobility groups and measure their tax burdens.

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