The Lifetime Incidence Of Consumption Sales Taxes

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by

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Consumption sales taxes are regressive in terms of annual income, but the shortcomings of annual data motivate analysis of tax incidence over a longer time interval. Two widely read public finance textbooks contain mistakes regarding the effect of different lifetime consumption profiles on consumption sales tax proportionality. This paper concludes that consumption sales taxes would be proportional in lifetime terms if all individuals eventually consumed their entire lifetime incomes. However, monetary gifts and bequests escape the tax and make horizontal inequities and lifetime non-proportionality likely. Augmenting the tax with equal-rate taxes on gifts and bequests would ensure lifetime proportionality among all individuals regardless of their lifetime consumption profiles, gift givings, and estates.
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I. Introduction

Traditionally, taxes have been described as regressive, proportional, or progressive depending on whether the ratio of annual taxes to annual income falls, remains constant, or rises across individuals ranked by annual income levels. By this standard consumption sales taxes are generally regarded as regressive because the average propensity to consume from annually measured income declines as annual income rises. Various authors [1, 2, 6, 8, 9] have noted the deficiencies of measuring incidence in terms of annual data and some have considered incidence in terms of the relation between lifetime taxes and lifetime income. However, two of the most widely read public finance textbooks [6, 7] contain incorrect conclusions regarding the lifetime incidence of consumption sales taxes.

This paper presents a general formulation of the lifetime incidence of consumption sales taxes, and notes the inadequacies of some previous treatments. We conclude that in lifetime terms, consumption sales taxes are proportional to lifetime income among those who give no gifts and leave zero bequests. Giving monetary gifts and leaving bequests reduce the fraction of lifetime income taken by consumption taxes, and make nonproportional incidence possible. Since there is probably a positive relation between lifetime income and the fraction of it used for gifts and bequests, consumption sales taxes are probably regressive in lifetime terms. If consumption sales taxes were augmented with equal-rate taxes on gifts and bequests given, the present value of lifetime taxes would be
proportional to the present value of lifetime income for all individuals regardless of their lifetime income profiles, consumption profiles, gift givings, and terminal asset holdings. The formal analysis is presented in the following section. The final section relates our findings to some previous writings on this topic.

II. Analysis of Lifetime Incidence

Our conclusions are derived from a lifetime budget constraint expressed in terms of lifetime flows of income and spending, the interest rate, and terminal assets. We define:

\[ Y_i = \text{non-capital income in year } i. \text{ This includes gifts and bequests received, but it excludes interest earned on savings and is not adjusted for interest paid on borrowings.} \]

\[ C^*_i = \text{gross-of-tax spending in year } i \text{ on consumption and gifts.} \]

\[ r = \text{the interest rate received on savings and paid on borrowings.} \]

\[ A_i = \text{asset holdings at the end of period } i. \]

We treat time as discrete periods between birth at time zero and death at the end of period \( n \). We assume that all income is received and all expenditures occur on the last day of each period. With these conventions, \( A_n \) represents terminal asset holdings and constitutes the individual's estate or bequest.

The individual lifetime budget constraint may be derived by starting with the expression for terminal asset holdings:

\[ A_n = A_{n-1}(1 + r) + Y_n - C^*_n. \]

Asset holdings at the end of period \( n \) equal last period's assets, plus interest thereon, plus non-capital income in period \( n \), minus spending on consumption and gifts in period \( n \). Similarly, asset holdings at the
end of periods 2 through \(n-1\) are

\[
A_i = A_{i-1}(1 + r) + Y_i - C_i^*, \quad \text{for } i = 2, 3, \ldots, n-1.
\]

Asset holdings at the end of period 1 are simply

\[
A_1 = Y_1 - C_1^*.
\]

because any gifts, grants, or inheritances received in the first period
of life are included in \(Y_1\).

To express \(A_n\) in terms of lifetime income and spending streams, the
\(n-2\) relations of equation 2 are sequentially substituted into equation 1
for \(A_{n-1}\) through \(A_2\), and equation 3 is substituted for \(A_1\). The resulting
expression may be compactly written as

\[
A_n = \sum_{i=1}^{n} (Y_i - C_i^*)(1 + r)^{n-i}.
\]

Dividing both sides by \((1 + r)^n\) transforms the terminal value of asset
holdings given by equation 4 into the present value at the time of
birth

\[
\frac{A_n}{(1 + r)^n} = \sum_{i=1}^{n} \frac{(Y_i - C_i^*)}{(1 + r)^i}.
\]

This expression may be rewritten as

\[
\sum_{i=1}^{n} \frac{Y_i}{(1 + r)^i} = \sum_{i=1}^{n} \frac{C_i^*}{(1 + r)^i} + \frac{A_n}{(1 + r)^n}.
\]

Equation 6 is the lifetime budget constraint for an individual; it states
that the present value of lifetime income equals the present value of life-
time spending plus the present value of terminal asset holdings. To
analyze the lifetime incidence of consumption sales taxes, it is necessary to separate total annual spending $C_i$ into spending on taxed consumption items $C_i$ and spending on gifts in the form of money or capital assets $G_i$. Since $C_i = C_i + G_i$, the lifetime budget constraint may be expanded to:

\[
\sum_{i=1}^{n} \frac{Y_i}{(1+r)^i} = \sum_{i=1}^{n} \frac{C_i}{(1+r)^i} + \sum_{i=1}^{n} \frac{G_i}{(1+r)^i} + \frac{A_n}{(1+r)^n}.
\]

Letting $t$ represent the consumption sales tax rate, expressed as the proportion of gross consumption expenditures taken in tax, consumption taxes paid in year $i$ are

\[
T_i = tC_i,
\]

and the present value of lifetime consumption taxes $B$ is

\[
B = \sum_{i=1}^{n} \frac{tC_i}{(1+r)^i} = t \sum_{i=1}^{n} \frac{C_i}{(1+r)^i}.
\]

Substituting this relation into 7 and letting $W$ represent the present value of lifetime income, we obtain

\[
W = \frac{B}{t} + \sum_{i=1}^{n} \frac{G_i}{(1+r)^i} + \frac{A_n}{(1+r)^n}.
\]

If $A_n = 0$, and $G_i = 0$ in all years, then

\[
\frac{B}{W} = t.
\]

Equation 11 shows that for individuals who give no gifts and leave no bequests, the present value of lifetime consumption taxes is a unique fraction of the present value of lifetime income, and that fraction is
the sales tax rate. In other words, if all saving were for future consumption, the lifetime incidence of the sales tax, \( B/W \), would be equal for all individuals regardless of their lifetime income levels and consumption profiles. Under these circumstances the lifetime incidence of the consumption sales tax would be proportional.

The lifetime proportionality of consumption sales tax incidence breaks down if individuals at different income levels give and bequeath different fractions of their lifetime incomes. Let

\[
g_j = \text{the ratio of the present values of lifetime gifts and lifetime income for individual } j, \text{ and}
\]

\[
a_j = \text{the ratio of the present values of bequests and lifetime income for individual } j.
\]

Using these ratios, equation 7 is rewritten:

\[
(12) \quad W_j = \frac{B}{t} + g_j W_j + a_j W_j,
\]

and the ratio of the present values of lifetime consumption taxes and lifetime income is

\[
(13) \quad \frac{B_j}{W_j} = t(1 - g_j - a_j).
\]

Therefore, with non-zero gifts and bequests, the incidence of the consumption sales tax is horizontally equitable and proportional across income levels only among those who give and bequeath the same fractions of their lifetime incomes. Positive gifts and bequests reduce the fraction of lifetime income taken by consumption sales taxes and make both horizontal inequities and lifetime non-proportionality of the tax possible.
The lifetime incidence of consumption sales taxes depends on the relation between lifetime income and the fraction of income which is used for gifts and bequests of untaxed items. If the elasticity of such gifts and bequests with respect to lifetime income exceeds one, consumption sales taxes would be regressive. To ensure that lifetime incidence is proportional among those who give and bequeath different fractions of their lifetime income, it would be necessary to supplement a consumption sales tax with equal-rate taxes on gifts and bequests collected at the time of transfer. The lifetime incidence of this combination of taxes would equal the lifetime incidence of an annual proportional tax on income, with income defined as above.

III. Comments on Some Previous Literature

The lifetime incidence of consumption sales taxes has been discussed by Richard Musgrave in his graduate text [7] and by Richard and Peggy Musgrave in their intermediate text [6]. Both treatments discuss the possibility that non-proportionality of lifetime incidence may result from either (a) different lifetime consumption profiles among those who leave no bequests, or from (b) individuals bequeathing different fractions of their lifetime incomes. Their assertions regarding the effect of bequests on tax incidence are consistent with our findings and need only to be extended to explicitly include gifts of untaxed non-consumption items. However, statements in both texts regarding the effect of early lifetime saving for future consumption on the lifetime proportionality of the tax are incorrect.

On pages 442-443 and footnote 8 of the intermediate text [6] it is asserted that among those who eventually consume their entire lifetime income, the present value of individuals' consumption tax
burdens depend on their lifetime consumption profiles, and that this burden falls to the extent that consumption is deferred until later in life. The same argument appears on pp. 381-2 of *The Theory of Public Finance*. On the basis of that argument Musgrave states that, "If the fraction of income thus transferred (saved and dissaved) rises when moving up the (life) income scale, . . . differential incidence . . . is regressive" (p. 382). Musgrave's argument explicitly recognizes that the present value of future taxes is less than that of current taxes, but the argument fails to incorporate the fact that deferred consumption is augmented by interest on savings, and that this augmentation of consumption increases the amount of lifetime consumption taxes ultimately paid. If the interest rate on savings equals the rate used in computing present values, the two effects exactly cancel and the present value of lifetime consumption taxes is independent of the lifetime consumption profile.

In a recent paper [5, pp. 9-13] Richard Musgrave used a two-period model to analyze the horizontal equity of various taxes imposed on two individuals with equal initial endowments, all received in the first period. That analysis recognized that deferred consumption is augmented with interest and that the present value of consumption taxes for two equally-endowed individuals does not depend on their lifetime consumption profiles. Our analysis generalizes this result over n periods and across individuals with different amounts of lifetime income. Our results indicate that the Musgraves' textbook conclusions are incorrect because the effects of interest received on savings and paid on borrowings are not incorporated.
The relation between the present values of lifetime consumption and income (as defined here) has also been mentioned in a recent paper by Feldstein [4, p. 88]. He asserted that consumption and income have the same present value, and stated that a proportional tax on consumption is equivalent to a tax on the present value of income. However, as Musgrave has noted [5, p. 12], if the lifetime view is chosen, it is essential to allow for bequests. Feldstein failed to note that non-zero gifts and bequests destroy the equality between the present values of lifetime consumption and income and that proportionality requires that consumption sales taxes be augmented with equal-rate taxes on giving gifts and bequests. Consumption sales taxes alone will generally not impose equal tax burdens on those with equal lifetime incomes and will not generally impose proportional tax burdens on those with different lifetime incomes.

This paper shows that the lifetime incidence of consumption sales taxes depends on different factors than does annually measured incidence. For purposes of evaluating tax equity the lifetime incidence seems superior because it is not subject to the arbitrary distortions inherent in annual data. Individual ages, consumption profiles, and temporary income fluctuations affect annually measured incidence, but not lifetime incidence.
FOOTNOTES

* The authors are assistant professor and graduate student in the Department of Economics at Iowa State University. Helpful comments on a previous draft were received from the participants in our departmental public finance seminar.

1. We assume throughout this paper that the differential incidence of consumption sales taxes is on consumers. A rebuttal to opposing views has been provided by Due (3).

2. Data on this relation are scarce.

3. Musgrave [5, p. 12] has argued that the augmentation of consumption sales taxes with a tax on bequests is needed for horizontal equity.

4. Notice that gifts and bequests in the form of durable consumer goods would normally be taxed at the consumption sales tax rate when purchased by the donor, so only monetary and capital asset gifts and bequests escape the tax.
REFERENCES


