Technical Paper Series
Macroeconomic Analysis and Tax Analysis Divisions
Congressional Budget Office
Washington, D.C.

TAXING GOVERNMENT IN A NATIONAL RETAIL SALES TAX

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October 1998

1999-5

In recent months, proposals to replace all or most of the existing federal tax system with a national retail sales tax have received increased attention. The most prominent proposals include those by Reps. Dan Schaefer, R-Colo., and Billy Tauzin, R-La., and by a group called Americans for Fair Taxation (AFT). Schaefer-Tauzin (S-T) would replace existing personal and corporate income taxes, the estate tax, and some excise taxes with what they term a 15 percent sales tax.[1] AFT would replace taxes on personal and corporate income, estates, and payrolls with what they term a 23 percent sales tax.[2] These proposals raise a number of interesting issues.[3]

One of the more controversial and interesting features of these proposals is that all consumption and investment purchases made by federal, state, and local governments would be subject to the sales tax. These provisions increase the statutory sales tax base by more than 40 percent. The proposals would also tax all private consumption of goods and services sold by the government to households.

In this report, we examine the treatment of government in a national retail sales tax, with emphasis on three issues: What are the alternatives for taxing federal, state, and local governments under a national retail sales tax? How does taxing government affect the sales tax rate required to

1. See H.R. 2001, "The National Retail Sales ax Act of 1997."

2. As discussed further below, these are "tax-inclusive" rates. In the AFT proposal, for example, the sales tax would be 23 percent of the total cost -- that is, of the price of the good plus the tax. This corresponds to the sales tax representing a 30 percent mark-up over the price of the good.

3. Selected recent analyses of the national retailsales tax include Bartlett (1995), Burton and Mastromarco (1997), the Congressional Budget Office (1997a, b), Due and Mikesell (1994), Feenberg, Mitrusi, and Poterba (1997), Gale (1998b), Metcalf (1998), Mikesell (1997), and Murray (1997).

maintain the real value of government programs? What are the implications of these results for existing sales tax proposals?

We find that taxing federal, state, and local government purchases in a national retail sales tax would provide consistency in comparisons of the sales tax with other taxes, such as the income tax or the flat tax. It may also help establish neutrality between public and private provision of goods or services in a sales tax.

However, we also find that taxing government purchases does *not* affect the tax rate needed in a sales tax to maintain the real value of government spending. This result may be surprising. How can it be that increasing the tax base by 40 percent by taxing government does not reduce the required tax rate?

Before providing a more detailed summary of this finding, we note two items. First, consider the current income tax. If the government decided not to tax its interest payments on government bonds, it could issue the bonds at a lower interest rate. Government expenditures would fall because gross Treasury interest rates would fall, even though the after-tax return would not. Government revenues would fall by the same amount because no one would pay taxes on interest on government bonds. Thus, no other tax rates would be affected. This provides an example of how choosing to tax or not to tax government can leave all other tax rates unaffected.

Second, we emphasize that there can be a difference between a "revenue-neutral" tax reform -- that is, one that raises the same amount of nominal tax revenue as the current system -- and a tax reform that maintains the real value of government spending -- that is, one that allows government to pay its current real obligations without increasing seignorage or bond sales to the public. Because sales taxes drive a wedge between producer prices and consumer prices, whereas the flat tax (Hall and Rabushka 1995) and income tax do not, maintaining the real value of government spending in the sales tax can involve a different level of nominal spending (and hence a different nominal revenue target) than in either the flat tax or income tax.

Now consider the case in which the producer price level stays the same when the sales tax replaces the income tax. This implies that consumer prices (prices including the sales tax) would have to rise by the amount of the sales tax. Under these circumstances, if the federal government taxed its own purchases and wanted to maintain the same real programs, it would have to allow its nominal spending and its nominal revenue target to rise by the exact amount of the tax payments it made to itself. Thus, the tax on government would have no impact on the tax rate needed to maintain current government programs.

For state and local governments, the issue is similar. If they are forced to pay federal sales taxes on their purchases, then either (a) the federal government will reimburse them for the added payments, which raises the federal spending level and revenue target by the exact amount of the taxes paid, (b) state and local governments will have to raise their own taxes to cover the payment, or (c) state and local government spending will have to be reduced. Thus, *if the real value of government*

spending is to be maintained, taxing government in a retail sales tax will not influence the required tax rate.

These results have important implications for analysis of current sales tax proposals. Both the AFT and the S-T proposals aim to raise the same nominal revenue as the existing system, and both proposals would tax government purchases as well. Therefore, to the extent that producer prices remain constant (i.e, to the extent that consumer prices rise) after conversion to a NRST, the AFT and S-T proposals would require cuts in the size of government, or increased deficits, or higher tax rates.

All of the discussion above assumes that producer prices will stay constant. What if producer prices fall after switching from the current system to a NRST? In that case, the existing level of government spending plus the sales taxes on that spending could be financed with the current nominal government revenue, but the sales tax base -- the producer price of goods and services times the quantity consumed -- would shrink relative to the base envisioned by the AFT and S-T proposals. Thus, in this case as well, the AFT and S-T proposals, at the tax rates they report, would not generate enough revenues to maintain the real size of government programs.

Therefore, regardless of how switching to a sales tax would affect the producer price level, we find that if tax reform options are compared holding constant the real value of government programs and without increasing seignorage or bond sales, then taxing or not taxing government does not affect the required sales tax rate. In addition, current sales tax proposals require either significant cuts in

government spending, increases in the deficit (reductions in the surplus), or significantly higher tax rates than currently advertised.

For example, our calculations indicate that, under conservative assumptions, the AFT proposal would reduce the real value of federal, state, and local government spending on purchases of goods and services and transfer payments by about 17 percent, or more than $400 billion annually, if the deficit (surplus) were held constant in real terms. For the S-T proposal, the analogous shortfalls are 11 percent, and $270 billion. Alternatively, to maintain the current real value of government programs in the AFT or S-T proposals would require increases in the sales tax rate above the rates proposed. For example, for the AFT proposal, the required increases would be 10 to 12 percentage points, measured on a tax-inclusive basis, or 19 to 24 percentage points, measured on a tax-exclusive basis.

Thus, comparing the existing sales tax proposals to the current system is misleading, since the sales tax proposals involve substantial cuts in government or increases in deficits at the tax rates proposed, or require significantly higher tax rates. Debating the size of government is a completely legitimate issue, but it is different from, and should not be confused with, debates about the structure of taxes. Comparisons of the reform proposals and the existing system can only be done clearly when each proposal maintains the same real size of government, without increasing reliance on real nontax revenue sources like bond sales or seignorage.

We also note that the issues examined in this report are not fundamentally about taxing income versus consumption, but are rather concerned with the equivalent treatment of government under

direct and indirect taxes. Direct taxes are imposed on individuals or corporations as in the income tax and the proposed flat tax. Indirect taxes are imposed on transactions, as in retail sales taxes and value-added taxes (Stiglitz 988).

The remainder of the report develops these findings in more detail. Section I discusses alternative approaches to taxing governments in a retail sales tax. Section II provides a series of simple models that demonstrate that taxing government does not affect the required tax rate as long as real government spending on programs is held constant. Section III applies these results to recent proposals. Section IV develops corresponding formula for the required tax rate in the income tax and the proposed flat tax. Section V offers concluding remarks.

I. Alternative Approaches to Taxing Government[4]

In general, the appropriate treatment of government in a NRST depends on what is intended, conceptually, to be the tax base. If the goal is to include all value added with respect to final goods and services, then value added by government should be included in the tax base.

The AFT and S-T proposals would tax all federal, state, and local government purchases of goods and services, including the wages and nonpension fringe benefits of government workers, new government investments, and inputs of goods and services.[5] However, government purchases of

4. The Joint Committee on Taxation (1996) contains an extended discussion of issues involved in the taxation of government under fundamental tax reform options.

5. Formally, the proposals claim they would tax government consumption and investment, not "purchases." However, government consumption, as listed in the national income and product accounts and in the proposals' tax bases, includes depreciation of government capital. This depreciation is an imputed measure, and does not correspond to either a cash flow or a market transaction. Moreover, if the gross investment purchase is taxed, the depreciation should not also be subject to taxation. For all these reasons, it is both likely and appropriate that a sales tax

property and services for purposes of resale or production would be exempt. For example, the Government Printing Office's purchase of paper for printing for books that were sold to the public would be exempt (Burton and Mastromarco 1996). The proposals would also tax all household purchases of government-provided goods and services.

It may seem strange to tax government in a national retail sales tax. At the very least, the significance of a government taxing itself requires some explanation. Moreover, only 8 of the 45 states with state-level retail sales taxes apply the tax generally to state and local government purchases (Due and Mikesell 1994). It would be interesting to examine why so few states choose to tax their own purchases.

The taxation of government is further complicated by the fact that governments consume, produce, and redistribute resources. Indeed, in some contexts, it is difficult to determine whether the government is a producer or a consumer (see Joint Committee on Taxation 1996). Thus, taxing government in the retail sales tax poses some difficult questions.

However, complete exemption of government from taxation in the sales tax would not be consistent either with the existing system or with the proposed flat tax. The income tax base includes the wages of government workers and the profits that businesses earn on sales of goods or services to the government. Under the flat tax, wages of government workers would be taxed under the individual tax, and revenues from business sales to government would be taxed under the business tax.

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not subject depreciation to tax.

This does not provide an exact correspondence between the flat tax and income tax with respect to taxing government because the business tax base varies between the income tax and the flat tax. But it does show a rough correspondence between the treatment of government in the two systems.

In the NRST, one approach would tax all government provision of goods and services to the household sector. Government *sales* of goods and services to households are a component of private consumption expenditure and are thus appropriately taxed under an NRST. However, many government-provided goods or services are not obtained via market transactions. Moreover, for many or most of these items, it would be difficult to establish a market price, on which to base a sales tax, and/or would be difficult to determine who the consumer of the good or service is, and thus who should pay the tax. Thus, it is not practical simply to tax all government-provided goods and services at the point of consumption.

An alternative is to tax government on a prepayment basis, as the proposals would. This involves placing a tax, paid by government, on all government purchases, which would allow taxation of the government sector even in the absence of market transactions for government-provided goods and services. The prepayment approach also helps remove any tax advantage the government might have over the private sector in producing goods and services if government were completely exempt from taxes in a NRST. In short, the prepayment approach makes the sales tax more consistent with the flat tax and the current system than total exemption of government would.[6]

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6. It may seem that taxing government wages on a prepayment basis and also taxing government sales of goods and services to households could lead to double taxation on the value added to government goods and services sold to households (Joint Committee on Taxation, 1996). This treatment, however, is roughly the same as in the current system and in the flat tax. Under both systems, government workers pay taxes on their wages and government-provided goods are purchased with after-tax wages. Under the proposed sales tax, government would pay taxes on its workers' wages, and households would use pretax wages to purchase goods and pay sales taxes.

The taxation of transfers raises a variety of issues. Cash transfers represent neither production nor consumption and so should not be subject to the NRST. Instead, the value of cash transfers would be taxed if and when the household spends the funds on consumption. The current system taxes some cash transfers, such as social security, unemployment insurance, and government interest payments. Cash transfers would not be subject to the flat tax.

In-kind transfers represent final consumption, but are often provided in the absence of a market transaction. Moreover, in-kind transfers are not taxed under the income tax, nor would they be under the flat tax. For both reasons, the appropriate treatment would be to exempt in-kind transfers from a sales tax. Of course, the resources that governments used to produce in-kind transfers would be taxed under the prepayment approach noted above, just as they would be in the flat tax or the current system.

II. Effects on the Required Tax Rate

The required tax rate in a national retail sales tax depends on numerous factors, including: the taxes to be replaced; the statutory sales tax base, net of any demogrants, exclusions, deductions, or credits; the rate of evasion; the effect of economic growth on the tax base; and any transition relief provided. For purposes of making our calculations comparable to those done by others, we assume the sales taxes replace existing taxes as specified in the AFT and S-T proposals; the statutory sales tax

base is as specified in those proposals;[7] and the evasion rate in a sales tax is zero. Likewise, we ignore possible effects of economic growth on the tax base, and assume there is no transition relief.

Our analysis focuses on the effects of two other issues on the required tax rate in a NRST: how the producer price level changes after the switch to an NRST; and how government is treated -- including the taxation of government spending and maintenance of nominal or real government program spending.

How the producer price level responds can be interpreted as an issue of the Federal Reserve's response to tax policy, and/or the incidence of removing an income tax and adding a sales tax. For our purposes, it does not matter whether either interpretation or some other interpretation is used. The analysis only requires information on how the producer price level changes, not why.[8] The consumer price level is just the producer price plus the amount of any sales tax. Thus, if an item costs $100 and there is a $30 tax payment, the producer price is $100 and the consumer price is $130.

The standard approach for controlling for the size of government is to focus on "revenue-neutral" tax changes. This approach holds the size of government constant as long as there are no price level changes or changes in the point of taxation. However, the sales tax would tax at the point of consumption, whereas the flat tax and the income tax place taxes on wages and business

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7. This includes the assumptions that personal consumption expenditures as measured in the National Income and Product Accounts, with some adjustments to housing consumption, represents fully taxable transactions, and that depreciation of government capital is taxed (see footnote 5).

8. Excellent discussions of the monetary policy response and the incidence of income and sales taxes may be found in Bull and Lindsey (1996), Hall (1996), and Slemrod and Bakija (1996).For evidence on the actual price level effects of replacing income taxes with consumption taxes, see Buiter and Miller (1981), Poterba, Rotemberg, and Summers (1989), and Tait (1991).

profits. Thus, in comparing the sales tax to the other tax systems, it is necessary to hold constant *the real deficit and real government spending on programs, not including the sales tax payments on government purchases*, rather than total revenues.[9]

A. Tax-Inclusive and Tax-Exclusive Tax Rates

Suppose a good costs $100 and there is a $30 sales tax placed on the item. Most people would probably consider that to be a 30 percent sales tax, since the tax is 30 percent of the selling price, or producer price. This is known as the tax-exclusive tax rate and is calculated as T/P, where T is the total tax payment and P is the producer price. This rate is termed "exclusive" because the denominator excludes the tax.

There is an alternative approach, however. The alternative would divide the $30 tax payment by the total cost of the good to the consumer ($100+$30) and report a 23 percent rate. This is known as the tax-inclusive tax rate, because the tax payment is included in the denominator in determining the rate. This rate is calculated as T/(P+T).

Sales taxes are typically quoted in terms of tax-exclusive rates. Income tax rates, however, are typically quoted as tax-inclusive rates. For example, a household that earns $130 and pays $30 in taxes would normally think of itself as facing about a 23 percent (30/130) income tax rate.

9. Holding just the deficit constant is not a sufficient way to compare tax systems, because one system can have lower revenues and lower spending, but the same deficit, as another.

Although there is no single correct method of reporting the rate, it is crucial to understand which type of tax rate is being quoted, for at least two reasons. First, comparing a proposed sales tax with existing sales taxes is easier to do if one uses the tax-exclusive rate in the proposed sales tax. Comparisons with current income taxes or the flat tax are clearer using the tax-inclusive approach.

Second, the tax-inclusive rate is always lower than the tax-exclusive rate. If the tax-exclusive rate is given by t, the tax-inclusive rate is simply t/(1+t). The difference between these measurements grows dramatically as the rate rises. At a rate of 1 percent the difference is negligible, but a 50 percent tax-exclusive rate corresponds to a 33 percent tax-inclusive rate. The 15 percent rate in S-T and the 23 percent rate in AFT are tax-inclusive. The equivalent tax-exclusive rates are about 17.5 percent and 30 percent, respectively. In the analysis below, we report tax-exclusive rates, except where noted.

B. Modeling the Effects of Taxing Government

In the pre-sales-tax economy, let

C = consumption expenditures,

G = government expenditures on goods and services (including wages and investments)

T = government transfers to households,

α = the proportion of such transfers that are untaxed in the pre-sales-tax economy ($0<\alpha<1$),

D = a cash-flow measure of the budget deficit ($D<0$ represents a surplus), and

R = government revenues.

All values except α are in nominal dollars, and G and T include the tax payments that government workers and transfer recipients, respectively, make under the existing income tax. Note that C, G, and T represent expenditures rather than quantities of consumption.

One might expect that, to hold the size of government constant, all transfer payments would have to be adjusted in accord with any changes in the consumer price level. However, some transfer payments are currently subject to income taxation, which alters the adjustment needed to maintain real purchasing power. For example, suppose that all transfer payments are currently taxed under the income tax at the same (tax-inclusive) tax rate as would be imposed under the sales tax. In this case, removing the income tax and adjusting the nominal value of such transfers in accordance with changes in the consumer price level would generate windfall gains for recipients of such transfers. In contrast, removing the income tax and adjusting the nominal value of the transfer in accordance with changes in the producer price level would maintain the real purchasing power of the transfer.[10] Thus, to hold the real purchasing power of transfers constant, transfers that are currently *untaxed* need to be adjusted in accord with the consumer price level. Transfers that are currently taxed at the same (tax-inclusive) rate that a national sales tax would have can be adjusted in accord with the producer price level and still retain their real after-tax value under a sales tax.

10. For example, a household that currently receives $100 in transfers and pays 20 percent in income taxes has a net-of-tax transfer of $80. Suppose that, in the switch to a sales tax with a 20 percent tax-inclusive rate, the producer price level remained constant and consumer prices rose. The household could then make the same net-of-tax purchases as before with a gross-of-tax nominal transfer of $100. That is, the nominal transfer does not have to change to retain its value, if the producer price does not change and the transfer is currently taxed at the same rate as it would be under the sales tax. If the nominal transfer were adjusted in accordance with consumer prices, the nominal transfer would rise and the household would receive a windfall gain.

If all transfers were currently taxed in the income tax at either a zero rate or the rate that would prevail in a sales tax, α could be thought of simply as the proportion of transfers that are untaxed. In the more general case, where transfers are currently taxed at a variety of rates in the income tax, the notion of the proportion of transfers that is untaxed is given by $1-t_y^I/t_s^I$, where t_y^I is the average tax-inclusive income tax rate on all transfers currently received, including those taxed at zero rates, and t_s^I is the tax-inclusive sales tax rate.[11, 12]

The deficit is the difference between total government outlays and revenues, so revenue is given by:

(1) $$R = G + T - D.$$

The major sales tax proposals include provisions for "demogrants." These are payments to each household equal to an exempt amount of consumption times the sales tax rate. Typically, the exempt amount is set to compensate households for consumption expenditures up to the poverty line. We define

X = the aggregate exempt amount of consumption expenditures (holding producer prices constant) in the demogrant in the sales tax (X=0 in the pre-sales-tax economy).

In each of the cases examined below, we follow a similar procedure. First, we develop an equation for tax revenues by multiplying the sales tax rate by the statutory tax base. Second, we develop a government budget constraint that adjusts government spending on goods and services, the

11. Note that this implies that transfers that are currently taxed, but at a lower rate than would apply in a sales tax, need to be adjusted by an amount between the changes in the consumer and producer price level changes. Transfers that are currently taxed at a higher rate than a sales tax would generate need to be adjusted by less than the change in the producer price level to retain their purchasing power.

12. It is also worth noting that, in the current system, transfers such as social security benefits are indexed explicitly for inflation, and other benefits, such as Medicare and Medicaid, may be thought of as implicitly indexed. Transfer payments such as net interest are not indexed. Our calculations do not depend, however, on what proportion of transfers are indexed.

deficit, and a proportion α of transfers for changes in prices. Then we combine the two equations to solve for the required tax rate. In case j, j=1 to 4, t_j indicates the sales tax rate (on a tax-exclusive basis), and R_j indicates the nominal revenue requirement.

(i) Nominal wages and producer prices are constant

When nominal wages and producer prices are constant after a switch to a sales tax, the consumer price level will rise by the full amount of the sales tax; that is, consumer prices, including the sales tax, will rise by t percent, where t is the tax-exclusive sales tax rate.

(a) Government spending is tax-exempt

If government spending on goods and services is tax-exempt, the statutory tax base is private consumption, so the tax revenue equation is

$$R_1 = t_1 C.$$

Note that t_1 is a tax-exclusive rate, so that aggregate consumption expenditure, not including sales tax payments, is the same as in the pre-sales-tax economy.

The real value of current government spending on goods and services can be maintained with nominal government spending of G since nominal producer prices are constant and government spending is not in the tax base. Nominal government spending on transfers rises to $(1+\alpha\ t_1)T$ from T.[13] The government provides demogrants that compensate households in aggregate for taxes on consumption of X. The budgetary cost is t_1X. To hold the real deficit constant, the nominal deficit is

13. Untaxed transfers rise to $(1+t_1)\alpha$ T from α T. Taxed transfers remain constant at $(1-\alpha)$T. The sum of these two items is $(1+\alpha\ t_1)T$.

allowed to rise to $(1+t_1)D$ since the consumer price level rose.[14] This generates a government budget constraint of

$$R_1 = G+(1+\alpha\ t_1)T+t_1X-(1+t_1)D.$$

Combining the tax revenue equation and the budget constraint yields

(2) $$t_1 = R/(C-X-\alpha\ T+D).$$

Before discussing this finding, we consider the case where government is taxed.

(c) Government spending is taxed

Adding government spending on goods and services to the tax base, but adjusting the nominal revenue target to hold real government spending on goods and services constant introduces two changes, which offset each other exactly. First, the statutory tax base is now given by the sum of private consumption and government spending on goods and services, so the tax revenue equation is

$$R_2 = t_2(C+G).$$

Second, since government spending is now taxed, α to maintain real government spending on goods and services, nominal spending must rise by the same percentage as the consumer price level; that is, it must rise from G to $(1+t_2)G$. All other spending is as in the previous case. The new government budget constraint is given by

$$R_2 = (1+t_2)G + (1+\alpha\ t_2)T + t_2X - (1+t_2)D.$$

Equating the two formulas for R_2 yields

(3) $$t_2 = R/(C-X-\alpha\ T+D).$$

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14. If the consumer price level rises, the real value of outstanding government debt falls. Allowing the real public debt to be restored to its pre-sales-tax value would involve running large nominal budget deficits. In principle, this can be thought of as a broader view of what constitutes "holding real government policy constant." However, in practice, current budgetary rules would forbid enacting a tax policy that would generate sustained deficits.

Several aspects of (3) merit comment. First, $t_2 = t_1$; that is, taxing government does not affect the required sales tax rate if government spending on items other than the sales tax is maintained in real terms. Second, relative to the first example, the statutory tax base is larger by an amount G, which raises tax revenues by t_2G. However, again relative to the first example, nominal government spending is higher by an amount t_2G, exactly offsetting the impact of a higher tax base on tax rates. Thus, in comparing an income tax or a flat tax to a sales tax, holding the real value of government spending constant does not necessarily imply holding nominal revenues constant.

Third, although the statutory tax base includes government spending (G), the *effective* tax base not only omits G, but also subtracts from consumption the exempt amount of consumption in the demogrant and the currently untaxed portion of transfers. G is omitted because to hold real government spending constant requires an increase in nominal spending that offsets the tax revenues collected on government spending. Consumption that is financed with demogrants is not part of the effective tax base because financing the demogrants requires higher tax revenues. Consumption that is financed with untaxed transfers is not part of the effective tax base because, to retain their real purchasing power, such transfers must be adjusted the same way as the consumer price level changes. The effective tax base also includes the pre-sales-tax deficit. The larger the deficit, the larger the effective tax base and hence the lower the required rate. Smaller deficits (or larger surpluses) require higher sales tax replacement rates.

Finally, it may be helpful to consider a special case where all transfers are untaxed (α =1), and there is no deficit. In that case, the required tax rate is just R/(C-X-T). Thus, even when government

is included in the statutory tax base, the effective base is only the portion of consumption that is not financed by untaxed government transfers or demogrants, as long as the size of government is maintained.

(ii) Nominal wages and producer prices decline

If nominal wages and producer prices decline by the full amount of the removed income tax, the consumer price level (including the sales tax) would remain constant after switching to a sales tax.

(a) Government spending is tax-exempt

If government spending is tax-exempt, the tax base is given by private consumption expenditures. Although the quantity of consumption remains the same after tax reform (by assumption, since the size of the economy stays the same), private consumption *expenditures*, not including the sales tax, would fall by the same proportion as producer prices. Thus, the tax revenue equation is

$$R_3 = t_3C/(1+t_3).$$

To hold real government spending on goods and services constant, nominal government spending falls by a factor $1/(1+t_3)$ since nominal wages and producer prices decline and government is not in the tax base. Nominal transfers fall from T to $(1+\alpha\ t_3)T/(1+t_3)$.[15] Nominal deficits remain constant since the consumer price level is constant. Nominal demogrant amounts are given by $X/(1+t_3)$. This generates a government budget constraint of

15. Nominal transfers in the pre-sales-tax economy may be divided into untaxed (α T) and taxed ((1-α)T) components. To hold these transfers constant in real terms, taxed transfers should change in accordance with the producer price level, and thus should fall to (1-α)T/(1+t_3), while untaxed transfers change in accordance with the consumer price level, and thus remain at α T. The sum of these two components is (1+α t_3)T/(1+t_3).

$$R_3 = G/(1+t_3) + t_3X/(1+t_3) + (1+\alpha\ t_3)T/(1+t_3) - D.$$

Combining the tax revenue equation and the budget constraint yields

(4) $$t_3 = R/(C-X-\alpha\ T+D).$$

As before, the effective tax base is consumption less untaxed transfers and demogrants, plus the deficit.

(d) Government spending is taxed

As before, there are two changes. First, the statutory tax base is expanded to include government spending on goods and services as well as private consumption, but since wages and producer prices have fallen, each component is deflated by the factor $(1+t_4)$. Thus, the tax revenue equation is

$$R_4 = t_4(C+G)/(1+t_4).$$

Second, to maintain real government spending on goods and services, nominal government spending, including the sales tax payments on government spending, is held constant. Transfers, the demogrant, and the deficit are the same as in the previous example. Thus, the government budget constraint is given by

$$R_4 = G + t_4X/(1+t_4) + (1+\alpha\ t_4)T/(1+t_4) - D.$$

Equating the tax revenue equation and the budget constraint yields:

(5) $$t_4 = R/(C-X-\alpha\ T+D).$$

Two aspects of (5) merit comment. First, (4) and (5) show, as before, that the required sales tax replacement rate does not depend on the inclusion of government in the tax base, as long as the real size of government is maintained. Second, comparing t_3 and t_4 to t_1 and t_2 shows that, in the

specification above, the required tax rate also does not depend on whether the producer price level stays constant or falls.

The latter result depends crucially on the assumption that transfer payments would change in the same way whether the producer price level falls or is constant. This may not be the most realistic assumption. After all, if producer prices fall, it may prove difficult for political reasons to make downward nominal adjustments to taxed transfers such as social security benefits and net interest payments. Note that if the downward nominal adjustments are not made, the required sales tax rate rises. Thus, our assumption that the adjustment is made may understate the true replacement sales tax rate when producer prices fall, but generates the correct formula assuming that the real size of government is held constant.

III. Application to Sales Tax Proposals

The results above indicate that the formula for computing sales tax replacement rates is given by

(5) $$t_4 = R/(C-X-\alpha T+D).$$

It is worth emphasizing the tax rate in (5) is tax-exclusive. The equivalent tax-inclusive tax rate would be

(5') $$t_4^I = R/\{(C-X-\alpha T+D)+R\}= t_4/(1+t_4).$$

A. Replacement Rates in the AFT and S-T Proposals

In contrast to the equations above, replacement rates in the S-T and AFT proposals are calculated, on a tax-exclusive basis, as

(6) $$s = R/(C-X+G),$$

and on a tax-inclusive basis as

(6') $$s^I = R/(C-X+G+R) = s/(1+s).$$

It is straightforward to show that these require reductions in real government spending. Let the statutory tax base include private consumption and government spending on goods and services, so that the tax revenue equation is given by

(7) $$R^* = t^* (C+G).$$

Now, let the government budget constraint be given by

(8) $$R^* = G + T + t^*X - D.$$

Note that G, total nominal government spending on goods and services, includes any sales tax payments on those purchases.

Solving (7) and (8) for t^* yields

(9) $$t^* = R/(C-X+G),$$

the formula used by AFT and S-T to calculate replacement tax rates, and reported in (6).

Now consider the interpretation of these equations. First, suppose that wages and producer prices stay constant after switching to a sales tax. This implies that consumer prices will rise by the amount of the sales tax. In that case, the revenue equation (7) is specified appropriately, but (8) does not hold the real size of government constant. Note that, in (8), total nominal government spending

(including the sales tax it pays to itself) on goods and services, transfers and the deficit are held constant even though the consumer price level has risen and government spending on goods and services is included in the tax base. Net of sales taxes, this requires real declines in government spending, transfers, and deficits.

Alternatively, assume that wages and producer prices decline after tax reform. Then (8) is specified appropriately, but (7) is not. In particular, C and G in (7) should be deflated by $1+t^{*}$. Thus, in either case, the tax rate derived in (6) and (9) would not generate enough revenue to sustain real government spending, and the specification used by AFT and S-T implies reductions in real government spending or in the deficit.

Holding the deficit constant, the implied decline in real government spending under existing sales tax proposals is given by

(10) $$G+T - [G/(1+t) + \alpha\, T/(1+t) + (1-\alpha)T] = \{t/(1+t)\}\,(G + \alpha\, T),$$

where t is the tax-exclusive sales tax rate. The intuition for this is easiest to see in the case where the consumer price level rises after the switch to the sales tax and the producer price level remains constant. In the pre-sales tax-economy, nominal government spending on goods, services, and transfers is G+T. Under the AFT and S-T plans, nominal government spending on goods and services, including sales tax payments, and untaxed transfers is fixed; therefore, real outlays on these items fall by the factor 1/(1+t). Nominal taxed transfers are also fixed, but they retain their original value, since

the producer price level is constant and the income tax on such transfers is removed.[16] Of course, if the real deficit were to rise by the amount in (10), the real value of government spending could remain constant.

Thus, there is a fundamental inconsistency in comparing the AFT and S-T plans to other tax reform plans or to the existing system. To calculate how high the sales tax rates would need to be, and to estimate the implied reduction in government under the existing AFT and S-T proposals, requires estimates for each parameter in the equations above.

B. Parameter Estimates

We develop parameter estimates under two sets of assumptions. The first holds constant the real value of federal, state, and local government. The second only holds the federal government constant.

Tax revenues for the taxes to be replaced by the S-T and AFT proposals are shown in table 1. Thus, R is $803 billion for the S-T plan and $1,362 billion for the AFT plan.[17]

16. The last statement is approximate, since income tax rates vary across households.

17. Recent government data modify these revenue figures, but the net revenue target is roughly the same. For example, updated NIPA figures indicate that the taxes AFT would replace raised $1,344 billion in revenues in 1995. In our calculations below, we retain the AFT revenue target for purposes of comparability.

TABLE 1. TAXES TO BE REPLACED BY MAJOR SALES TAX PROPOSALS, 1995 (Billions of Dollars)

	Schaefer-Tauzin,	Americans for Fair Taxation
Personal Income Tax	598.1	598.1
Corporate Income Tax	161.1	161.1
Estate and Gift Tax	14.8	14.8
Excise Taxes	28.0*	----
Payroll Taxes	--	588.0
Total	803.0	1,362.0

*Estimated

Source: Burton and Mastromarco (1997,, Table 2) and Americans for Fair Taxation,, "Revenue Neutrality."

The proposed tax base for the AFT plan is shown in table 2 and summarized below. We specify the various parameters as follows:

	Private consumption tax base	$4,620.0
	Less state taxes	-238.3
C:	Equals net private consumption	4,381.7
X:	The demogrant	1,137.1
G:	State and local spending	841.7
	Federal spending	516.5
	Total government purchases	1,358.2

Note that C-X+G add up to $4,602.8, the "AFT tax base" in table 2. Federal, state, and local spending equals $1,358 billion, raising the tax base by over 40 percent, from $3,244.6 billion to $4,602.8 billion.[18]

18. To simplify calculations, we use the same tax base for the AFT and the S-T proposals. In practice, the proposed bases differ somewhat in their treatment of state and local taxes, housing, and tax-exempt organizations, and their calculation of the demogrant. Because the differences between the proposals largely offset each other in terms of their effects on the size of the tax base, incorporating the differences would have only small effects on our results.

TABLE 2. PROPOSED TAX BASE FOR NATIONAL SALES TAX, 1995 (BILLIONS OF DOLLARS)

Description of Taxable Item	Tax Base (1995)
Personal consumption expenditures	4,924.9
Less: Education expenditures	-97.5
Less: Food produced and consumed on farms	-0.4
Purchases of new houses	156.4
Improvements to single-family homes	73.9
Less: Imputed rent on housing	-534.3
Additional financial intermediation services	53.0
Less: Expenditures abroad by U.S. residents	-2.7
Less: Foreign travel by U.S. residents (one-half)	-26.4
Expenditures in U.S. by nonresidents	73.1
(1) Private consumption tax base	4,620.0
(2) State sales taxes	238.3
(3) Demogrants	1,137.1
State and local government	682.6
State and local government gross investment	159.1
(4) State and local tax base	841.7
Federal government consumption	453.8
Federal government gross investment	62.7
(5) Federal tax base	516.5
(6) AFT tax base = (1)-(2)-(3)+(4)+(5)	4,602.8
(7) State and local government capital consumption	54.2
(8) Federal government capital consumption	68.2
Modified AFT tax base = (6)-(7)-(8)	4,480.4

Sources: National Income Product Accounts,, Survey of Current Business,, August 1996; AFT Web site.

We adjust this tax base, however, because measured government consumption includes the imputed depreciation on government capital, which should not be taxed under a sales tax. As shown in the table, depreciation equaled $122.4 billion in 1995; the remaining tax base is $4,480.4 billion. Government consumption net of depreciation (G^*) was $1,235.8 billion for all levels of government, $448.3 billion for the federal government and $787.5 billion for state and local governments and is used in the calculations below.

To estimate T, we note that federal transfers to individuals totaled $709.4 billion in 1995 and state and local transfers totaled $280.6 billion, for total transfers to persons of $990 billion. The federal government made net interest payments of $224.8 billion, while state and local governments made net interest payments of -$59.6 billion (that is, they received net interest). Thus, total net interest payments were $165.2 billion, total transfers were $1,152.7 billion, and total federal transfers were $934.2 billion (NIPA, Tables 3.1, 3.2, and 3.3).

Estimating α precisely is difficult and we attempt only to provide a rough calculation. The following transfers can be subject to federal income taxation: net interest payments ($181.7 billion), 50 percent to 85 percent of social security benefits ($163.8 billion to $278.5 billion), unemployment insurance ($21.7 billion), federal employee retirement ($67.3 billion), and state and local employee retirement ($66.3 billion) (NIPA table 3.12). If only 50 percent of social security benefits are subject to taxation, these transfers total $501 billion in 1995 or 43.5 percent of total transfers, suggesting α = 0.565. If 85 percent of social security benefits are taxed, taxed benefits equal $616 billion in 1995, suggesting that α = 0.466.

TABLE 3. PARAMETER VALUES (BILLIONS OF 1995 DOLLARS)

Parameter	Holding federal, state, and Local government constant	Holding federal government constant
C	4,381.7	5,169.2
X	1,137.1	1,137.1
G	1,358.2	516.5
G^{*1}	1,235.8	448.3
T	1,155.2	934.2
D	162.4	172.3

[1]G* removes depreciation on government capital from the sales tax base,, as discussed in the text.

These figures should be raised, however, for two reasons. First, not all taxable transfers are actually taxed (because of the zero tax rate bracket in the income tax). For example, only about 15 percent of social security benefits are taxed, because benefits are only taxable if other income exceeds certain thresholds. About two-thirds of net interest payments are taxed, reducing taxable net interest by $60 billion (Congressional Budget Office (1997b, p. 16).) Thus, only $327 billion, or 28 percent, of transfers would be taxable, suggesting that α = 0.72. Likewise, preliminary calculations using the Joint Committee on Taxation individual tax model suggest that over three quarters of transfers are not taxed.

Second, some -- presumably large -- proportion of taxed transfers face the 15 percent rate in the existing system, which is below the rate that would apply in a national retail sales tax. Preliminary calculations from the JCT model indicate an average tax rate of roughly 21 percent on the small minority of transfers that are actually taxed. This is below what would be required in the AFT proposal, which should raise α further.

Thus, setting α = 0.75 may still understate the true value. To provide some sensitivity analysis below, we use α = 0.50 and α = 0.75. Higher values of α would generate higher sales tax replacement rates than reported below.

To estimate D, we note that the federal budget deficit measured on a current basis was $174.4 billion in 1995. To this figure, we add federal gross investment ($66.1 billion) and subtract depreciation of federal capital ($68.2 billion), for a federal cash flow deficit of $172.3 billion. The corresponding state and local figures are a current surplus of $103.1 billion, gross investment of $147.4 billion, and depreciation of $54.2 billion, for a cash flow surplus of $9.9 billion. The overall government cash flow deficit was therefore $162.4 billion (NIPA tables 3.1, 3.2, 3.3, and 3.7).

To hold only federal government constant, we use estimates of G (or G^*, as noted), T, and D based on federal statistics only. State and local spending on goods and services is placed in C -- that is, it is treated just like private consumption. This raises C to $5,169.2 billion. In this case, state and local transfers are not protected against price changes. For convenience, all of the parameter values for the two cases are summarized in table 3.

C. Results

Table 4 reports estimates of the implied decline in the real value of government spending under existing sales tax proposals, holding the real deficit constant. The AFT proposal (using G in the statutory base) would require a tax-inclusive rate of 22.8 percent using equation (6'), or a tax-exclusive rate of 29.6 percent using equation (6). Removing government depreciation from the tax base raises the rates slightly. In either case, however, the proposal would not raise sufficient revenues to finance existing levels of government.

TABLE 4. IMPLIED DECLINE IN THE SIZE OF GOVERNMENT SPENDING AND TRANSFERS UNDER EXISTING SALES TAX PROPOSALS (BILLIONS OF 1995 DOLLARS)

Level of Government	AFT	S-T
Alpha = 0.5*		
Federal	210.5	137.3
State & Local	206.5	134.7
Total	417.0	272.0
Alpha = 0.75*		
Federal	264.2	172.3
State & Local	219.2	143.0
Total	483.5	315.3

*Alpha = The proportion of government transfers that are untaxed in the curent system.

If α = 0.75, (10) implies that the real value of annual federal, state, and local government spending on goods and services (G^*) and on transfers to persons would fall under the AFT proposal by about 20 percent, or $483 billion annually. The decline in real federal spending would be about 19 percent, or $264 billion, and the decline in real state and local spending would be about 22 percent, or $219 billion. If α = 0.50, these figures are somewhat smaller, as shown in table 4, but would still total over $400 billion annually for all levels of government, a 17 percent decline. Alternatively, the figures above represent the increase in the real deficit that would occur if the real value of government programs were held constant under the AFT or S-T proposals.

Table 5 uses (5') and (5) to show the tax rate needed to maintain the size of government programs. If α = 0.75, holding federal, state, and local government constant, the AFT proposal would require a 34.9 percent tax rate on a tax-inclusive basis or a 53.6 percent rate on a tax-exclusive basis. Even if α is as low as 0.50, the analogous figures are 32.5 percent and 48.1 percent, respectively. Thus, maintaining the size of federal, state, and local government would require tax-inclusive tax rates that are between 10 and 12 percentage points higher than claimed by AFT, and tax-exclusive tax rates that are between 19 and 24 percentage points higher than the tax-exclusive rate implied by AFT's claims.

TABLE 5. REQUIRED SALES TAX RATES (PERCENT)

	AFT		S-T	
Tax Rate	**Tax-Inclusive**	**Tax-Exclusive**	**Tax-Inclusive**	**Tax-Exclusive**
As proposed	22.8	29.6	14.9	17.5
Modified to avoid taxing the depreciation of government capital	23.4	30.4	15.2	17.9
Needed to maintain the size of federal state and local government				
(a) Alpha = 0.5*	32.5	48.1	22.1	28.4
(b) Alpha = 0.75*	34.9	53.6	24.0	31.6
Needed to maintain the size of federal government only				
(a) Alpha = 0.5*	26.7	36.5	17.7	21.5
(b) Alpha = 0.75*	28.0	38.9	18.6	22.9

*Alpha = The proportion of government transfers that are untaxed in the current system.

If only the size of the federal government is maintained, the required tax-inclusive rates would be between 26 and 28 percent, and the required tax-exclusive tax rates would be between 36 and 39 percent. Thus, even in this case, which would reduce real state and local spending by over $200 billion, the AFT proposal significantly understates the required tax rate.

The S-T proposal faces similar problems. It would require a tax-inclusive rate of 14.9 percent using equation (6'), or a tax-exclusive rate of 17.5 percent using equation (6) and using G in the base. Using G^*, the rates are slightly higher. But at either set of rates, the proposal would not raise sufficient revenues to finance existing levels of government.

If α = 0.75, (10) implies that the real value of annual federal, state, and local government spending on goods and services and on transfers to persons would fall under the S-T proposal by over 13 percent, or $315 billion annually, if the real deficit were held constant. The decline in real federal spending would be about $172 billion, and the decline in real state and local spending would be about $143 billion. If α = 0.50, these figures are somewhat lower, but still equal about $272 billion, or 11 percent of government spending on goods, services and transfers.

If α = 0.75, table 5 shows that the S-T proposal would require a 24.0 percent tax-inclusive rate or a 31.6 percent tax-exclusive rate, to hold federal, state, and local government constant. If α = 0.50, the S-T proposal would require a 22.1 percent tax-inclusive rate or a 28.4 percent tax-exclusive rate. Thus, maintaining the size of the government would require tax-inclusive tax rates

that are between 7 and 9 percentage points higher than claimed by S-T, and tax-exclusive tax rates that are between 11 and 14 percentage points higher than implied by S-T's claims.

If only the size of the federal government is maintained, the required tax-inclusive rates would be between 17 and 19 percent, and the required tax-exclusive tax rates would be between 21 and 23 percent.

Our analysis also applies to the results of Feenberg, Mitrusi, and Poterba (1997). Using 1991 data, they calculate that -- to replace revenues from taxes on personal and corporate income, estates, and payrolls -- a sales tax with a poverty-level demogrant would require a 45.4 percent tax-exclusive tax rate. They calculate the replacement sales tax rate as R/(C-X).

Their discussion (pages 56 and 57) makes clear that they are aware of the problems with placing government in the base and the change in valuation of transfers. Notably, their estimates do not assume that government purchases are in the effective tax base, which explains why their rate estimate is so much higher than the analogous AFT estimate of 29.6 percent. However, their estimate does not account for untaxed transfers or the deficit. Using 1991 data for these items and equation (5) indicates a tax-exclusive tax rate of 51.1 percent.[19] This adjustment is relatively minor, compared to the tax-exclusive tax rate adjustments required of the AFT and S-T proposals, because Feenberg, Mitrusi, and Poterba (1997) do not place government spending in the sales tax base.

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19. We use R = $941 billion and C-X = $2,073 billion (from Feenberg, Mitrusi and Poterba 1997), α = 0.5 (by assumption), T = $889 billion (NIPA, tables 3.2 and 3.3), and D = $214 billion (NIPA, table 3.1, 3.7).

IV. Comparisons With Income Tax and Flat Tax

The sales tax replacement rates computed above are derived from data on aggregate tax revenues and aggregate spending by households and governments. Under an income tax or a flat tax, the starting point to compute rates is aggregate income earned in the private and government sectors. In this section, we use the national income accounting relationships between aggregate spending and aggregate income to show how the replacement sales tax rates compare to the required rates under an income or flat tax. To focus on the main issues, we set transfers and deficits to zero, so that the government spending equation is R=G, and we compare taxes with flat rates and no demogrants, exemptions, or deductions.[20] Under these assumptions, the equations above imply that the tax-exclusive sales tax rate would be

$$t_s^E = R/C,$$

and the tax-inclusive rate is

$$t_s^I = R/(C+R).$$

For an income tax, let

$$R = t_y^I * (W+K)$$

be the revenue equation, where t_y^I is the tax-inclusive income tax rate, W is wages, and K is not capital income. W and K are measured inclusive of the tax payments that households and businesses have to pay on those incomes. Solving for t_y^I yields

$$t_y^I = G/(W+K) = R/(W+K).$$

20. For a comparison of income and consumption tax bases without these simplifying assumptions, see Congressional Budget Office (1997b).

Note that the standard aggregate income identity requires that the sum of incomes paid to factors of production (W+K) equals spending across sectors

$$W + K = C + (H - \Delta) + G,$$

where H=gross investment and Δ = depreciation. Then the tax-inclusive income tax rate is

$$t_y^I = R/(C+H-\Delta+G) = R/(C+H-\Delta+R),$$

since G=R, and the tax-exclusive rate is

$$t_y^E = R/(C+H-\Delta).$$

For the proposed flat tax, all wage income is taxed at the personal level. Gross capital income is taxed at the business level, and gross investment (not depreciation) is subtracted from total sales when computing taxable cash flow. Thus, if there are no personal exemptions, the flat tax base is

$$W + (K + \Delta - H) = C + R.$$

Note that while it is well-known that the Hall-Rabushka flat tax is a consumption tax, the tax base, in this formulation, is C+R, not C. This occurs because the flat tax rate -- which is derived here by starting with the income tax base and making adjustments -- typically inherits the standard income tax practice of having rates quoted in tax-inclusive terms. The flat tax revenue equation is $R = t_f^I (W+K+\Delta-H)$, where t_f^I is the tax-inclusive flat tax rate. Solving for t_f^I yields

$$t_f^I = R/(W+K+\Delta-H) = R/(C+R).$$

The tax exclusive rate would be

$$t_f^E = R/C.$$

These comparisons show that, setting the sales tax demogrant and the flat tax exemption equal to zero, and controlling for the taxes to be replaced and other assumptions like the rate of evasion, the

flat tax and sales tax replacement rates are the same, as they ought to be since both tax consumption in the aggregate. In addition, although both the proposed flat tax and the income tax clearly tax government, the correct formulas for the tax-exclusive tax rate contain neither R nor G in the denominator. The correct formula for the tax-inclusive tax rate includes only R or G in the denominator, not both. This corresponds to the specifications in equations (5) and (5') for the sales tax. In contrast, equations (6) and (6') show that the AFT and S-T proposals have essentially double-counted, by including both G and R in the denominator of the tax-inclusive tax rate, and by including G in the denominator of the tax-exclusive rate.

V. Conclusion

Taxing government in a national retail sales tax would provide consistency with the way other plans treat government and would eliminate a potential tax advantage for government production over private production. However, it would not reduce the required tax rate. Analysis of structural tax reform is subject to two key constraints -- the need to hold the real deficit constant as well as the need to hold real government programs constant. Holding government constant involves adjusting government spending to reflect changes in the consumer price level and changes in the after-tax purchasing power of government transfers. Given these constraints, the sales tax may require different nominal revenue targets than the flat tax or income tax. This result is not an issue of consumption versus income taxation, but rather one of taxing via direct or indirect methods. The same issue would arise in a value added tax, for example.

These findings imply that current sales tax proposals contain significant, unstated, reductions in the real value of government spending, or increases in the real deficit. To avoid these shortfalls, the retail sales tax would require a significantly higher tax rate than is reported in the proposals themselves.

We note, also, that the replacement rates reported in this paper adjust the S-T and AFT proposals only to maintain the real value of government spending. The net effect of making other plausible adjustments--for example, to allow for nonzero evasion rates, to provide for transition relief, to account for economic growth, and to account for states changing their income taxes to sales taxes, etc. -- could raise the required replacement tax rate in a national retail sales tax to significantly higher levels than those reported here (see Gale 1998b).

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