

This PDF is a selection from an out-of-print volume from the National Bureau of Economic Research

Volume Title: Tax Policy and the Economy, Volume 8

Volume Author/Editor: James M. Poterba

Volume Publisher: MIT Press

Volume ISBN: 0-262-66091-1

Volume URL: <http://www.nber.org/books/pote94-3>

Conference Date: November 16, 1993

Publication Date: January 1994

Chapter Title: Life Cycle versus Annual Perspectives on the Incidence of a Value Added Tax

Chapter Author: Gilbert E. Metcalf

Chapter URL: <http://www.nber.org/chapters/c10884>

Chapter pages in book: (p. 45 - 64)

# LIFE CYCLE VERSUS ANNUAL PERSPECTIVES ON THE INCIDENCE OF A VALUE ADDED TAX

*Gilbert E. Metcalf*

Princeton University and NBER

## EXECUTIVE SUMMARY

This paper analyzes the steady-state distribution of tax burdens of a Value Added Tax (VAT) in the United States using a lifetime perspective. In contrast to an annual snapshot perspective, I find that a VAT on total expenditures would be proportional over the lifetime. Various modifications to the VAT (zero rating necessities or lump-sum household rebates) would increase the progressivity of the tax substantially. However, the additional progressivity comes at the cost of substantial tax revenue.

## 1. INTRODUCTION

Over the past twenty-five years most developed countries have adopted some form of a Value Added Tax (VAT). Moreover, this tax has become

---

This paper has been prepared for the NBER Tax Policy and the Economy conference to be held in Washington, DC, on November 16, 1993. Jim Poterba provided useful comments on an earlier draft. Andrew Clarkson provided excellent research assistance.

an important source of revenue in many of those countries.<sup>1</sup> The arguments on its behalf are well known. A VAT can raise significant amounts of revenue. The U.S. Congressional Budget Office (1993) estimates that a broad-based VAT imposed at a 5 percent rate in the United States beginning in 1995 could raise close to \$70 billion in its first year. Even after exempting food, housing, and medical care, the VAT would still raise roughly \$36 billion in its first year. In addition, a VAT does not distort current and future consumption decisions. Put differently, the returns to saving are untaxed—a feature that has made consumption taxes like a VAT attractive to policy makers concerned with the level of savings in the United States.<sup>2</sup>

Despite these facts and despite a number of efforts to introduce a VAT in this country, the United States does not employ a VAT, for two important reasons. First, many are suspicious that a VAT would be a “money machine.” That is, it would be a “hidden” tax raising large sums of money and would ease pressure on Congress and the president to reduce federal spending. Second, others view the VAT as a highly regressive tax.<sup>3</sup>

This paper takes up the second issue—whether a value added tax would be regressive. Viewed in the context of a single year, a VAT does in fact look quite regressive. However, when viewed in the context of a taxpayer’s lifetime, a VAT looks decidedly less regressive and in fact can look quite progressive under different design schemes. In the next section, I review the literature on the incidence of consumption taxes and discuss the importance of the lifetime perspective. Section 3 presents the essential results of the paper. Using the 1990 Consumer Expenditure Survey (CEX), I estimate the incidence of a VAT using annual income and current consumption as my two income measures. Here I find that a broad-based VAT looks essentially proportional when a taxpayer’s resources over the course of a lifetime are considered. I then consider how

<sup>1</sup> In 1986 West Germany raised 14 percent of its total tax revenue from a VAT while the United Kingdom raised 18 percent and Denmark 27 percent (Tait, 1988).

<sup>2</sup> It has also been argued (incorrectly) that a VAT would help improve the trade balance. With appropriate border adjustments, a VAT is neutral with respect to trade (see Grossman, 1980). A VAT could encourage net exports if used to reduce reliance on direct taxes, for which some of the burden might be passed forward to consumers and result in higher export prices.

<sup>3</sup> In addition, there are fears that a VAT would be inflationary, that it would hinder state and local governments’ ability to raise money through sales taxes, and that it would be difficult to administer. It is by no means clear why a one-time price increase would fuel inflation. As for the other two concerns, these are design considerations that would need to be addressed if a VAT were implemented. Note, though, that a VAT with a state-revenue sharing component could reduce sales-tax tensions of the type currently taking place between New York and New Jersey (*New York Times*, December 9, 1992).

bequests affect this result. Over a lifetime, the present discounted value of labor earnings must equal the present discounted value of consumption plus net bequests given (net of bequests received). It is by no means clear how a broad-based consumption tax would affect the value of bequests even if they are not directly taxed. I consider one extreme scenario, namely, that bequests given are not subject to nor affected by a value added tax. Accounting for bequests in this fashion does not affect the central finding of proportionality in any significant way.

Section 4 considers various ways to increase the progressivity of a VAT. I find that a VAT could be easily modified in ways that would substantially increase the progressivity of the tax. Section 5 concludes.

## 2. CONSUMPTION TAX BURDENS

As is well known, the statutory incidence of a tax can differ markedly from its economic incidence. Despite the number of ways that a VAT can be administered, the tax is generally considered to be a tax on consumption.<sup>4</sup> The final incidence of a tax will depend on whether it is passed forward (economic incidence on consumers), backward (economic incidence on factors of production—capital and labor), or in some combination of forward and backward shifting. Early studies (e.g., Musgrave, Case, and Leonard (1974) and Pechman (1985)) take the results from a wide number of empirical studies to make judgments about the appropriate shifting of individual taxes and conclude that consumption taxes are passed forward to and borne by consumers in proportion to their expenditures. In these studies, families are ranked according to their annual income, and average tax shares by decile or quintile are computed. These studies find that average tax rates for existing consumption taxes in the United States (federal excise taxes, state and local sales and excise taxes) fall with income: consumption taxes are regressive.

As an alternative to the approach used by Pechman and others, Ballard, Scholz, and Shoven (1987) used a computable general equilibrium (CGE) model that allows for relative prices to change in response to changes in tax systems to study a VAT. They estimate that a VAT introduced as a partial substitute for the personal income tax would produce welfare losses for lower-income groups and welfare gains for higher-income groups. Such a shift in taxation would be regressive.<sup>5</sup>

<sup>4</sup> See U.S. Congressional Budget Office (1992) for a good discussion of the ways a VAT could be administered.

<sup>5</sup> Pechman assumes that the system of sales and excise taxes in the United States would be replaced by a lump-sum tax. The regressivity of the tax shift in Ballard, Scholz, and Shoven is partially due to the use of a VAT and partially due to the decreased reliance on the income tax with its progressive rate schedule.

Recently, there has been considerable interest in measuring the lifetime incidence of consumption taxes. There are two reasons for this interest. First, annual income can fluctuate substantially. Given people's ability to save and spend accumulated savings, annual income may not be a good measure of an individual's ability to consume in a given year. Friedman (1957) formalized this notion in his Permanent Income Hypothesis (PIH), arguing that people make consumption decisions based on an unobservable measure of permanent income. If the purpose of a distributional analysis is to group and rank people by a measure of their economic welfare, permanent income is probably a better measure than annual income. Fluctuations in annual income tends to make a consumption tax look more regressive than it would be if we measured and ranked people by permanent income. Someone with a positive shock to income (e.g., winning the lottery) will appear "rich" and have a low consumption to income ratio (and hence a low consumption tax to income ratio), whereas someone with a negative shock (e.g., experiencing a temporary spell of unemployment) will appear "poor" and have a high consumption tax to income ratio.

Furthermore, life-cycle considerations suggest that we should view individuals by their lifetime income (*viz.*, Modigliani and Brumberg, 1954). People tend to earn low amounts of income (relative to their average income over their lifetime) in their youth as well as in old age. In a cross-sectional analysis, lower-income groups will include not only poor people (in a lifetime sense) but also young and old people who are not poor in a lifetime sense but are making consumption decisions based on their future ability to earn or on their past earning history. The difficulties with measuring income at the low end of the distribution are well understood by economists.<sup>6</sup>

Recognizing the difficulties with using annual income as a measure of ability to pay, economists have conducted distributional analyses using life-cycle models in which a measure of lifetime income is used to rank households. The challenge in this approach is to measure the unobservable, variable-lifetime income: the present discounted value of earned income plus gifts received. Lifetime income  $W$  can be measured in one of two ways. As equation (1) shows, we can measure  $W$  on the sources or on the uses side:

$$W = \sum_{t=t_0}^{t=T} \frac{E_t + G_t}{(1 + \rho)^{t-t_0}} = \sum_{t=t_0}^{t=T} \frac{C_t + B_t}{(1 + \rho)^{t-t_0}}. \quad (1)$$

<sup>6</sup> Pechman resolved this measurement problem by discarding the lowest 5 percent of the families in the income distribution from his sample.

On the sources side, lifetime income is the present discounted value of earned income  $E$  and bequests received  $G$ , while on the uses side, it equals the present discounted value of consumption  $C$  and bequests made  $B$ .

Poterba (1989, 1991) has proposed using a measure of consumption as a proxy for lifetime income in studies of federal excise taxes. Under the assumption that consumption tends to be smoother than income, total annual consumption is likely to be a better measure of well-being than is annual income. This approach measures lifetime income from the uses side. Metcalf (1993) has used a similar approach to analyze state and local tax systems. In general, these studies find that consumption taxes are less regressive from a life-cycle perspective than from an annual perspective.

Fullerton and Rogers (1993) have conducted an extensive study of lifetime incidence of the U.S. tax system; in effect, they've "redone" Pechman in a lifetime setting. They construct a measure of lifetime income by estimating age-income profiles for different demographic groups and use it to impute a stream of wage rates from which their lifetime income can be constructed. They measure lifetime income on the sources side.<sup>7</sup> Fullerton and Rogers find that the system of federal, state, and local sales and excise taxes in the United States is roughly as regressive in a life-cycle perspective as in an annual perspective. This finding cannot be easily carried over to a VAT. The tax rates facing consumers in their study range widely from 0 (housing) to 79 percent (tobacco). Much of the regressivity is due to the fact that necessities tend to be taxed at higher rates than luxury goods.<sup>8</sup> Presumably, a VAT would be structured differently.

Policy makers may be apprehensive about an approach that must make heroic assumptions about future income and consumption streams to assess the distributional impact of a consumption tax. The U.S. Congress Joint Committee on Taxation (JCT) (1993) recently considered this issue and proposed a five-year window to approximate lifetime income. This approach probably deals well with the problem of transitory fluctuations to income but does not capture life-cycle considerations very well. The JCT found that nearly 90 percent of the observations in their study were in a five-year, average-income decile that was within one decile of their annual income decile. They concluded that single-year income mea-

<sup>7</sup> They estimate wage profiles rather than earned income profiles in order to include leisure as a consumption good.

<sup>8</sup> Fullerton and Rogers's results are also somewhat sensitive to their use of a Stone-Geary utility function. Varying the minimum required purchase has a large effect on the measured regressivity of consumption taxes.

asures are reasonably good measures for permanent income (p. 86). This finding contrasts sharply with Fullerton and Rogers's analysis, however; they find that less than half (46%) of the individuals in their sample are in a lifetime-income decile within one decile of their annual income decile. Fullerton and Rogers's finding indicates that a five-year income measure may not be a good proxy for lifetime income and that analyses based on lifetime income measures may give substantially different results than analyses based on annual income measures.

### 3. THE DISTRIBUTION OF A VAT

In this section, I consider the distribution of a 5 percent value added tax introduced as an additional tax with no change in government expenditures, using data from the 1990 Consumer Expenditure Survey.<sup>9</sup> I will assume that the burden of a VAT is borne by consumers and compute the tax burden as the statutory rate multiplied by the dollar amount of consumption.<sup>10</sup> The forward-shifting assumption is consistent with previous work by Pechman (1985), Musgrave, Case, and Leonard (1974), and others. In addition, I will measure taxes at the household level.

Data for the analysis come from the 1990 CEX family expenditure files. The CEX interviews families once every three months for five quarters. Information from the second through fifth interviews is publicly available and can be used to construct estimates of annual consumption.<sup>11</sup> New households enter the sample every quarter and depart after their fifth interview. Families interviewed in a given quarter are asked about consumption over the last three months. Because families may be interviewed at any date within the quarter, data from the previous three-month period can be included in the current quarter. Thus, families interviewed in the first quarter of 1990 may report some expenditures from the last quarter of 1989. Similarly, families interviewed in the first quarter of 1991 may report expenditures from 1990. I use families who report complete income information, are interviewed for all four quarters (that are publicly released), and who enter the sample in either the first or second quarter of 1990. This gives me 1,561 observations for my sample.

<sup>9</sup> This is an absolute incidence experiment. I do not consider what is done with the revenue raised by the tax.

<sup>10</sup> In latter parts of the paper, I consider deductions as well as lump-sum subsidies. Most VATs are administered by the invoice method in which the tax is paid at each stage of manufacture on total value with a credit allowed for taxes paid at previous stages. From the viewpoint of determining the tax burden, this method is equivalent to implementing a VAT as a retail sales tax at the national level.

<sup>11</sup> There is also a diary component to the study. I do not use this part of the CEX.

TABLE 1.  
*Summary Statistics on Income and Consumption.*

	Annual income	Current consumption	Current consumption with bequests
Mean	34,794	27,780	31,696
Median	27,900	24,140	26,622
Standard deviation	26,155	16,189	19,233
$X_{25}$	14,994	16,585	18,791
$X_{75}$	47,685	35,676	38,709
Coefficient of variation	.75	.58	.61

Summary statistics from 1990 Consumer Expenditure Survey. Annual income is the before-tax income measure reported in the CEX. Current consumption is total expenditures with two sets of adjustments. First, shelter costs for home owners, new vehicle purchases, life-insurance premiums, and pension contributions are subtracted from total expenditures. Second, annual rental values for owner-occupied housing and vehicles are added back in. See text for more details as well as the adjustment for current consumption with bequests.

$X_{25}$  refers to the value at the 25th percentile,  $X_{75}$  refers to the value at the 75th percentile. There are 1,561 observations in the data set.

To compare annual and lifetime measures, I use annual income before tax for the annual measure and current consumption as a measure of lifetime income. The before-tax income measure comes from the 1990 CEX. I construct current consumption as total expenditures (as reported in the CEX) minus new vehicle purchases, housing costs for homeowners, and contributions for pensions and life insurance. These deductions are in large part a form of savings. To measure the consumption component of housing and automobiles, I include an imputed rental value for owner-occupied housing (reported in the CEX) and impute an automobile-consumption value using an approach of Cutler and Katz (1991).<sup>12</sup>

Table 1 provides summary statistics on current consumption and income for my sample; Table 2 presents the cutoff values for each decile. Mean income at \$34,794 is substantially higher than mean current consumption at \$27,780 (ignore the last column for now). The skew in income is apparent: mean income is 25 percent greater than the median while mean consumption is only 15 percent greater than median consumption. Income is also more variable. The coefficient of variation for the income measure is .75 but only .58 for current consumption. Note also that annual income minus current consumption is negative for the lowest three deciles and increases monotonically with consumption (or

<sup>12</sup> See the appendix for details on the construction of automobile consumption. For renters, I include their rent payment.



**TABLE 2.**  
*Boundary Values for Deciles.*

Decile	Annual income	Current consumption	Current consumption with bequests
1	8,536	10,729	13,174
2	12,400	14,639	16,827
3	17,572	18,131	20,397
4	22,725	20,926	23,294
5	27,870	24,131	26,622
6	35,402	28,216	30,878
7	43,319	32,796	35,724
8	53,012	38,207	41,455
9	68,410	49,898	57,831
10	190,360	152,324	182,484

This table reports the upper limit values for the deciles in three different income measures from the 1990 Consumer Expenditure Survey. For example, 8,536 is the maximum value for the first annual-income decile. The values reported for the 10th decile are the maximum values in the sample.

income). Presumably, consumption exceeds income for many in the lowest deciles because annual income for many of these households has been reduced by an income shock that is not expected to persist over time.

Table 3 is a tabulation of current consumption against income. Roughly 9 percent of the households in the lowest income decile have current consumption above median consumption in the sample. In addition, 36 percent of the households are in a consumption decile at least two deciles away from their income decile. This dispersion of consumption within income deciles should make one cautious about using income as a measure of well-being.

Another way to see the difficulties associated with using annual income in an incidence analysis is depicted in Figure 1. I computed the median ratio of total expenditures to before-tax income by age of head of household and graphed this variable against age. As the life-cycle model predicts, all but one of the observations in which the median ratio exceeds one are for ages below twenty-five and above sixty. In addition, I regressed this ratio against age, age squared, and age cubed.<sup>13</sup> Figure 1 also shows the graph of the predicted ratio against age. The graph has

<sup>13</sup> I also ran the regression with age raised to the fourth. The *t* statistic on this variable was 1.1. The graph of predicted expenditures to income against age looks very similar to the graph using a cubic polynomial.

**TABLE 3.**  
*Consumption versus Income in the 1990 Consumer Expenditure Survey.*

Income deciles	Consumption deciles									
	1	2	3	4	5	6	7	8	9	10
1	<b>53.2</b>	19.2	7.7	6.4	4.5	3.9	1.9	1.9	1.3	0.0
2	30.8	<b>30.8</b>	13.5	12.2	5.8	2.6	1.9	2.6	0.0	0.0
3	9.0	24.4	<b>23.1</b>	16.0	7.7	9.6	5.1	1.9	1.9	1.3
4	6.4	14.1	25.0	<b>18.0</b>	17.3	5.1	7.0	4.5	1.9	0.6
5	0.6	6.4	14.7	17.3	<b>17.3</b>	19.2	12.8	6.4	1.3	3.8
6	0.0	3.8	4.5	14.7	26.3	<b>17.3</b>	17.3	10.3	3.8	1.9
7	0.0	1.3	7.7	12.2	10.9	17.3	<b>19.9</b>	16.0	10.3	4.5
8	0.0	0.0	2.6	1.9	7.7	14.1	19.2	<b>25.6</b>	21.8	7.0
9	0.0	0.0	0.6	1.3	1.9	7.7	11.5	20.5	<b>32.0</b>	24.4
10	0.0	0.0	0.6	0.0	0.6	3.2	3.2	10.2	25.5	<b>56.7</b>

This table presents a tabulation of annual income against current consumption from the 1990 Consumer Expenditure Survey. Cell entries are the probability of being in a consumption decile, conditional on being in a given income decile. Consumption is net of expenditures on automobiles and housing and inclusive of rental equivalents for those durables. Pension and life-insurance contributions are excluded.

The probabilities in bold face give the probability of being in the same consumption decile as a household's income decile for each income decile. There are 1,561 observations in the data set.

peaks at age eighteen and seventy-eight, once again suggesting that the young and the old are making expenditure decisions taking variables other than current income into account.

One problem with the consumption measure described above is that it does not include bequests. Lifetime income on the uses side consists of consumption plus bequests given. As Menchik and David (1982) have noted, a VAT would likely exempt bequests from taxation. How one should think about bequests when constructing a VAT is not entirely clear. Bequest behavior can be categorized in the following ways: accidental, altruistic, "warm glow," and strategic. Bernheim (1987) finds little support for either accidental or altruistic bequests.<sup>14</sup> One can reasonably think of "warm glow" and strategic bequests as a form of consumption that should be taxed. To the extent that the bequest is worth less to the recipient (because it is taxed upon consumption), the bequest is also

<sup>14</sup> It is not clear how one would think about these forms of bequests with a VAT. If bequests are accidental, should one consider them as lifetime income or as a form of untaxed consumption? If bequests are altruistic, one must reconsider the lifetime approach to measuring tax incidence. Altruism suggests that the lifetime of a dynasty is the appropriate measure rather than the lifetime of a member of the dynasty.

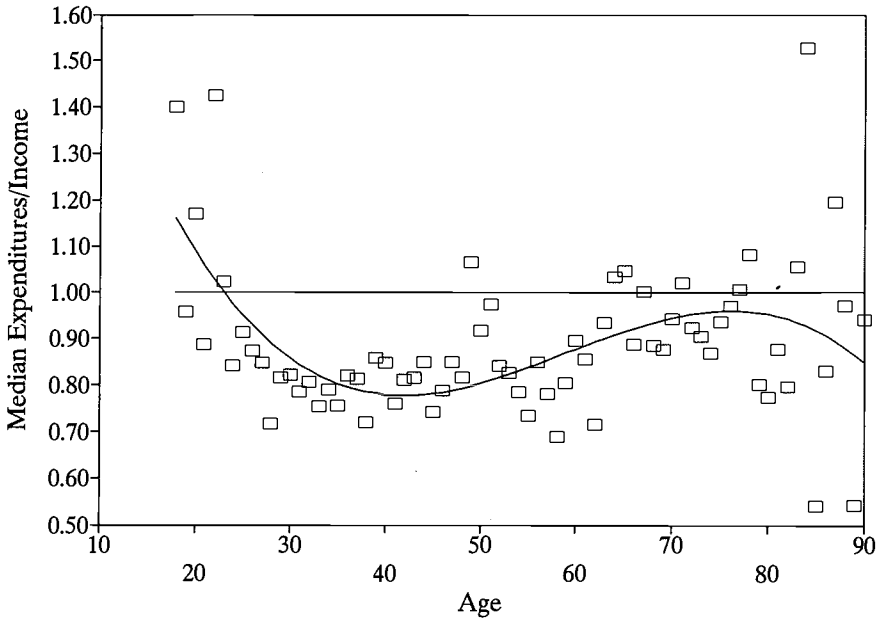


FIGURE 1. *Consumption to Income Profile*

worth less to the donor. Put differently, one could argue that these forms of bequests are in fact taxed by a VAT.

Rather than argue that a VAT actually does tax bequests, I proceed by providing an alternative measure of current consumption that includes an annualized value of bequests. In the analysis below, I do not assume that bequests are part of the tax base, the better to consider whether including bequests as part of the income measure affects the distributional effects of the tax. To understand the importance of bequests, consider equation (2) below, which rewrites the uses side of the lifetime-income definition:

$$W_0 = B + C, \quad (2)$$

where  $B$  is the present discounted value of bequests given and  $C$  the present discounted value of consumption. Current consumption can serve as a proxy for  $C$ ; my tax base is misspecified by ignoring  $B$ . To add bequests to the tax base, I rely on work by Menchik and David (1982). The first column of Table 4 reproduces Table 4 of their article. Using an extensive data set on income-tax returns and probate records, they con-

TABLE 4.  
Adjustment Factors for Bequests.

Decile	$\phi$	$\frac{1}{1 - \phi}$
1	.231	1.300
2	.142	1.166
3	.117	1.133
4	.105	1.117
5	.097	1.107
6	.089	1.098
7	.083	1.091
8	.078	1.085
9	.137	1.159
10	.165	1.198

Note:  $\phi$  represents the ratio of lifetime bequests to lifetime income and is reproduced from Menchik and David (1982), Table 4. The second column represents one plus the ratio of annualized bequests to current consumption.

struct an estimate of the ratio of bequests to lifetime income. Let  $\phi$  represent this ratio.

$$\phi = \frac{B}{B + C}. \quad (3)$$

We can also think of  $\phi$  as the ratio of annualized bequests to the sum of annualized bequests and current consumption. Equation (3) can be rewritten in terms of annualized bequests and current consumption as

$$\frac{B}{C} = \frac{\phi}{1 - \phi}. \quad (4)$$

If  $C^* = C + B$ , we can write  $C^*$  as

$$C^* = C \left( 1 + \frac{B}{C} \right) = \left( 1 + \frac{\phi}{1 - \phi} \right) C = \left( \frac{1}{1 - \phi} \right) C \quad (5)$$

The second column of Table 4 reports the ratio  $1/(1 - \phi)$ , which serves as an adjuster to measure true lifetime income on an annual basis. Bequests as a ratio of income are U-shaped with a trough at about the 80th percentile. Current consumption is increased by 30 percent in the lowest decile

**TABLE 5.**  
*Distribution of a VAT on Total Expenditure.*

Decile	Annual income	Current consumption	Adjusted current consumption
1	7.07	5.00	3.85
2	5.66	5.00	4.21
3	5.29	4.95	4.37
4	4.33	4.92	4.40
5	4.31	4.79	4.35
6	3.96	5.08	4.61
7	3.83	4.99	4.58
8	3.61	4.99	4.59
9	3.51	5.09	4.39
10	3.15	5.09	4.25

*Note:* This table reports median tax rates by decile for different income measures. VAT liabilities per household are computed as 5 percent of total expenditures in the 1990 Consumer Expenditure Survey. Tax rates are computed as the ratio of VAT liability to the appropriate income measure. Households are sorted by the income measure and the median tax rate within each decile reported. There are 1,561 observations in the data set.

with the adjustment falling to 8.5 percent in the 8th decile. It then rises sharply with bequests, increasing by 20 percent in the top decile.<sup>15</sup>

The last column of Table 1 provides summary statistics on the bequest-adjusted consumption variable. Mean consumption is now roughly \$4,000 higher than when bequests are ignored and median about \$2,500 higher.<sup>16</sup> Table 5 presents distributional results for a 5 percent VAT on total expenditures for the three measures of income: annual income, current consumption, and bequest adjusted current consumption. Households are sorted by the appropriate income measure and allocated to deciles.<sup>17</sup> The average VAT tax rate is computed for each household and

<sup>15</sup> It may be surprising that the bequest-to-lifetime-income ratio is not monotonic in income. However, there is no reason to believe that it should be. A monotonically increasing relationship implies that the elasticity of bequests with respect to lifetime income is greater than one. Although various theories of bequests can help explain why the elasticity should be positive, no theory requires that bequests be a luxury good.

<sup>16</sup> Kotlikoff (1988) estimates reported transfers of \$45.5 billion in 1974 or 3.1 percent of GDP. Grossing this number up to 1990 using the 1990 GDP yields a per capita value of transfers of \$689. Assuming 2.7 people per household (1990 value) yields an estimate of \$1,860 in annual transfers per household.

<sup>17</sup> For households in a few deciles, adjusting consumption for bequests may move them into a different decile. I use an iterative procedure to correct for this problem.

the median is identified within each decile. Using annual income to rank households leads to a VAT looking distinctly regressive. Median tax rates fall from 7.1 percent in the lowest decile to 3.2 percent in the highest decile. The story dramatically changes, however, when current consumption is used to rank households and construct tax rates. Now, the lowest decile faces a median tax rate of 5 percent while the highest faces a median rate of 5.1 percent. Furthermore, there is no distinct pattern to rates moving from the lowest to highest decile. This pattern is very similar to results shown in Caspersen and Metcalf (1993) using the 1988 CEX.<sup>18</sup> Adjusting consumption for bequests (but not subjecting bequests to a VAT) does not alter the results very much. Median tax rates fall by about 1.2 percent at the bottom and 0.8 percent at the top of the distribution and fall about 0.4 percent in the 7th and 8th deciles. It does not appear that excluding bequests in the construction of a proxy for permanent income affects the results significantly.

The results in Table 5 suggest that a broad-based VAT would be roughly proportional if viewed over the life cycle. So far I have not considered variations on the basic VAT to alter its progressivity. In the next section, I take up this subject, first considering reasonable categories of expenditures that would not be subject to a VAT and then variations on a VAT.

#### 4. ALTERING A VAT'S DISTRIBUTION

Few countries subject all expenditures to a value added tax. Of the twenty-one countries surveyed by Ernst and Young in 1991, fifteen apply a lower or a zero rate to basic foodstuffs and 20 partially or fully exempt health services.<sup>19</sup> Housing is more complicated. In general, most VAT countries do not tax residential shelter.<sup>20</sup> If the United States were to adopt a value added tax, these three categories of consumption—food, shelter, and medical care—would be likely candidates for special treatment. Table 6 presents distributional results for a VAT which zero-rated these three categories of consumption. Two pictures emerge from this table. First, removing these three classes of consumption from a

<sup>18</sup> See Table 5 in their paper.

<sup>19</sup> Only New Zealand subjects health services to a VAT. See Appendix A of Ernst and Young (1991) for details.

<sup>20</sup> See Tait (1988) for a general description of the treatment of housing. The treatment of real property in the United Kingdom changed after a court case brought against the European Commission in the European Court of Justice. As a result of that decision, zero-rating of buildings is largely confined to residential and charitable properties.

**TABLE 6.**  
*Distribution of a VAT on Food, Medical Care, and Shelter Zero Rated.*

Decile	Annual income	Current consumption	Adjusted current consumption
1	1.65	1.11	0.87
2	1.65	1.56	1.34
3	1.77	1.87	1.65
4	1.70	1.91	1.71
5	1.77	2.09	1.89
6	1.77	2.39	2.15
7	1.73	2.23	2.07
8	1.70	2.30	2.12
9	1.65	2.40	2.07
10	1.65	2.50	2.08

*Note:* This table reports median tax rates by decile for different income measures. VAT liabilities per household are computed as 5 percent of total expenditures minus food, shelter, and health expenditures in the 1990 Consumer Expenditure Survey. Tax rates are computed as the ratio of VAT liability to the appropriate income measure. Households are sorted by the income measure and the median tax rate within each decile reported. There are 1,561 observations in the data set.

VAT would substantially diminish the revenue potential.<sup>21</sup> Second, the tax becomes substantially more progressive. Using annual income as a base, average tax rates are nearly constant across the income distribution, rising from 1.65 percent at the low end to 1.77 percent in the middle before falling back to 1.65 percent at the top of the distribution. Using current consumption as a proxy for permanent income, the tax looks decidedly progressive. The top decile median average tax rate is 2.3 times as large as the corresponding tax rate for the first decile. Adjusting consumption for bequests reduces median average tax rates for all deciles with the largest change occurring at the bottom and top of the distribution. The top rate is now 2.4 times as large as the bottom rate.

Recently, Lester Thurow (1993) argued that a VAT could be made substantially more progressive by allowing an exemption of \$4,000 in spending per person. A family of four would be able to exempt the first \$16,000 in spending from a VAT. With a 5 percent VAT, this exemption would reduce their tax liability by \$800. To capture the flavor of this proposal, I consider a VAT with a \$1,000 refundable credit per household combined with a VAT. I adjust the tax rate to raise the same amount of revenue as a 5 percent VAT without the credit. Table 7 reports distribu-

<sup>21</sup> The Congressional Budget Office (1993) estimates that zero-rating these three categories would halve the tax revenue from a VAT.

**TABLE 7.**  
*Distribution of a VAT with \$1,000 Refundable Credit.*

Decile	Base of VAT	
	Total expenditures	Food, shelter and medical care excluded
1	-4.24	-7.75
2	0.30	-2.41
3	2.44	-0.21
4	3.30	1.00
5	3.75	1.79
6	4.74	3.06
7	5.17	3.11
8	5.64	3.93
9	6.35	4.86
10	7.07	5.76
rate	8.5%	10.3%

*Note:* This table reports median tax rates by decile. VAT liabilities per household are computed as 5 percent of the relevant base in the 1990 Consumer Expenditure Survey minus a refundable credit of \$1,000. Tax rates are computed as the ratio of net VAT liability to current consumption. Households are sorted by current consumption and the median tax rate within each decile reported. There are 1,561 observations in the data set.

tional results where current consumption is used as a proxy for lifetime income. If total expenditures are taxable, the VAT rate becomes 8.5 percent, whereas if food, shelter, and health care are excluded, the rate becomes 10.3 percent. VAT burdens as a share of lifetime income are now markedly progressive. If total expenditures are taxed, the median average tax rate in the lowest decile is negative: these households tend to pay less than \$1,000 in VAT. The average tax rate rises sharply by decile with the rate in the top decile now exceeding 7 percent. Excluding food, shelter, and medical care leads to a subsidy for the median taxpayer in the bottom three deciles. The top rate now is 5.8 percent.

Another way to think about the distributional effects of a VAT with a \$1,000 household credit is to consider what rate structure on a consumed income tax would raise the same revenue and maintain the same Suits Index as does the VAT with credit. I considered a three-rate, consumed income tax where total expenditures are subject to a graduated rate structure with break points at the 25th and 75th percentiles. We can preserve revenue and the Suits Index with a rate structure of 2 percent, 6.5 percent, and 11.9 percent when current consumption is used to measure people's economic well-being. To duplicate the effects of a VAT



**TABLE 8.**  
*Distribution of a Consumed Income Tax on Total Expenditures.*

Decile	VAT equivalent base	
	Total expenditures	Food, shelter, and medical care excluded
1	2.00	0.00
2	2.00	0.00
3	2.04	0.00
4	2.59	0.58
5	2.93	0.94
6	3.68	1.55
7	3.99	1.86
8	4.34	2.23
9	6.01	4.33
10	7.75	6.67
rates	2.0%	0.0%
	6.5%	4.2%
	11.9%	12.4%

This table reports median tax rates from a consumed income tax by consumption decile. The tax liability per household is computed from a progressive rate schedule on a tax base of total expenditures in the 1990 Consumer Expenditure Survey. Individual average tax rates are computed as the ratio of tax liability to current consumption. Households are sorted by consumption and the median tax rate within each decile reported. There are 1,561 observations in the data set. Marginal tax rates are chosen to raise the same amount of revenue as the VAT in Table 7 and have an equivalent value for the Suits Index.

with credit and exclusions for food, shelter, and medical care, rates of 0%, 4.2 percent, and 12.4 percent will suffice if total expenditures are the base of the tax.<sup>22</sup> Table 8 reports median average tax rates (with current consumption in the base) for these consumed income taxes. For the tax equivalent to a VAT on total expenditures, the bottom tax rate is set to zero and the middle and top rate are set to raise the same amount of revenue and preserve the Suits Index value, conditional on the marginal rates increasing with income. It is not possible to construct a set of tax rates that satisfy the above conditions with the lowest rate being zero. The lowest value I can set the bottom rate and meet the required conditions is 2 percent. Once various expenditures are excluded from the VAT, it becomes possible to set the rate on the lowest bracket equal to zero.

<sup>22</sup> The Suits Index for a VAT on total expenditures with a \$1,000 household credit is 0.243. If food, shelter, and health expenditures are zero rated, the Suits Index rises to 0.433.

There are two basic messages in these results. First, the conventional wisdom that a value added tax is regressive is not correct when a lifetime perspective is used. Second, there are relatively easy ways to modify a VAT to increase its progressivity (in either the annual or lifetime perspective).

## 5. CONCLUSION

A value added tax is viewed as being a regressive tax and has been opposed by many for its impact on the poor. This paper has argued that when "rich" and "poor" are properly measured, a VAT may not burden the poor substantially more than it would the rich. When a lifetime perspective is taken, a VAT on total expenditures is roughly proportional. In addition, various modifications of a VAT could substantially increase the progressivity of the tax. In this paper I have considered household credits as well as the exclusion of various spending categories from the tax base. The effect of these modifications on the distribution of a VAT can be quite substantial, with the VAT now looking quite progressive.

In closing, let me note that the results discussed above are steady-state results assuming households are subject to a VAT for their entire lives. The transitory incidence of a VAT would be substantial and is likely to be of considerable interest to policy makers. Imposing a VAT today would lead to a substantial shift in taxes to current owners of capital, many of whom are elderly. An alternative way to impose a consumption tax like a VAT is via a wage tax.<sup>23</sup> Although the steady-state effects of a wage tax and of a comprehensive VAT would be equivalent, a wage tax would exempt current owners of capital from the consumption tax in the transition.

From a policy-making perspective, it may be more attractive to impose a wage tax than a VAT and thereby avoid imposing a transitional burden on the current elderly (and other capital owners). However, the wage tax approach comes with an efficiency cost. A VAT can be viewed as a wage tax with a one-time, lump-sum tax on existing capital. The lump-sum nature of the tax reduces the dead-weight loss associated with the imposition of the consumption tax. Moreover, the welfare gains resulting from the lump-sum component of the VAT can be substantial.<sup>24</sup>

<sup>23</sup> Referring back to equation (1), a wage tax is levied on the sources side of the lifetime budget constraint, but a VAT is levied on the uses side.

<sup>24</sup> Auerbach, Kotlikoff, and Skinner (1983) have demonstrated in a large-scale simulation model that imposing a consumption tax generates efficiency gains over a wage tax on the order of 4 percent of lifetime resources.

**TABLE A1.**  
*New Vehicle Purchase Regression.*

Variable	Coefficient
Age of household head	50.47 (18.24)
Other expenditures	0.100 (0.045)
Other expenditures squared (\$1,000,000)	-0.281 (0.350)
After-tax income	0.080 (0.017)
Family size	-570.51 (179.53)
Male head of household	322.89 (604.26)
Nonwhite head of household	2,338.00 (912.47)
Intercept	493.84 (1,620.94)
<i>N</i>	415
$\bar{R}^2$	.242

*N* signifies the number of observations in the regression.  $\bar{R}$  squared is a regression statistic. The dependent variable is spending per vehicle on new or used vehicles among those households making a vehicle purchase at some point in the year. There are 415 observations in the sample. See appendix for more details.

## APPENDIX: IMPUTING ANNUAL VEHICLE CONSUMPTION

My approach to constructing an annual measure of vehicle consumption follows Cutler and Katz (1991). I begin by running a regression of spending per vehicle for those households that reported the purchase of at least one vehicle.<sup>25</sup> The regression is reported in Table A1. Spending on vehicles goes up with age, other expenditures (over the plausible range of the sample), and after-tax income. Spending is also higher for smaller families, and families with male or nonwhite heads of households. This regression is used to impute the value of the new car each household would purchase if it purchased a car that year. I then assume that cars

<sup>25</sup> From the quarterly CEX data, I can construct an estimate of how many cars were purchased over the course of the year.

depreciate in a straight line over an eight-year period and use that value as the consumption value per vehicle on the household. Finally, I multiply this consumption value by the number of vehicles owned by the household.

## REFERENCES

- Auerbach, A., L. Kotlikoff, and J. Skinner (1983). "The Efficiency Gains From Dynamic Tax Reform." *International Economic Review* 24, 81-100.
- Ballard, C., K. Scholz, and J. Shoven (1987). "The Value-Added Tax: A General Equilibrium Look at its Efficiency and Incidence." In *The Effects of Taxation on Capital Accumulation*. Martin Feldstein, ed. Chicago: National Bureau of Economic Research.
- Bernheim, D. (1987, July). "Ricardian Equivalence: An Evaluation of Theory and Evidence." NBER Working Paper No. 2330.
- Caspersen, E., and G. Metcalf (1993, June). "Is a Value Added Tax Progressive? Annual Versus Lifetime Incidence Measures." NBER Working Paper No. 4387.
- Cutler, D., and L. Katz (1991). "Macroeconomic Performance and the Disadvantaged." *Brookings Papers on Economic Activity* 2, 1-61.
- Ernst and Young (1991). *International VAT*. London: Kogan Page Limited.
- Friedman, M. (1957). *A Theory on the Consumption Function*. Princeton, NJ: Princeton University Press.
- Fullerton, D., and D. Rogers (1993). *Who Bears the Lifetime Tax Burden?* Washington, DC: Brookings Institution.
- Grossman, G. (1980). "Border Tax Adjustments: Do They Distort Trade?" *Journal of International Economics* 10, 117-28.
- Kotlikoff, L. (1982). "Intergenerational Transfers and Savings." *Journal of Economic Perspectives* 2(2): 41-58.
- Menchik, P., and M. David (1982). "The Incidence of a Lifetime Consumption Tax," *National Tax Journal* 35, 189-203.
- Metcalf, G. (1993). "The Lifetime Incidence of State and Local Taxes: Measuring Changes during the 1980s." In *Tax Progressivity in the 1980s*. J. Slemrod, ed. New York: Cambridge University Press.
- Modigliani, F., and R. Brumberg (1954). "Utility Analysis and Aggregate Consumption Functions: An Interpretation of Cross-Section Data." In *Post-Keynesian Economics*. K. Kurihara, ed. New Brunswick: Rutgers University Press.
- Musgrave, R., K. Case, and H. Leonard (1974). "The Distribution of Fiscal Burdens and Benefits." *Public Finance Quarterly* 2, 259-311.
- New York Times* (1992). "New York State Crosses Hudson in Search of Taxes," December 9, B5.
- Pechman, J. (1985). *Who Bears the Tax Burden?* Washington, DC: Brookings Institution.
- . (1989). "Lifetime Incidence and the Distributional Burden of Excise Taxes." *American Economic Review* 79, 325-30.
- Poterba, J. (1991). "Is the Gasoline Tax Regressive?" In *Tax Policy and the Economy* 5, 145-64. D. Bradford, ed. Cambridge, MA: MIT Press.
- Suits, D. (1977). "Measurement of Tax Progressivity," *American Economic Review* 67, 747-52.

- Tait, A. (1988). *Value Added Tax: International Practice and Problems*. Washington, DC: International Monetary Fund.
- Thurrow, L. (June 8, 1993). "Answer: A Value-Added Tax." In *The New York Times*.
- U.S. Congress, Joint Committee on Taxation (1993). *Methodology and Issues in Measuring Changes in the Distribution of Tax Burdens*. Washington, DC: U.S. Government Printing Office.
- U.S. Congressional Budget Office (1993). "Reducing the Deficit: Spending and Revenue Options." Washington, DC: U.S. Government Printing Office.
- (1992). "Effects of Adopting a Value-Added Tax," Washington, DC: U.S. Government Printing Office.