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by William G. Gale

The National Retail Sales Tax: What Would the Rate Have To Be?

William G. Gale is the Arjay and Frances Fearing Miller chair and deputy director in the economic studies program at the Brookings Institution, and codirector of the Tax Policy Center. He thanks Barry Bosworth, John Buckley, David Burton, Larry Kotlikoff, Karen Pence, and Maria Perozek for helpful discussions, and Emil Apostolov, Matt Hall, and Shannon Leahy for research assistance.

This report addresses a technical issue regarding the national retail sales tax: What would the required tax rate have to be? According to the report, the four principal results are:

First, as long as real federal revenues and real federal spending are maintained during the transition to a sales tax, the required sales tax rate would not depend on whether federal purchases are subject to tax or whether consumer prices rise after the sales tax is imposed.

Second, H.R. 25, a recent legislative proposal, would replace the existing income, corporate, payroll, and estate and gift taxes with a 23 percent tax-inclusive (30 percent tax-exclusive) sales tax on almost all private consumption, a significant portion of household interest payments, and all federal, state, and local government noneducation purchases, and would provide payments to offset taxes on consumption to households up to the poverty line. Even if there were no avoidance and no evasion, however, the required tax rate for that proposal over the next 10 years would be 31 percent tax-inclusive (44 percent tax-exclusive). If the tax rate were set at 23 percent (tax-inclusive), the revenue loss would exceed $7 trillion over the next decade relative to current law.

Third, with plausible allowances for avoidance, evasion, and tax exemptions for some private consumption and some state and local purchases, both the required tax rates and the revenue loss from imposing a sales tax at a 23 percent tax-inclusive rate climb significantly higher.

Fourth, the commonly cited 23 percent tax-inclusive rate in H.R. 25 was derived using a set of assumptions about changes in the price level that are not consistent with each other and that lead to an estimated tax rate that is systematically and substantially too low.

I. Introduction

President Bush has made federal tax reform a priority for his second term. One well-known proposal for reform would replace almost all of the federal tax system with a national retail sales tax (NRST). This report addresses a technical and deceivingly simple question regarding the NRST: What would the required sales tax rate have to be?

The answer is important because people's view of the sales tax could reasonably depend on how high the rate is. To the extent that federal revenues could be replaced and government programs maintained with a low-rate NRST, it would be relatively more attractive. To the extent that keeping the government whole would require very high NRST rates, the proposal is likely to be viewed as less attractive (and may not even be enforceable).

Determining the required rate appears to be the source of significant confusion in public debates. Part of the reason is that there are two ways to quote tax rates. Suppose a good costs $100, before taxes, and there is an additional $30 sales tax placed on top of that price. The *tax-exclusive* sales tax rate is the ratio of the tax to the pretax price (that is, the tax payment is excluded from the denominator). In this example, it would be 30 percent (30/100). The tax-exclusive rate corresponds to the ''mark-up at the cash register.'' In contrast, the *tax-inclusive* tax rate is the ratio of the tax payment to the entire cost of the good, including both the pretax price and the tax payment itself; in this example, it would be about 23 percent (30/130). Note that for positive tax rates the tax-inclusive rate is always less than the tax-exclusive rate.[1]

Although sales taxes are typically quoted in tax-exclusive terms, income taxes are typically quoted in tax-inclusive rates. For example, someone earning $130 and paying $30 in income taxes would normally think of themselves as paying a 23 percent income tax. Neither method of quoting a tax rate is incorrect, but public discussion could be greatly improved if the difference between the two rates was clarified.

[1]The two rates are related by TI = TE/(100+TE), where TI is the tax-inclusive rate and TE is the tax-exclusive rate and both rates are expressed as percents. Tax-inclusive rates can not exceed 100 percent, though tax-exclusive rates (markups at the cash register) can. The difference between tax-inclusive and tax-exclusive rates rises as either rate rises. For example, a 10 percent tax-exclusive rate corresponds to about a 9 percent tax-inclusive rate. But a 100 percent tax-exclusive rate corresponds to a 50 percent tax-inclusive rate.

A second factor is that various sales tax proposals differ regarding factors that affect the required rate. Those factors include which taxes would be replaced, the specification of the tax base, and assumptions about tax avoidance, tax evasion, and economic growth under a sales tax.[2] As shown below, a third factor is that some sales tax advocates have calculated the required tax rate using assumptions that are mutually inconsistent and that serve to understate the required rate significantly.

This report explores those issues and develops new estimates of the required tax rate in an NRST under a variety of scenarios. All of the scenarios assume that the real size of government would remain the same under the sales tax and that real revenues would remain the same. That permits ''apples-to-apples'' comparisons: examining different ways of financing the same set of government policies.

I first develop equations for the required tax rate in a NRST that holds the real (inflation-adjusted) size of government programs constant and maintains the real level of revenues. Besides providing an explicit formula for the required rate (as a function of taxes to be replaced, the tax base, avoidance, evasion, and so on), the theory displays two significant ''neutrality'' properties. First, if the real size of the federal government is held constant, taxing federal government purchases in a federal retail sales tax does not affect the required tax rate; it simply raises required federal spending by the same amount as it raises federal revenues. Second, the required tax rate does not depend on whether the switch to a sales tax results in higher consumer prices.

The next step is to use the formulas to analyze the required tax rate under H.R. 25, a legislative proposal sponsored by Rep. John Linder, R-Ga., and cosponsored by 54 additional members of the House of Representatives. H.R. 25 proposes a national retail sales tax that would replace the personal income, corporate income, payroll, and estate and gift taxes and would tax almost all private consumption, a significant portion of household interest payments, and all federal, state, and local government noneducation purchases. H.R. 25 and its supporters claim that a 23 percent tax-inclusive rate (30 percent tax-exclusive tax rate) would be sufficient.[3]

I show that even under the strong assumptions made in H.R. 25 — *no* avoidance, *no* evasion, *no* legislative erosion of the private consumption or the state and local government consumption and investment purchases tax base — the NRST would still require a 31 percent tax-inclusive rate (44 percent tax-exclusive) to be revenue-neutral and hold government programs constant relative to current law over the next 10 years.

The differences between those rates and the 23 percent tax-inclusive (30 percent tax-exclusive) rate used in H.R. 25 can be traced to a mathematical or logical mistake made by advocates of the NRST. When they estimated government revenues under the sales tax, they (implicitly) assumed that consumer prices (what consumers pay, including the sales tax) would rise by the full amount of the sales tax and that producer prices (what producers receive, net of the sales tax) would stay constant. But when they estimated government spending needs, they (implicitly) assumed that consumer prices would stay constant and producer prices would fall by the full amount of the tax. Both sets of assumptions cannot be valid at the same time; either the first assumption overstates nominal revenues, or the second assumption understates nominal required spending, or both. In any of those cases, the inconsistency has significant effects. If H.R. 25 *were* enacted at a 23 percent tax-inclusive rate, the resulting revenue loss relative to current law would be $268 billion in 2005, almost $600 billion in 2010, and more than $7 trillion over the next decade — even under the strong, optimistic assumptions noted above.[4]

I also examine the required rate under more realistic assumptions, allowing for some avoidance, some evasion, and some legislative adjustments to the tax base. Modest adjustments in this direction significantly raise the required tax rate and raise the revenue loss from imposing a 23 percent (tax-inclusive) tax rate. For example, if evasion occurred at the same rate in the sales tax as in the income tax and if the sales tax did not cover interest payments such as mortgages and credit card payments, 20 percent of the consumption base would be lost. In that case, even with no avoidance and with all other consumption (including health, housing, and food) fully taxed, the required 10-year rate would rise to 39 percent tax-inclusive (65 percent tax-exclusive). If, in addition, state and local purchases were omitted from the federal sales tax, the 10-year revenue-neutral federal sales tax rate would rise to 45 percent tax-inclusive (82 percent tax-exclusive).

To replace just the personal income tax and corporate income taxes with a sales tax would require a tax-inclusive rate about 60 percent as large as the rates quoted above. Thus, if 20 percent of the proposed consumption base were not taxed and state and local governments were not taxed, replacing the personal and corporate income taxes would require a 27 percent tax-inclusive (36 percent tax-exclusive) rate over the next decade.

Section II develops the formulas for calculating the required rate. Section III describes H.R. 25. Section IV calculates required tax rates and the revenue loss under a 23 percent tax-inclusive rate under the strong assumptions of no avoidance, no evasion, and no legislative adjustment of the tax base. Section V provides similar calculations under more realistic assumptions. Section VI

[2]For previous work displaying a range of estimates, see Feenberg, Mitrusi, and Poterba (1997), Gale et al. (1998), Gale (1999, 2004), Koenig (1999), and Paull (2000).

[3]The text of H.R. 25 is available at: http://thomas.loc.gov/cgi-bin/query/C?c108:./temp/~c1082advhF.

[4]If the sales tax were instead compared to a baseline in which the administration's 2001, 2003, and 2004 tax cuts were made permanent (rather than a current-law baseline, as in the text above), it would require a 29 percent tax-inclusive (41 percent tax-exclusive) rate to keep the government whole over the next decade, and enacting a 23 percent tax-inclusive tax rate would reduce revenues by $5.8 trillion.

shows the logical inconsistency that generates the 23 percent tax-inclusive rate assumed by H.R. 25. Section VII concludes.

II. Derivation of the Required Tax Rate Formula[5]

A. The Pre-Sales-Tax Economy

We begin by defining terms in the ''current,'' or pre-sales-tax, economy:

- R_S = current nominal revenue raised by federal taxes that would be replaced by the sales tax;
- R_O = current nominal revenue raised by federal taxes that would not be replaced by the sales tax;
- R_I = current nominal federal revenue from interest income;
- B = current nominal federal borrowing;
- G_S = current nominal expenditures on federal outlays for goods and services that would be subject to the sales tax;
- G_O = current nominal expenditures on federal outlays for goods and services that would not be subject to the sales tax;
- G_I = current nominal expenditures on federal interest payments; and
- T = current nominal expenditures on federal transfer payments.

The federal government's annual budget constraint in the pre-sales-tax economy is given by (1):

$$(1) \qquad R_S + R_O + R_I + B = G_S + G_O + G_I + T.$$

This budget constraint implies that spending is financed by tax revenues, interest income, and gross borrowing.[6] The primary deficit, D, is defined as federal borrowing less net interest payments:

$$(2) \qquad D = B - (G_I - R_I)$$

Using (2), (1) can be rewritten as

$$(3) \qquad R_S + R_O + D = G_S + G_O + T,$$

which states that federal tax revenues ($R_S + R_O$) plus the primary deficit (D) must equal noninterest outlays ($G_S + G_O + T$). We also define:

- X = the sum, over all households, of the current nominal poverty income level (adjusted to remove marriage ''penalties'' as described below);
- $C_{PRIVATE}$ = current nominal expenditures on private consumption and household interest payments that would be subject to a national retail sales tax;
- C_{SL} = current nominal expenditures on state and local government consumption and investment items that would be subject to a national retail sales tax; and
- $C = C_{PRIVATE} + C_{SL}$.

B. Price-Level Adjustments

Replacing some or all current federal taxes with a sales tax introduces two potential sets of adjustments to prices. First, introducing a sales tax drives a wedge between producer prices (what the producer receives from a sale after paying sales tax but before paying any income or payroll taxes) and consumer prices (what the consumer pays, including the sales tax). The implication is that, while the consumer and producer prices of a good are the same in the current federal tax system (ignoring federal excise taxes and state and local sales taxes), they would be different by the amount of the federal sales tax under an NRST, so at least one of them would have to change from its current value.

Second, repealing existing income and payroll taxes could affect producer prices. If the reduction in taxes reduces nominal costs and if wages and prices are nominally flexible, nominal producer prices may fall. However, if prices and wages are nominally ''sticky,'' or if nominal wages are set by contract, producer prices may remain unchanged.[7]

Keeping track of those changes is crucial to estimating the required tax rate in the NRST.[8] We examine two possibilities: First, nominal wages and the producer price level stay constant after the sales tax is introduced, in which case nominal consumer prices (including the sales tax) would rise by the full amount of the tax; second, nominal wages and the producer price level fall by the full amount of the previously existing taxes, in which case nominal consumer prices (including the sales tax) would stay constant after the tax is imposed.

The use of internally inconsistent assumptions plays a pivotal role in explaining why H.R. 25 mistakenly reports that a 23 percent tax-inclusive rate would be sufficient.

It is shown below that each case generates identical results for the required tax rate. In fact, it is straightforward to show that *any* assumption about how much consumer prices change would not affect the required tax rate calculation — *as long as* the assumptions about nominal wages and producer prices, on the one hand, and consumer prices, on the other, are made in an internally consistent fashion. As shown in Section VI, the use of internally *in*consistent assumptions plays a pivotal

[5]This section builds on Gale, Koenig, Rogers, and Sabelhaus (1998) and Gale (1999).

[6]Obviously, in the long term net borrowing must be zero — that is, the present value of net taxes must equal the present value of government purchases of goods and services. The goal of this report, however, is to hold the projected streams of spending and revenue constant over time, and examine the effects of changing the source of the revenue stream from existing taxes to a national sales tax.

[7]For analysis of the effects of sales tax increases on the price level, see Poterba, Rotemberg, and Summers (1986), Poterba (1996), and Besley and Rosen (1998).

[8]For an early treatment of these issues, see Tolley and Steuerle (1975).

role in explaining why H.R. 25 mistakenly reports that a 23 percent tax-inclusive rate would be sufficient.

C. Producer Prices Constant/Consumer Prices Rise

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_1 percent, where t_1 is the required *tax-exclusive* national sales tax rate.

To solve for t_1, we begin by writing the federal government's budget constraint, defining the variables in this scenario with a subscript of 1 to distinguish them from the corresponding variables in the pre-sales-tax economy (in equation (3)). We also add outlays for the demogrant, $F_1(X)$, to the equation:

$$(4) \qquad R_{S1} + R_{O1} + D_1 = G_{S1} + G_{O1} + T_1 + F_1(X).$$

Equation (4) states that in an economy with a sales tax, and with the producer price level the same as it was in the pre-sales-tax economy, the sum of federal tax revenue plus the primary deficit equals noninterest federal spending, including the demogrant. All of the variables are in nominal terms. To solve for the required tax rate, we need formulas for each of the variables in (4).

R_{S1}: The statutory tax base is the sum of (a) nominal private consumption expenditures and household interest payments subject to sales tax, (b) state and local government spending on goods and services subject to tax, and (c) federal spending on goods and services subject to the tax. In the pre-sales-tax economy, the first two items are given by C, the third by G_S. Because the producer price level is assumed not to change, each of those items takes on the same nominal value as in the pre-sales-tax economy. Thus, the nominal sales tax base is $C+G_S$ and nominal sales tax revenue is $R_{S1} = t_1(C+G_S)$.

R_{O1}: Nominal revenue collected from other federal taxes would rise from R_O in the pre-sales-tax economy to $R_{O1} = R_O(1+t_1)$ under the sales tax, because consumer prices rise by the factor t_1.

G_{S1}: To maintain the real size of the federal government and its programs, any nominal federal outlays that are subject to the sales tax must rise in nominal terms by t_1 percent to cover the tax payments that are due on that spending. Thus, nominal taxable federal spending must rise from G_S in the pre-sales-tax economy to $G_{S1} = (1+t_1)G_S$.

G_{O1}: Federal outlays that are not subject to sales tax (G_O) would not have to change in nominal terms, because the producer price level has not shifted. Thus, $G_{O1} = G_O$.

T_1: To retain their real purchasing power, transfer payments need to be adjusted for the change in consumer prices.[9] Thus, nominal transfer spending would have to rise from T in the pre-sales-tax economy to $T_1 = (1+t_1)T$ under the sales tax.

$F_1(X)$: The budgetary cost of the demogrant would be t_1X.[10]

D_1: The primary deficit reflects the balance between noninterest spending and noninterest revenues. To maintain the real size of the federal government, the real primary deficit should remain constant; that is, the nominal primary deficit should rise with consumer prices, so that $D_1 = (1+t_1)D$.

Incorporating those changes into equation (4) yields the following budget constraint for the federal government under a sales tax (when producer prices stay constant and consumer prices rise by the full amount of the sales tax):

$$(5) \qquad (C+G_S)t_1 + R_O(1+t_1) + D(1+t_1) = G_S(1+t_1) + G_O + T(1+t_1) + Xt_1.$$

Solving (5) for t_1 yields

$$(6) \qquad t_1 = (G_S + G_O + T - R_O - D) / (C - X - T + D + R_O).$$

Using (3) implies that

$$(7) \qquad t_1 = R_S / (C - X - T + D + R_O).$$

Equation (7) is the central theoretical result in the report. The equation generates the tax-exclusive sales tax rate required to maintain real revenues and maintain the real size of government. Note that all of the terms are defined in terms of the current pre-sales-tax economy and are thus observable even if the sales tax does not exist.

The equation defines the required tax-exclusive sales tax rate as the ratio of the nominal revenues to be replaced (R_S) divided by what might be called the nominal *effective* tax base, given by $C-X-T+D+R_O$. The key analytical points relate to (a) the differences between the nominal effective tax base and the nominal statutory tax base, $C+G_S$, and (b) the implications of those differences for the required tax rate.

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[9]It is straightforward to show that, as a matter of theory, to maintain the real purchasing power of transfers, transfers that are taxed in the current system at the same rate as the required tax rate in an NRST should be adjusted according to changes in the producer price level and transfers that are untaxed should

(Footnote continued in next column.)

be adjusted according to changes in the consumer price level (Koenig 1999, Gale 1999). In practice, however, that would be a very difficult standard to determine (since the taxation depends in part on individual circumstances). H.R. 25, for example, stipulates that all Social Security benefits (some of which are taxable) should be adjusted in accordance with changes in the consumer price level. We thus make the simplifying assumption here that all federal transfers would be adjusted with the consumer price level. Because the vast majority of non-Social-Security transfers are either explicitly not subject to tax, or are in-kind (such as Medicare and Medicaid) and hence effectively not subject to income tax, that assumption is reasonable and making the alternative assumption that taxable transfers were adjusted according to the producer price level would have little effect on the results (Gale 1999).

[10]The demogrant is specified in H.R. 25 in tax-inclusive terms, but specified here in tax-exclusive terms. Nevertheless, the specification in the report is the equivalent of the specification in H.R. 25. The demogrant in H.R. 25 would pay households the product of (a) the tax-inclusive sales tax rate and (b) the poverty guideline level of income. Because consumer prices rise in the example considered here, the poverty guideline would rise from X to $X(1+t_1)$. Paying households the (tax-inclusive rate)$*X(1+t_1)$ is the same as paying t_1X, because the tax-inclusive rate = $t_1/(1+t_1)$, as discussed in *supra* note 1.

One difference is that the effective tax base does not include any purchases by the federal government (G_S). The reason is that adding federal spending to the statutory tax base raises the federal government's spending needs by exactly the same amount as it raises federal revenue collection. The implication is that, as long as the real size of the federal government is held constant, *the required tax rate does not depend at all on whether federal purchases are subject to the sales tax*.[11]

A second difference is that the effective tax base does not include all consumption that is subject to tax; in particular, consumption that households finance with either the demogrant or government transfers does not lead to a larger effective tax base and therefore does not reduce the required tax rate.

Third, the effective tax base is increased (and therefore the required tax rate is reduced) to the extent that the federal government would continue to collect other taxes or finance spending with borrowing.[12]

D. Consumer Prices Constant/Producer Prices Fall

This section derives the required national sales tax rate when nominal wages and producer prices decline by the full amount of the repealed taxes, and consumer prices (including the sales tax) remain constant, after the sales tax is imposed, and proceeds in an entirely parallel fashion relative to section C above. To begin, we write the budget constraint, giving each variable the subscript of 2:

$$(8) \qquad R_{S2} + R_{O2} + D_2 = G_{S2} + G_{O2} + T_2 + F_2(X).$$

Equation (8) says that in the sales tax economy, with the consumer price level the same as it was in the pre-sales-tax economy, the sum of federal tax revenue plus the primary deficit equals noninterest federal spending including the demogrant. We denote the required tax-exclusive tax rate in this scenario as t_2. To solve for the required tax rate, we need formulas for each of the variables in (8).

R_{S2}: The statutory tax base is the sum of nominal private consumption expenditures and household interest payments subject to sales tax, state and local government purchases subject to the tax, and federal purchases subject to the tax. Those items equal $C+ G_S$ in the pre-sales-tax economy. Because the producer price level is assumed to fall by the full amount of the preexisting taxes, each of those items falls by $(1+t_2)$ so the nominal tax base is $(C+G_S)/(1+t_2)$, and the nominal revenue collected is $R_{S2} = t_2(C+G_S)/(1+t_2)$.

R_{O2}: Revenues collected from other taxes would remain unchanged, because consumer prices do not change, so that $R_{O2} = R_O$.

G_{S2}: To maintain the real size of the federal government and its programs, any federal outlays that are subject to the sales tax would remain constant in nominal terms, because consumer prices do not rise in this example. Thus, taxable federal spending is $G_{S2} = G_S$.

G_{O2}: In contrast, government outlays that are not subject to sales tax (G_O) would fall because producer prices have fallen. Thus, $G_{O2} = G_O/(1+t_2)$.

T_2: To retain their real purchasing power, transfer payments need to be adjusted for the change in consumer prices. Thus, nominal transfer spending would remain constant: $T_2 = T$.

$F_2(X)$: The budgetary cost of the demogrants would be $Xt_2/(1+t_2)$.[13]

D_2: As before, the real primary deficit should remain constant. Because consumer prices remain constant, the nominal primary deficit should also remain constant. Therefore, $D_2 = D$.

Incorporating those changes yields the following budget constraint for the federal government under a sales tax (when consumer prices stay the same under the sales tax as they were in the pre-sales-tax economy):

$$(9) \qquad (C+G_S)t_2/(1+t_2) + R_O + D = G_S + G_O/(1+t_2) + T + Xt_2/(1+t_2)$$

Solving (9) for t_2 yields

$$(10) \qquad t_2 = (G_S + G_O + T - R_O - D) \,/\, (C - X - T + D).$$

Using (3), this implies that

$$(11) \qquad t_2 = R_S \,/\, (C - X - T + D + R_O).$$

The right side of (11) is exactly the same expression as the right side of (7). That confirms that, as long as the real size of the federal government is held constant, the required tax rate (a) is not a function of what happens to the price level after a sales tax replaces existing taxes, and (b) does not depend on whether federal purchases are taxed.

E. Derivation of the Required Tax-Inclusive Rate

Equations (7) and (11) derive the same formula for the required tax-*exclusive* tax rate and show that the required tax-exclusive rate is invariant for whether government spending is taxed and whether the consumer price level rises.

The required tax-*inclusive* rate is simply the ratio of the tax-exclusive rate to the sum of the l plus the tax-exclusive rate. Thus, it is given by either $t_1/(l+t_1)$, where t_1 is defined by (7) or $t_2/(l+t_2)$, where is defined by (11). Obviously, the same tax-inclusive rate would be derived using either formula, since the right hand sides of (7) and (11) are identical.

It is also useful to derive here the precise formula for the required tax-inclusive tax rate in terms of observable quantities. Defining the required tax-inclusive tax rate as

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[11]If government purchases were not subject to the sales tax, G_S would be zero in (1), (3), (4), (5), and (6), and the calculations leading to equation (7) would yield the same required tax rate.

[12]Deficit spending, of course, only postpones the need to make revenue or outlay adjustments. That analysis, however, holds the level of explicit government borrowing constant in comparing the income tax and the sales tax. *See supra* note 6.

[13]The nominal poverty guidelines would stay the same after the sales tax was introduced, because consumer prices were the same as before the sales tax. The demogrant would pay each household that threshold times the tax-inclusive tax rate, which is given by $t_2/(1+t_2)$, where t_2 is the tax-exclusive tax rate (*see supra* notes 1 and 10).

$t_{INCLUSIVE} = t_2/(1+t_2)$, plugging in the formula in (11), and using the formula for R_S embodied in (3) yields the result that

(12) $$t_{INCLUSIVE} = (R_S/(C - X + G_S + G_O).$$

Note that, like the required tax-exclusive rate derived in (7) and (11), the required tax-inclusive rate derived in (12) does *not* depend on whether federal purchases are subject to the sales tax; that is, given total federal purchases of goods and services, $G_S + G_O$, the required rate does not depend on how much of those purchases are taxed.

Note also that *if* all federal purchases were subject to sales tax, so the G_O equals zero, then the formula for the tax-inclusive rate becomes

(13) $$t_{INCLUSIVE} = (R_S/(C - X + G_S).$$

This formula will relate closely to discussion of H.R. 25 in section VI, where it is shown that making *inconsistent* assumptions about price level changes will incorrectly generate the right-hand side of (13) as the formula for the tax-*exclusive* rate.

III. Overview of H.R. 25

Replacement taxes. H.R. 25 would repeal all federal taxes except excise taxes. Specifically, the legislation would repeal the individual income tax, corporate income tax, payroll taxes, self-employment taxes, and the estate, gift, and generation-skipping taxes.

Private consumption tax base. The tax base would include all goods or services purchased for consumption purposes in the United States. Other than expenditures on housing, which are discussed below, all personal consumption outlays would be taxed, other than education and job training[14] (on the grounds that those are investments), food produced and consumed on farms (for administrative reasons), and state sales taxes.

Retail sales occur when businesses sell goods or services to households. Thus, sales of newly constructed homes to families that intend to live in the home would be subject to tax. But sales of an already existing owner-occupied home would not be taxable (because it is a sale from one household to another), and sale of a newly constructed home to businesses or individuals that intend to rent the home would not be taxed (because it is a sale from a business to a business). Rental payments would be taxed.

The proposed base includes the imputed value of financial intermediation services. For example, household purchases of banking services — measured as the average balance times the difference between the interest rate earned on the account and a benchmark Treasury rate — would be taxable. Likewise, any interest *paid* by a household to a business lender at a rate higher than the prevailing Treasury rate would be considered payment for the provision of financial services and therefore taxable under H.R. 25. Thus, for example, a taxpayer with a mortgage at a 7 percent rate would have 4/7 of the mortgage interest payment subject to tax if the Treasury rate were 3 percent even though the home purchase itself was already subject to tax. Likewise, a consumer paying an 18 percent interest rate on outstanding credit card debt would have 5/6 of the interest payment subject to sales tax if the Treasury rate were 3 percent, even though the original purchases were already subject to sales tax.[15]

Domestic expenditures by U.S. nonresidents would be taxed. The tax would exempt expenditures by U.S. residents incurred while abroad or for foreign travel, but taxpayers would be responsible for paying taxes on goods that they import into the country or that are mailed, downloaded, or otherwise transported to them from outside the country.

Government purchases. Households consume, directly and indirectly, goods and services that are produced by the government. Some of that consumption occurs via sales, such as national park admissions, but some occurs without any specific household-government transaction, such as police and fire protection. Thus, the proposal adopts a ''prepayment'' approach to taxing consumption of government-provided goods and services, and would tax federal, state, and local government purchases of inputs, materials, services, and wages. Government would not pay taxes on transfer payments. If and when individuals spent the transfer payments on consumption, they would be subject to tax.

Business purchases. Business-to-business transactions would not be taxed, because the purchase is used as an input, not as household consumption.[16]

Demogrants. The proposal would provide a monthly demogrant to each household. The amount is equal to the tax-inclusive sales tax rate times the Health and Human Services poverty guideline, and is then adjusted upward slightly for married households to eliminate any marriage penalties that would otherwise arise from the fact that the poverty guidelines rise less than linearly with household size.[17]

IV. Basic Results: Best-Case Assumptions

This section reports estimates of the required tax rate and the revenue loss from imposing a 23 percent tax-inclusive rate under the assumptions that 100 percent of

[14]H.R. 25 describes education and training as ''tuition for primary, secondary, or postsecondary education and job-related training courses. Such term does not include room, board, sports activities, recreational activities, hobbies, games, arts, crafts, or cultural activities'' (section 2(a)(4)).

[15]For further discussion, see Buckley and Rogers (2004) and section 801(a)(3)(B)(ii) of H.R. 25 cited in *supra* note 3.

[16]For items that are used in both business and personal application, there would be rules permitting rebate of taxes paid under certain circumstances.

[17]H.R. 25 also includes two items that we ignore but whose inclusion would raise the required tax rates reported below. Those two items are a credit for inventories existing at the time of the transition to a sales tax, and an annual payment to businesses to help defray the costs of compliance. The compliance payment is 0.25 percent of tax revenue collected. The transitional credit is estimated by Paull (2000) to raise the five-year revenue-neutral tax rate by 1.5 percentage points (tax-inclusive) and 2.5 percentage points (tax-exclusive) relative to the 10-year revenue-neutral rate.

Table 1. Sales Tax Rates and Revenue Losses (Baseline = Current Law Revenues)

Avoidance, Evasion, and Legislative Erosion of Private Consumption Tax Base	Taxation of State and Local Government Consumption and Investment?	Required Tax-Exclusive Tax Rate				Required Tax-Inclusive Tax Rate				Revenue Loss at 23% Tax-Inclusive Tax Rate ($ Billions)			
		2005	2010	2015	2006-2015	2005	2010	2015	2006-2015	2005	2010	2015	2006-2015
Panel 1: NRST as Replacement for Personal Income, Corporate Income, Payroll, and Estate Taxes													
None	Yes	0.364	0.416	0.492	**0.441**	0.267	0.294	0.330	**0.306**	-268	-590	-1,139	**-7,186**
10%	Yes	0.427	0.494	0.591	0.525	0.299	0.331	0.371	0.344	-450	-824	-1,432	-9,591
20%	Yes	0.517	0.606	0.738	0.647	0.341	0.377	0.425	0.393	-632	-1,058	-1,724	-11,996
None	No	0.420	0.484	0.579	0.514	0.296	0.326	0.366	0.340	-431	-800	-1,401	-9,340
10%	No	0.506	0.592	0.719	0.632	0.336	0.372	0.418	0.387	-613	-1,034	-1,693	-11,745
20%	No	0.638	0.762	0.949	0.819	0.389	0.432	0.487	0.450	-795	-1,268	-1,985	-14,150
Panel 2: NRST as Replacement for Personal Income and Corporate Income Taxes													
None	Yes	0.174	0.207	0.252	0.222	0.148	0.171	0.201	0.181				
10%	Yes	0.199	0.239	0.293	0.256	0.166	0.193	0.227	0.204				
20%	Yes	0.233	0.282	0.350	0.304	0.189	0.220	0.259	0.233				
None	No	0.196	0.235	0.288	0.252	0.164	0.190	0.224	0.201				
10%	No	0.229	0.277	0.343	0.298	0.187	0.217	0.255	0.229				
20%	No	0.276	0.337	0.423	0.364	0.216	0.252	0.297	0.267				

Source: See appendix tables 6 and 8.

the tax base employed in H.R. 25 would be subject to tax. The following section relaxes the assumptions and provides alternative estimates.

A. Parameter Values

Equations (7) and (11) show that the required tax rate in a national retail sales tax can be estimated with information on six parameters of the *current* economic and tax system: R_S, C, X, T, D, and R_0.

We calculate parameter values and the implied required tax rates using different time periods and sources. First, we use data from the National Income and Product Accounts (NIPA) for 2003. The 2003 data, however, may be misleading because federal revenues were just 16.5 percent of gross domestic product in that year, the lowest share since 1951. To generate estimates more representative of normal revenue levels and to conform with standard revenue estimating procedures, we also use historical and projected data from the Congressional Budget Office for 2003-2015. To ensure that the two sets of data are consistent, we show that results using the CBO data for 2003 are virtually identical to those using the NIPA data.

We report revenues under two different baselines for the pre-sales-tax economy. Appendix Table 1a provides data on revenues and the primary deficit under current law. Appendix Table 1b shows the same items under the assumption that the president's 2001, 2003, and 2004 tax cuts are made permanent. As noted earlier, H.R. 25 would repeal the federal income, estate, corporate, and payroll taxes.

Appendix Table 2 provides information on federal transfers and purchases. H.R. 25 would tax virtually all federal purchases, so G_O is set to zero.

Appendix Table 3 provides information on the proposed tax base for 2003. Because the inclusion of federal outlays in the statutory tax base has no effect on the required tax rate as long as the real size of the federal government is held constant, federal purchases are not reported. My best estimate of the tax base for private consumption is shown in the table and includes all private consumption expenditures (a) less those on education, food consumed on farms, expenditure abroad and foreign travel, (b) plus a series of adjustments to capture expenditures on new housing and remove imputed housing consumption, (c) plus expenditure in the U.S. by nonresidents, (d) plus interest payments from households to businesses (including interest on mortgages and credit card balances) to the extent that the payments represent an interest rate higher than the benchmark Treasury rate. (If interest rates fell under a sales tax, the tax base would shrink and the required tax rates would be higher than reported here.) State and local consumption and investment purchases are listed as well, with purchases for education subtracted.

Appendix Table 4 reports the data needed to calculate the cost of the demogrant in 2003. Exempted consumption is the product of the number of households in each marital status/family size category and the income level given by the poverty guideline for a family of that size and marital status.

Appendix Table 5 reports the values of each of the variables used in equations (7) and (11) for 2003-2015. To

Table 2. Sales Tax Rates and Revenue Losses (Baseline = Tax Cuts Extended)

Avoidance, Evasion, and Legislative Erosion of Private Consumption Tax Base	Taxation of State and Local Government Consumption and Investment?	Required Tax-Exclusive Tax Rate				Required Tax-Inclusive Tax Rate				Revenue Loss at 23% Tax-Inclusive Tax Rate ($ Billions)			
		2005	2010	2015	2006-2015	2005	2010	2015	2006-2015	2005	2010	2015	2006-2015
Panel 1: NRST as Replacement for Personal Income, Corporate Income, Payroll, and Estate Taxes													
None	Yes	0.364	0.412	0.437	**0.413**	0.267	0.292	0.304	**0.292**	-268	-571	-847	**-5,865**
10%	Yes	0.427	0.489	0.521	0.489	0.299	0.328	0.342	0.328	-450	-805	-1,140	-8,270
20%	Yes	0.517	0.600	0.644	0.600	0.341	0.375	0.392	0.375	-632	-1,039	-1,432	-10,675
None	No	0.420	0.479	0.511	0.480	0.296	0.324	0.338	0.324	-431	-781	-1,109	-8,019
10%	No	0.506	0.586	0.628	0.586	0.336	0.369	0.386	0.370	-613	-1,015	-1,401	-10,424
20%	No	0.638	0.752	0.816	0.753	0.389	0.429	0.449	0.430	-795	-1,249	-1,693	-12,829
Panel 2: NRST as Replacement for Personal Income and Corporate Income Taxes													
None	Yes	0.174	0.204	0.222	0.205	0.148	0.170	0.181	0.170				
10%	Yes	0.199	0.236	0.257	0.237	0.166	0.191	0.204	0.191				
20%	Yes	0.233	0.278	0.305	0.280	0.189	0.218	0.233	0.219				
None	No	0.196	0.232	0.252	0.233	0.164	0.188	0.202	0.189				
10%	No	0.229	0.273	0.299	0.275	0.187	0.215	0.230	0.215				
20%	No	0.276	0.332	0.366	0.334	0.216	0.249	0.268	0.250				

Source: See appendix tables 7 and 9.

calculate values of C and X in years beyond 2003 we assume that the ratio of each to GDP is the same in future years as it is in 2003, and use CBO projections of GDP. Note that the values of R_S, R_O, and D depend on both the baseline employed (current law versus extended tax cuts) and the taxes to be replaced (income, corporate, payroll, and estate and gift or just income and corporate).

B. Required Tax Rates

Table 1 reports required tax rates under the current-law baseline. Table 2 reports similar values under the extended-tax-cut baseline. Table 1, line 1, shows that a federal sales tax that maintains real federal revenues under current law and real federal noninterest spending over the 10-year period of 2006 to 2015 would require a tax-inclusive rate of 31 percent, or a tax-exclusive rate of 44 percent. (Figures in bold in Table 1. Appendix Table 6 provides more detail.) The required rate would rise over time (because federal revenues are slated to rise over time from their current low levels). The rate would be 27 percent on a tax-inclusive basis (36 percent tax-exclusive) in 2005, and would rise to 29 percent on a tax-inclusive basis (41 percent tax-exclusive) by 2010. By 2015, to maintain current-law revenues would require a 33 percent tax-inclusive (49 percent tax-exclusive) rate.

Under the extended-tax-cut baseline (Table 2, line 1), the results change but only slightly. (Appendix Table 7 contains details.) The required sales tax rate would be 29 percent on a tax-inclusive basis (41 percent tax-exclusive) over the 2006-2015 period. (Figures in bold.) The rate would be almost exactly the same as under the current-law baseline through 2010, but by 2015, the required rate would be ''only'' 30 percent on a tax-inclusive basis or 44 percent on a tax-exclusive basis.

C. 23 Percent Tax-Inclusive Rate: Revenue Loss

If, instead of the rates above, a 23 percent tax-inclusive rate were imposed on the H.R. 25 tax base, the revenue loss under either baseline would be $268 billion in 2005, rising to almost $600 billion by 2010.[18] Over the 2006-2015 decade, the revenue loss would total a whopping $7.2 trillion dollars compared to current law and $5.9 trillion compared to the extended-tax-cut baseline.[19]

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[18]We compute these figures assuming that under a sales tax, the consumer price level would stay the same as it would have been under the income tax. That allows direct comparison, without any needed adjustment for differing inflation or price levels, of the revenue figures under the sales tax with the baseline CBO projections described in Appendix Table 1. If we allowed the consumer price level to rise after the transition to a sales tax, the nominal figures we calculated would have to be adjusted to reflect the differing price levels in each year under the sales tax compared versus under the income tax in the CBO baseline. Thus, the calculation used to generate the revenue loss estimate is that revenue under the sales tax in year t = Z = (.23/TI) * (nominal revenue to be replaced by the sales tax in year t), where TI is the required tax-inclusive rate from Table 1 and the nominal revenue to be replaced by the sales tax in year t is given by R_S in Appendix Table 1. Then, the revenue loss in year t is just equal to (Z in year t) - (R_S in year t).

[19]To put these figures in perspective, the revenue loss from (a) the existing Bush administration tax cuts, (b) making those

(Footnote continued on next page.)

D. Replace Personal and Corporate Income Taxes

Under the current-law baseline, replacing just the personal and corporate income taxes would require a tax-inclusive rate of 18 percent (22 percent tax-exclusive) over the next 10 years, under the optimistic assumptions noted above. The required rate would rise from 15 percent tax-inclusive (17 percent tax-inclusive) in 2005 to 17 percent tax-inclusive (21 percent tax-exclusive) in 2010 to 20 percent tax-inclusive (25 percent tax-exclusive) in 2015 (Table 1 and Appendix Table 8).

Under the extended-tax-cut baseline, those rates fall slightly to 17 percent tax-inclusive (21 percent tax-inclusive) over the 10-year period, and 18 percent tax-inclusive (22 percent tax-exclusive) in 2015 (Table 2 and Appendix Table 9).

V. Results with Alternative Assumptions

The analysis above assumes that the statutory tax base described in H.R. 25 would be the actual tax base in a national retail sales tax. This section discusses some of the reasons why that assumption is unlikely to be true and estimates the effects of deviations from that assumption.

A. Legislative Erosion of the Consumption Base[20]

Under H.R. 25, virtually all consumption is assumed to be taxable. In practice, no income or consumption tax comes close to meeting that standard. Some items are difficult to tax, some are exempted for reasons of economic and social policy, and some are exempted because of powerful political constituencies.

For example, using 2003 data, the private sales tax base in H.R. 25 is about 91 percent of personal consumption expenditures (PCE, Appendix Table 3), and 65 percent of GDP. These ratios are far higher than actual consumption taxes in existence. European value added taxes tax only about 41 percent of GDP (Tanzi, 1995). Likewise, state sales taxes tax only about half of private consumption of goods and services (Musgrave and Musgrave 1989).

The ratios described above are also higher than in other proposals for consumption taxes. Feenberg, Mitrusi, and Poterba (1997) use a very broad taxable private consumption base that constitutes 83 percent of PCE. Metcalf (1997) develops a broad taxable sales tax base that is about 80 percent of PCE. The Congressional Budget Office (1997) defines a ''broad'' consumption tax base that is about 80 percent of PCE. That base covers all transactions that could be easily taxed on the product side. A narrower base that restores some of the preferential treatment that exists in the income tax represents only 60 percent of PCE.

In thinking about the likely importance of legislative adjustments away from the pure H.R. 25 consumption tax base, it is useful to note that expenditures on health, housing, and food account for about half of all PCE in the United States. Yet significant federal tax preferences accrue to the consumption of housing and health, and state sales taxes impose relatively light burdens on housing, health, and food. Likewise, no state currently taxes interest payments on mortgages and credit cards under its retail sales tax. It seems unlikely that Congress or the administration would have the discipline to impose 31 percent tax-inclusive rates (44 percent tax-exclusive rates) on those items. It seems much more reasonable to assume that political lobbies, administrative factors, or the desire to introduce economic incentives and social policy adjustments will significantly reduce the proposed consumption tax base.

B. Avoidance and Evasion

Sales tax proponents point to several factors that they believe imply that avoidance and evasion would be lower under the sales tax than under the income tax (Mastromarco 1998), but those claims are controversial.[21] Regardless of the merits of the arguments, though, the estimates above for H.R. 25 are based on the assumption there would be *no* avoidance and *no* evasion, assumptions that are clearly overoptimistic.

A national retail sales tax would offer numerous channels for avoidance and evasion. Taxpayers could combine business activity — which is generally exempt from retail sales taxation — with personal consumption.[22] Consumers could purchase items from offshore entities and not pay taxes on the purchases. The enforcement of state-level ''use'' taxes and voluntary filings has been ''dismal at best'' (Murray 1997), and the applicable tax rates for those taxes are far lower than the rates that would prevail in an NRST, which implies that people would have much stronger incentives to evade the NRST. It would prove difficult to collect high-rate sales taxes from small-scale retailers and service industries. More generally, the two parties to a sale would have incentives to report lower-than-accurate transaction prices to the government and split the tax savings in some manner.

One of the most important determinants of the level of evasion in the current system is whether anyone other than the taxpayer withholds taxes or reports the tax to the government. The rate of evasion is currently around 17 percent in the income tax, but varies greatly by withholding and reporting arrangements. For income on which

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tax cuts permanent, and (c) indexing the AMT for inflation comes to just over $3 trillion during the 2006-15 period (CBO 2005).

[20]For further analysis of these issues, see Gale and Holtzblatt (2002).

[21]The claims supporting a lower evasion rate include the presence of fewer taxpayers, which implies a higher proportion of taxpayers could be audited, and a simpler tax system, which implies fewer unintentional errors. However, those claims are probably overstated. Gale and Holtzblatt (2002), for example, note that if taxpayers have to file monthly under an NRST, as has been proposed, the number of filings will rise, offsetting gains from fewer taxpayers. Also, the majority of filing requirements that would be eliminated under the NRST would cover relatively simple returns that were already effectively completely audited by the IRS because of information reporting requirements and withholding.

[22]For example, individuals may seek to register as firms, individuals may seek to purchase their own consumption goods using a business certificate, or employers might buy goods for their workers in lieu of wage compensation (GAO 1998).

taxes are withheld and reported to government by a third party, the evasion rate is about 1 percent. That predominantly involves withholding of taxes on wages. At the other extreme, for income on which taxes are not withheld and there is no third-party reporting, the evasion rate is 30 percent or more. The retail sales tax would be collected only from businesses that make retail sales; there would be no withholding or reporting by anyone other than the business itself, so the possibility of significant evasion needs to be taken seriously.

Sales tax advocates sometimes claim that the NRST would be more effective than the current system of raising revenue from the underground economy, but that prospect seems unlikely.[23] Other countries have attempted to implement some variant of a national retail sales tax with little success on the enforcement front when rates climb to more than 10 percent. For all of those reasons, several commentators have concluded that national retail sales taxes would face significant evasion and avoidance if the sales tax rate crept up much beyond 10 percent.[24]

C. State and Local Government Purchases

There are several reasons why state and local purchases may not end up in a national retail sales tax base. First, although including state and local government purchases reduces the required *federal* tax *rate*, it does not reduce the *overall burden* on taxpayers. After all, state and local government purchases (and the federal sales taxes that would have to paid on them) are financed by state and local taxes.[25] The tax on state and local purchases may also raise constitutional issues. It would certainly be fiercely opposed by the states. For all of those reasons, it is worth considering the effects of removing state and local purchases from the tax base.

D. Adjusting the Calculations for Base Erosion

Incorporating the factors discussed above into the required tax rate formula is straightforward. Let

- p = the extent to which enacted legislation deviates from the pure consumption tax base ($C_{PRIVATE}$) described in H.R. 25;
- a = the share of the legislated private consumption tax base (note that the legislated private consumption tax base is given by $(1- p)*C_{PRIVATE}$) that is lost due to tax avoidance;
- e = the share of the legislated private consumption tax base that is lost due to tax evasion;
- s = the share of state and local government consumption and investment purchases that are included in the tax base.

Then the actual tax base in an NRST is

$$C^* = (1-a)(1-e)(1-p)C_{PRIVATE} + sC_{SL}. \quad (14)$$

The required tax-exclusive sales tax rate is given by

$$t = R_S / (C^* - X - T + D + R_O). \quad (15)$$

Note that the right side of (15) is identical to the right sides of (7) and (11), except that C* substitutes for C. H.R. 25 makes the very strong assumptions that p=a=e=0 and s=1, in which case (15) generates the same required tax rate as (7) and (11). In the more typical case, where p, a, and e > 0 and where s<1 and is possibly zero, C* < C, and the required tax rate will be higher under (15) than under (7) and (11).

E. Results

Table 1 shows how quickly the required rate rises when even minor adjustments to the tax base are made. For example, suppose (optimistically) that evasion in the sales tax would be 8.5 percent, only half as large as in the income tax, and that legislators do not subject interest payments (for example, on mortgages and credit cards) to sales tax. That still assumes the full taxation of all food, all housing, all health care, and all other financial services, and the absence of any tax avoidance. The private consumption tax base would decline by 10 percent and the required sales tax rate would be 34 percent tax-inclusive (53 percent tax-exclusive) over the next 10 years (Table 1).

If 20 percent of the private consumption base in H.R. 25 were eroded because of avoidance, evasion, or legislative adjustments — an adjustment that seems modest given the discussion above — the 10-year revenue-neutral NRST rate would be 39 percent tax-inclusive (65

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[23] *See* Hines (2004) for a careful analysis. The classic example is that of a drug dealer who currently does not pay income tax on the money he earns, but would be forced to pay sales taxes under an NRST if he took the funds and bought, for example, a Mercedes. The problem with this argument is laid out by Armey (1995): "If there is an income tax in place, he [the drug dealer] won't report his income. If there is a sales tax in place, he won't collect taxes from his customers" and send the taxes to government. In the end, to a first order approximation, neither system taxes the drug trade. Some additional effects, though, may complicate the analysis. For example, the effective tax rate on drug dealers and their customers may differ, and the drugs may be purchased with income generated illegally.

[24] *See* Bartlett (1995), Casanegra (1987), McLure (1987), Mikesell (1997), Murray (1997), OECD (1998), Slemrod (1996), Tait (1988), Tanzi (1995), and *The Wall Street Journal* (1996). Unfortunately, there is little evidence from the states to gauge how extensive evasion would be under a NRST. Evasion in a federal sales tax would likely be significantly higher than in existing state taxes, because state sales tax rates have substantially lower rates than an NRST would, and states can piggyback on federal enforcement efforts, which are in turn aided by the existence of an income tax with its various reporting requirements.

[25] The federal government could always reduce federal tax rates by taxing state and local government purchases at very high rates, but that would not represent a reduction in households' net tax burden. For example, Appendix Table 3 shows that state and local government purchases account for roughly one-sixth of the tax base in H.R. 25 (not counting federal purchases, the taxation of which has already been shown not to affect the required tax rate). As a result, the federal government could raise the revenue it needed by taxing state and local

(Footnote continued in next column.)

purchases at six times the required rate in a national sales tax, and not taxing any private consumption. That would not mean, however, that the zero tax rate on private consumption in a federal sales tax was an accurate measure of the tax burden being placed on households. Consumers would still bear the same tax burden as before, but they would pay their federal burden indirectly, through higher state and local taxes.

percent tax-exclusive). If all private consumption were taxed but state and local government purchases were omitted, the 10-year required rate would be 34 percent tax-inclusive (51 percent tax-exclusive). If both adjustments were made — that is, 20 percent of the consumption base were lost and state and local government spending were excluded from the base — the required federal rates rise to 45 percent tax-inclusive (82 percent tax-exclusive). In any of those circumstances, the revenue loss from a sales tax at a 23 percent tax-inclusive rate would be astronomical (Table 1).[26]

To replace the current-law personal and corporate income taxes (and leave current-law payroll and estate taxes in place) would require a 23 percent tax-inclusive (30 percent tax-exclusive) rate over 10 years, if 20 percent of the consumption base were eroded. If, in addition, state and local governments were exempt from the tax, the required rate would rise to 27 percent tax-inclusive (36 percent tax-exclusive).

All of the figures reported so far in this subsection refer to the current-law baseline, with results shown in Table 1. Table 2 shows that using a baseline that extends the president's tax cuts does not alter the results significantly.

VI. Deriving the 23 Percent Tax-Inclusive Rate

Even under the assumptions of H.R. 25, the required federal rate in Table 1 — 31 percent tax-inclusive — is well in excess of the 23 percent tax-inclusive rate that H.R. 25 assumes. A relevant question is how the sponsors could have come up with a 23 percent federal sales tax rate in light of the findings above.[27]

To see how that rate can be (incorrectly) obtained, ignore revenue raised by taxes that would not be replaced by the sales tax, R_O (perhaps on the grounds that the sales tax would replace virtually all federal revenue), ignore the primary deficit, D, and ignore federal spending that would not be subject to tax, G_O (because all government spending would be subject to tax). Now consider a candidate government budget constraint equating revenues (the left side) and outlays (the right side) as follows:

$$(16) \qquad t_3(C+G_S) = G_S + T + t_3X,$$

where t_3 is the *tax-exclusive* rate. I emphasize and will show below that this is not a valid budget constraint, but for now simply assume that (16) is the budget constraint that the sponsors of H.R. 25 worked with. If so, (16) can be solved for t_3, as follows:

$$(17) \qquad t_3 = (G_S + T) / (C + G_S - X).$$

Because G_O, R_O, and D equal zero, (17) can be rewritten, using (3) as

$$(18) \qquad t_3 = R_S / (C + G_S - X).$$

Equation (18) appears to be the formula used in documents outlining and supporting a national sales tax.[28] Note that unlike (7), (11), or (15), it includes taxable government spending in the effective tax base and does not allow for adjustments to transfers (T). Using data from Appendix Tables 2 and 5 yields t_3 = 30.6 percent for 2006-15. The implied tax-inclusive rate would be roughly 23 percent.

I emphasize that although I have derived (approximately) a 23 percent tax-inclusive rate, the derivation is not valid and therefore neither is the estimated 23 percent tax-inclusive tax rate.

There are two ways to show this fact. First, equation (13) shows that the right hand side of (18) is the correct formula for the tax-*inclusive* tax rate, whereas (18) claims it is the right formula for the tax-exclusive rate. (Note that the (incorrect) formula in (18) generates a required tax-exclusive rate of 30.6 percent, whereas Table 1, line 1, generates a required tax-inclusive rate of 30.6 percent.)

Second, a careful inspection shows that for the budget constraint in (16), and hence the required tax-exclusive rate in (18) to hold, one must make mutually inconsistent assumptions about how the consumer and producer price levels change.

Equation (16) assumes that the sales tax generates revenues of $t_3(C+G_S)$. That assumption is valid if and only if *producer prices stay constant and consumer prices rise by the full amount of the sales tax* when a sales tax replaces the income tax (see equation (5)). Equation (16) also assumes that government purchases and transfers under the sales tax would be $G_S + T$. That assumption is valid if and only if *producer prices fall by the full amount of the removed taxes and consumer prices remain constant* when a sales tax replaces the income tax (see equation (8)).

Those assumptions are obviously inconsistent with each other. Thus, it appears that the sponsors of H.R. 25 made an error of logical inconsistency: When they estimated government revenues under the sales tax, they

[26]If the sales tax spurred economic growth, the required rates would be lower in the long run, but this would not materially affect the results. For example, even if consumption and state and local purchases grew by 10 percent, which is on the optimistic end of forecasts for the economic growth (*see* Altig et al. 2001), the required federal tax rate would be 35 percent on a tax-inclusive basis and 54 percent on a tax-exclusive basis if there were 20 percent erosion of the consumption base and state and local government purchases were taxed. On the other hand, if federal individual and corporate income taxes were repealed and a national sales tax established, it would be reasonable to expect that state and local individual and corporate income taxes would be repealed, too, with the revenue replaced by higher state sales taxes, and that state sales tax bases would be conformed to the federal base. That would imply that the combined federal, state, and local sales tax-exclusive rates would be higher than those reported in Table 1 by about one-third. Also, note that the required federal sales tax rate would have to rise because the federal government would have to pay state and local sales taxes on its purchases. See Fox and Murray, 2005.

[27]The Joint Committee on Taxation (Paull 2000) estimated that a precursor to H.R. 25 would require a 37 percent tax-inclusive rate (59 percent tax-exclusive rate).

[28]Although the precise formula is never written down in Burton and Mastromarco (1997) or Americans for Fair Taxation (1997), the text that describes the calculation of the required tax rate makes sense only if (16) and (18) were what the authors had in mind.

(implicitly) assumed that consumer prices would rise by the full amount of the sales tax; when they estimated government spending needs, they (implicitly) assumed consumer prices would stay constant. Both of those assumptions cannot be valid at the same time. As a result, the calculation in (16) and (18) either overstates revenues, understates spending needs, or both. As shown in the tables above, this inconsistency is neither minor nor inconsequential.

VII. Conclusion

This report examines the required tax rate in a national retail sales tax and shows that it is not possible to do all of the following three things at the same time: (a) repeal the existing income, corporate, payroll, and estate and gift taxes, (b) impose a 23 percent tax-inclusive (30 percent tax-exclusive) national retail sales tax, and (c) maintain the real levels of government revenues and the real size of government spending programs. Even if there were no avoidance, no evasion, no legislative erosion of the private consumption tax base, and no effort to spare state and local governments, the required revenue-neutral rates would be 31 percent on a tax-inclusive basis and 44 percent on a tax-exclusive basis. Alternatively, if the tax rate were kept at 23 percent (tax-inclusive), the revenue loss would exceed $7 trillion over the next decade relative to current law. With plausible allowances for avoidance, evasion, legislative erosion of the private consumption tax base, and the possibility of not taxing state and local governments, both the required rates and the revenue loss from imposing a 23 percent tax-inclusive sales tax climb significantly higher.

The considerations developed above also arise in the analysis of a value-added tax (VAT), because VATs drive a wedge between producer prices and consumer prices that is not present in the existing U.S. tax system. For example, the results in Table 1 imply that to provide a demogrant that exempts tax on consumption up to the poverty level and to replace one-half of current-law revenues from the individual income tax and the corporate income tax over the next decade would require a tax-exclusive value-added tax rate (or NRST rate) of 11 percent under the H.R. 25 base, 15 percent if 20 percent of the consumption base were excluded and 18 percent if 20 percent of the consumption base were excluded and state and local purchases were exempt.

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Appendix Table 1a. Federal Government Sources of Financing, 2003-2015
(Baseline = Current Law Revenues, Replacement Taxes = Income, Corporate, Payroll and Estate)

	NIPA	CBO													
Type of Receipt	**2003**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2006-2015**
Receipts to be Replaced (R_S)															
Personal Current Taxes[1]	775.8	775	779	879	965	1,059	1,150	1,238	1,331	1,525	1,676	1,783	1,890	2,003	14,620
Corporate Income Taxes[2]	169.3	151	185	199	219	217	235	244	248	254	262	272	282	293	2,526
Contributions for Government Social Insurance[3]	758.2	755	790	840	902	955	1,003	1,054	1,109	1,164	1,221	1,281	1,343	1,408	11,440
Estate Tax[4]	22.0	22	25	24	27	25	26	27	21	19	43	46	52	58	344
Subtotal	**1725.3**	**1,703**	**1,779**	**1,942**	**2,113**	**2,256**	**2,414**	**2,563**	**2,709**	**2,962**	**3,202**	**3,382**	**3,567**	**3,762**	**28,930**
Receipts Not to Be Replaced (R_O)															
Taxes on Production and Imports[5]	89.4	88	89	97	102	106	110	113	117	122	126	129	134	135	1,194
Taxes on Rest of World[6]	8.1	7	8	9	10	11	12	13	14	16	18	19	20	21	154
Current Transfer Receipts[7]	25.5	26	26	28	30	30	31	33	35	36	38	40	42	44	359
Current Surplus of Government Enterprises[8]	5.8	-2	5	6	6	5	5	5	6	6	6	6	6	6	57
Corporate Income Taxes[9]	22.0	20	24	26	28	28	31	32	32	33	34	35	37	38	328
Subtotal	**150.8**	**139**	**152**	**166**	**176**	**180**	**189**	**196**	**204**	**213**	**222**	**229**	**239**	**244**	**2,092**
Income on Assets (R_I)[10]	**23**	**23**	**23**	**25**	**26**	**26**	**27**	**28**	**28**	**29**	**30**	**30**	**32**	**33**	**289**
$R_S + R_O + R_I$	**1899.1**	**1,865**	**1,954**	**2,133**	**2,315**	**2,462**	**2,630**	**2,787**	**2,941**	**3,204**	**3,454**	**3,641**	**3,838**	**4,039**	**31,311**
Borrowing (B)[11]	**407.6**	**413**	**419**	**378**	**324**	**312**	**265**	**233**	**220**	**98**	**-18**	**-49**	**-76**	**-101**	**1,208**
Total ($B + R_S + R_O + R_I$)	**2306.7**	**2,278**	**2,373**	**2,511**	**2,639**	**2,774**	**2,895**	**3,020**	**3,161**	**3,302**	**3,436**	**3,592**	**3,762**	**3,938**	**32,519**
Primary Deficit (D) = ($B - (G_I - R_I)$)	**216.5**	**215**	**225**	**167**	**76**	**23**	**-51**	**-103**	**-134**	**-269**	**-391**	**-424**	**-452**	**-475**	**-2,200**
Borrowing (B)	407.6	413	419	378	324	312	265	233	220	98	-18	-49	-76	-101	1,208
Income on Assets (R_I)	23.0	23	23	25	26	26	27	28	28	29	30	30	32	33	289
Interest Payments (G_I)	214.1	221	217	236	274	315	343	364	382	396	403	405	408	407	3,697

Source: CBO, *The Budget and Economic Outlook: Fiscal Years 2006-2015*. Tables B1, B2. BEA, *National Income and Product Accounts*. April 2005. Table 3.2.

[1]NIPA Table 3.2, line 3. CBO, The Budget and Economic Outlook: Fiscal Years 2006-2015. Appendix B. Table 2.

[2]NIPA Table 3.2, line 9. CBO, The Budget and Economic Outlook: Fiscal Years 2006-2015. Appendix B. Table 2. Author's calculations.

[3]NIPA Table 3.2, line 11. CBO, The Budget and Economic Outlook: Fiscal Years 2006-2015. Appendix B. Table 2.

[4]NIPA Table 3.2, line 38. CBO, The Budget and Economic Outlook: Fiscal Years 2006-2015. Appendix B. Table 1.

[5]NIPA Table 3.2, line 4. CBO, The Budget and Economic Outlook: Fiscal Years 2006-2015. Appendix B. Table 2.

[6]NIPA Table 3.2, line 10. CBO, The Budget and Economic Outlook: Fiscal Years 2006-2015. Appendix B. Table 2.

[7]NIPA Table 3.2, line 15. CBO, The Budget and Economic Outlook: Fiscal Years 2006-2015. Appendix B. Table 2.

[8]NIPA Table 3.2, line 18. CBO, The Budget and Economic Outlook: Fiscal Years 2006-2015. Appendix B. Table 2.

[9]NIPA Table 3.2, line 7. CBO, The Budget and Economic Outlook: Fiscal Years 2006-2015. Appendix B. Table 2. Author's calculations.

[10]NIPA Table 3.2, line 12. CBO, The Budget and Economic Outlook: Fiscal Years 2006-2015. Appendix B. Table 2.

[11]NIPA Table 3.2, line 45. CBO, The Budget and Economic Outlook: Fiscal Years 2006-2015. Appendix B. Tables 1, 2.

Appendix Table 1b. Federal Government Sources of Financing, 2003-2015
(Baseline = Tax Cuts Extended, Replacement Taxes = Income, Corporate, Payroll, and Estate)

	NIPA	CBO													
Type of Receipt	**2003**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2006-2015**
Receipts to Be Replaced (R_S)															
Personal Current Taxes[1]	775.8	775	779	879	964	1057	1141	1217	1314	1394	1468	1569	1670	1776	13,570
Corporate Income Taxes[2]	169.3	151	185	199	219	217	235	244	248	254	262	272	282	293	2,526
Contributions for Government Social Insurance[3]	758.2	755	790	840	902	955	1,003	1,054	1,109	1,164	1,221	1,281	1,343	1,408	11,440
Estate Tax[4]	22.0	22	25	24	25	24	24	25	19	-10	-8	-9	-9	-7	73
Subtotal	**1725.3**	**1,703**	**1,779**	**1,942**	**2,110**	**2,252**	**2,403**	**2,540**	**2,690**	**2,802**	**2,943**	**3,113**	**3,286**	**3,470**	**27,609**
Receipts Not to Be Replaced (R_O)															
Taxes on Production and Imports[5]	89.4	88	89	97	102	106	110	113	117	122	126	129	134	135	1,194
Taxes on Rest of World[6]	8.1	7	8	9	10	11	12	13	14	16	18	19	20	21	154
Current Transfer Receipts[7]	25.5	26	26	28	30	30	31	33	35	36	38	40	42	44	359
Current Surplus of Government Enterprises[8]	5.8	-2	5	6	6	5	5	5	6	6	6	6	6	6	57
Corporate Income Taxes[9]	22.0	20	24	26	28	28	31	32	32	33	34	35	37	38	328
Subtotal	**150.8**	**139**	**152**	**166**	**176**	**180**	**189**	**196**	**204**	**213**	**222**	**229**	**239**	**244**	**2,092**
Income on Assets (R_I)[10]	**23**	**23**	**23**	**25**	**26**	**26**	**27**	**28**	**28**	**29**	**30**	**30**	**32**	**33**	**289**
$R_S + R_O + R_I$	**1899.1**	**1,865**	**1,954**	**2,133**	**2,312**	**2,458**	**2,619**	**2,764**	**2,922**	**3,044**	**3,195**	**3,372**	**3,557**	**3,747**	**29,990**
Borrowing (B)[11]	**407.6**	**413**	**419**	**378**	**327**	**316**	**276**	**256**	**239**	**258**	**241**	**220**	**205**	**191**	**2,529**
Total ($B + R_S + R_O + R_I$)	**2306.7**	**2,278**	**2,373**	**2,511**	**2,639**	**2,774**	**2,895**	**3,020**	**3,161**	**3,302**	**3,436**	**3,592**	**3,762**	**3,938**	**32,519**
Primary Deficit (D) = ($B - (G_I - R_I)$)	**216.5**	**215**	**225**	**167**	**79**	**27**	**-40**	**-80**	**-115**	**-109**	**-132**	**-155**	**-171**	**-183**	**-879**
Borrowing (B)	407.6	413	419	378	327	316	276	256	239	258	241	220	205	191	2,529
Income on Assets (R_I)	23.0	23	23	25	26	26	27	28	28	29	30	30	32	33	289
Interest Payments (G_I)	214.1	221	217	236	274	315	343	364	382	396	403	405	408	407	3,697

Source: CBO, *The Budget and Economic Outlook: Fiscal Years 2006-2015*. Tables B1, B2. BEA, *National Income and Product Accounts*. April 2005. Table 3.2.

[1]NIPA Table 3.2, line 3. CBO, The Budget and Economic Outlook: Fiscal Years 2006-2015. Appendix B. Table 2.

[2]NIPA Table 3.2, line 9. CBO, The Budget and Economic Outlook: Fiscal Years 2006-2015. Appendix B. Table 2. Author's calculations.

[3]NIPA Table 3.2, line 11. CBO, The Budget and Economic Outlook: Fiscal Years 2006-2015. Appendix B. Table 2.

[4]NIPA Table 3.2, line 38. CBO, The Budget and Economic Outlook: Fiscal Years 2006-2015. Appendix B. Table 1.

[5]NIPA Table 3.2, line 4. CBO, The Budget and Economic Outlook: Fiscal Years 2006-2015. Appendix B. Table 2.

[6]NIPA Table 3.2, line 10. CBO, The Budget and Economic Outlook: Fiscal Years 2006-2015. Appendix B. Table 2.

[7]NIPA Table 3.2, line 15. CBO, The Budget and Economic Outlook: Fiscal Years 2006-2015. Appendix B. Table 2.

[8]NIPA Table 3.2, line 18. CBO, The Budget and Economic Outlook: Fiscal Years 2006-2015. Appendix B. Table 2.

[9]NIPA Table 3.2, line 7. CBO, The Budget and Economic Outlook: Fiscal Years 2006-2015. Appendix B. Table 2. Author's calculations.

[10]NIPA Table 3.2, line 12. CBO, The Budget and Economic Outlook: Fiscal Years 2006-2015. Appendix B. Table 2.

[11]NIPA Table 3.2, line 45. CBO, The Budget and Economic Outlook: Fiscal Years 2006-2015. Appendix B. Tables 1, 2.

Appendix Table 2. Federal Government Uses of Financing, 2003-2015

Type of Spending	NIPA	CBO													
	2003	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2006-2015
Government Expenditures (G_S)															
Current Consumption[1]	658.6	650	694	719	709	713	728	743	760	777	795	814	833	853	7725
Investment[2]	93.6	93	102	108	111	114	117	120	124	128	132	135	140	144	1265
Depreciation[3]	-90.2	-85	-87	-88	-89	-90	-91	-92	-93	-95	-96	-96	-98	-99	-939
Subtotal	**662.0**	**658**	**709**	**739**	**731**	**737**	**754**	**771**	**791**	**810**	**831**	**853**	**875**	**898**	**8051**
Transfer Payments (T)															
Social Benefits to Persons[4]	956.1	956	986	1041	1129	1206	1266	1333	1410	1492	1568	1671	1779	1896	14750
Grants to State and Local Government[5]	339.9	330	349	363	372	387	405	425	449	475	502	532	565	600	4712
To Rest of World															
Social[6]	2.8	3	3	3	3	3	3	4	4	4	4	4	5	5	39
Other[7]	23.7	23	25	27	27	25	24	24	24	24	24	24	25	26	247
Subsidies to Business[8]	46.4	46	40	54	50	49	46	45	45	45	45	45	46	46	462
Capital Transfers[9]	61.9	42	45	48	51	53	54	55	56	56	57	58	59	60	559
Subtotal	**1430.8**	**1400**	**1448**	**1536**	**1632**	**1723**	**1798**	**1886**	**1988**	**2096**	**2200**	**2334**	**2479**	**2633**	**20769**
Interest Payments (G_I)[10]	**214.1**	**221**	**217**	**236**	**274**	**315**	**343**	**364**	**382**	**396**	**403**	**405**	**408**	**407**	**3697**
Total ($G_S + T + G_I$)	**2306.9**	**2279**	**2374**	**2511**	**2637**	**2775**	**2895**	**3021**	**3161**	**3302**	**3434**	**3592**	**3762**	**3938**	**32517**

Source: CBO, The Budget and Economic Outlook: Fiscal Years 2006-2015. Tables B1, B2. National Income and Product Accounts. BEA. April 2005. Table 3.2.

[1]NIPA Table 3.2, line 20. CBO, The Budget and Economic Outlook: Fiscal Years 2006-2015. Appendix B. Table 2.

[2]NIPA Table 3.2, line 41. CBO, The Budget and Economic Outlook: Fiscal Years 2006-2015. Appendix B. Tables 1, 2.

[3]NIPA Table 3.2, line 44. CBO, The Budget and Economic Outlook: Fiscal Years 2006-2015. Appendix B. Table 2.

[4]NIPA Table 3.2, line 23. CBO, The Budget and Economic Outlook: Fiscal Years 2006-2015. Appendix B. Table 1.

[5]NIPA Table 3.2, line 26. CBO, The Budget and Economic Outlook: Fiscal Years 2006-2015. Appendix B. Table 2.

[6]NIPA Table 3.2, line 24. CBO, The Budget and Economic Outlook: Fiscal Years 2006-2015. Appendix B. Table 2.

[7]NIPA Table 3.2, line 27. CBO, The Budget and Economic Outlook: Fiscal Years 2006-2015. Appendix B. Table 2.

[8]NIPA Table 3.2, line 31. CBO, The Budget and Economic Outlook: Fiscal Years 2006-2015. Appendix B. Table 2.

[9]NIPA Table 3.2, line 42. CBO, The Budget and Economic Outlook: Fiscal Years 2006-2015. Appendix B. Table 1.

[10]NIPA Table 3.2, line 28. CBO, The Budget and Economic Outlook: Fiscal Years 2006-2015. Appendix B. Table 2.

Appendix Table 3. Proposed Tax Base for National Sales Tax ($ Billions)		
Descripton of Taxable Item	**2003**	**NIPA Source (Table, Line)**
Total Private Consumption Base ($C_{PRIVATE}$)		
Personal Consumption Expenditures	7,760.9	(2.4.5, 1)
Less: Education Expenditure	-201.7	(2.4.5, 94)
Less: Food Produced and Consumed on Farms	-0.5	(2.5.5, 6)
Plus: Purchase of New Homes	345.9	(5.4.5B, 36)
Plus: Other Structures	218.4	(5.4.5B, 39)
Less: Imputed Rent on Housing	-859.6	(2.4.5, 49)
Less: Imputed Rent on Farm Dwellings	-11.9	(2.4.5, 51)
Less: Expenditure Abroad by U.S. Residents (nondurables)	-6.6	(2.5.5, 111)
Less: Foreign Travel by U.S. Residents (services)	-79.2	(2.5.5, 110)
Plus: Expenditure in U.S. by Nonresidents	86.7	(2.5.5, 112)
Plus: Taxable Home Mortgage Interest	82.2	see note 1
Plus: Taxable Nonprofit Interest	3.5	see note 2
Plus: Taxable Personal Interest	117.3	see note 3
Less: State sales taxes	-343.9	(3.3, 7)
Subtotal	**7,111.6**	
Total State and Local Government Tax Base (C_{SL})		
State and Local Government Consumption	1,058.5	(3.3, 22)
Less: Capital Consumption Allowance	-127.9	(3.3, 38)
Less: Current Education Spending	-482.5	(3.17, 28+53-70)
Plus: State and Local Government Gross Investment	264.9	(3.3, 35)
Less: Capital Education Spending	-76.2	(3.3, 122)
Subtotal	**636.8**	
Tax Base: $C = C_{PRIVATE} + C_{SL}$	**7,748.4**	

Note:
[1]Taxable home mortgage interest = A*(B-C), where A = owner-occupied housing interest payments (NIPA 7.11, line 16), B = average mortgage rate, 1995-2004 (Economic Report of the President, 2005, Table B-73), C = average 10-year Treasury bond rate (Economic Report of the President, 2005, Table B-73).
[2]Taxable nonprofit interest = A*(B-C), where A = nonprofit interest payments (NIPA 7.11, line 18), B = average mortgage rate, 1995-2004 (Economic Report of the President, 2005, Table B-73), C = average 10-year Treasury bond rate (Economic Report of the President, 2005, Table B-73).
[3]Taxable personal interest = A*(B-C), where A = personal household interest payments (NIPA 7.11, line 17), B = imputed consumer interest rate, 1995-2004 (Federal Reserve G.19 Release and NIPA Table 2.1, line 29), C = average 3-year Treasury bond rate (Economic Report of the President, 2005, Table B-73).

Appendix Table 4. Calculating Total Tax-Exempt Consumption Expenditure (Current Prices)			
Household Size	**Number of Households (1,000's)**	**Consumption Allowance ($)**	**Total Tax-Exempt Consumption ($1,000's)**
Single Households			
1	29,431	8,980	264,290,380
2	12,768	12,120	154,748,160
3	6,363	15,260	97,099,380
4	3,213	18,400	59,119,200
5	1,310	21,540	28,217,400
6	517	24,680	12,759,560
7 or more	357	27,820	9,931,740
(1) Subtotal			**626,165,820**
Married Households			
2	24,310	17,960	436,607,600
3	11,526	21,100	243,198,600
4	12,754	24,240	309,156,960
5	5,719	27,380	156,586,220
6	2,004	30,520	61,162,080
7 or more	1,007	33,660	33,895,620
(2) Subtotal			**1,240,607,080**
Total Tax-Exempt Consumption Expenditure (X) = (1) + (2)			**1,866,772,900**

Source: U.S. Census Bureau, Current Population Survey, 2003 Annual Social and Economic Supplement, Table H1; September 15, 2004. *Federal Register*, Vol. 68, No. 26, February 7, 2003, pp. 6456-6458.

Appendix Table 5. Elements of Retail Sales Tax Rate Calculation, 2003-2015															
	NIPA	CBO													
	2003	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2006-2015
$C_{PRIVATE}$	7,112	6,999	7,466	7,906	8,329	8,780	9,246	9,713	10,183	10,660	11,145	11,648	12,167	12,701	104,571
C_{SL}	637	627	669	708	746	786	828	870	912	955	998	1,043	1,089	1,137	9,364
C	7,748	7,625	8,135	8,614	9,075	9,567	10,074	10,582	11,095	11,614	12,143	12,691	13,257	13,838	113,935
X	1,867	1,837	1,960	2,075	2,186	2,305	2,427	2,550	2,673	2,798	2,926	3,057	3,194	3,334	27,450
T	1,431	1,400	1,448	1,536	1,632	1,723	1,798	1,886	1,988	2,096	2,200	2,334	2,479	2,633	20,769
GDP	11,004	10,829	11,553	12,233	12,888	13,586	14,307	15,029	15,757	16,494	17,245	18,023	18,826	19,652	161,806
Replacing Personal Income, Corporate Income, Payroll, and Estate Taxes (Baseline = Current Law)															
R_S	1,725	1,703	1,779	1,942	2,113	2,256	2,414	2,563	2,709	2,962	3,202	3,382	3,567	3,762	28,930
R_O	151	139	152	166	176	180	189	196	204	213	222	229	239	244	2,092
D	217	215	225	167	76	23	-51	-103	-134	-269	-391	-424	-452	-475	-2,200
Replacing Personal Income and Corporate Income Taxes Only (Baseline = Current Law)															
R_S	945	926	964	1,078	1,184	1,276	1,385	1,482	1,579	1,779	1,938	2,055	2,172	2,296	17,146
R_O	931	916	967	1,030	1,105	1,160	1,218	1,277	1,334	1,396	1,486	1,556	1,634	1,710	13,876
D	217	215	225	167	76	23	-51	-103	-134	-269	-391	-424	-452	-475	-2,200
Replacing Personal Income, Corporate Income, Payroll, and Estate Taxes (Baseline = Tax Cuts Extended)															
R_S	1,725	1,703	1,779	1,942	2,110	2,252	2,403	2,540	2,690	2,802	2,943	3,113	3,286	3,470	27,609
R_O	151	139	152	166	176	180	189	196	204	213	222	229	239	244	2,092
D	217	215	225	167	79	27	-40	-80	-115	-109	-132	-155	-171	-183	-879
Replacing Personal Income and Corporate Income Taxes Only (Baseline = Tax Cuts Extended)															
R_S	945	926	964	1,078	1,183	1,273	1,376	1,461	1,562	1,648	1,730	1,841	1,952	2,069	16,095
R_O	931	916	967	1,030	1,103	1,159	1,216	1,275	1,332	1,367	1,435	1,501	1,573	1,645	13,606
D	217	215	225	167	79	27	-40	-80	-115	-109	-132	-155	-171	-183	-879
Source: See text, Appendix Tables 1 to 4, and CBO, *The Budget and Economic Outlook: Fiscal Years 2006-2015*. Table 1-2.															

Appendix Table 6. Results, 2003-2015, for Replacing the Personal Income, Corporate Income, Payroll, and Estate Taxes (Baseline = Current Law Revenues)

	NIPA	CBO													
Tax Base	2003	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2006-2015
Tax Exclusive Rate (t_e)															
$C = C_{PRIVATE} + C_{SL}$	0.358	0.359	0.349	0.364	0.383	0.393	0.403	0.411	0.416	0.444	0.468	0.476	0.484	0.492	0.441
$C = 0.9*C_{PRIVATE} + C_{SL}$	0.420	0.421	0.408	0.427	0.452	0.464	0.477	0.487	0.494	0.529	0.558	0.569	0.580	0.591	0.525
$C = 0.8*C_{PRIVATE} + C_{SL}$	0.508	0.510	0.493	0.517	0.550	0.566	0.584	0.597	0.606	0.654	0.693	0.708	0.723	0.738	0.647
$C = C_{PRIVATE}$	0.413	0.414	0.401	0.420	0.444	0.455	0.468	0.477	0.484	0.519	0.547	0.558	0.568	0.579	0.514
$C = 0.9*C_{PRIVATE}$	0.497	0.499	0.482	0.506	0.538	0.553	0.570	0.583	0.592	0.638	0.676	0.691	0.704	0.719	0.632
$C = 0.8*C_{PRIVATE}$	0.625	0.627	0.605	0.638	0.682	0.705	0.730	0.748	0.762	0.828	0.884	0.906	0.927	0.949	0.819
Tax Inclusive Rate (t_i)[1]															
$C = C_{PRIVATE} + C_{SL}$	0.264	0.264	0.258	0.267	0.277	0.282	0.287	0.291	0.294	0.308	0.319	0.322	0.326	0.330	0.306
$C = 0.9*C_{PRIVATE} + C_{SL}$	0.296	0.296	0.290	0.299	0.311	0.317	0.323	0.327	0.331	0.346	0.358	0.363	0.367	0.371	0.344
$C = 0.8*C_{PRIVATE} + C_{SL}$	0.337	0.338	0.330	0.341	0.355	0.361	0.369	0.374	0.377	0.395	0.409	0.415	0.419	0.425	0.393
$C = C_{PRIVATE}$	0.292	0.293	0.286	0.296	0.307	0.313	0.319	0.323	0.326	0.342	0.354	0.358	0.362	0.366	0.340
$C = 0.9*C_{PRIVATE}$	0.332	0.333	0.325	0.336	0.350	0.356	0.363	0.368	0.372	0.389	0.403	0.408	0.413	0.418	0.387
$C = 0.8*C_{PRIVATE}$	0.385	0.385	0.377	0.389	0.405	0.414	0.422	0.428	0.432	0.453	0.469	0.475	0.481	0.487	0.450
Revenue Loss (in $ Billions) Under a 23% Tax-Inclusive (30% Tax-Exclusive) Rate															
$C = C_{PRIVATE} + C_{SL}$	-220	-221	-196	-268	-360	-416	-482	-539	-590	-748	-890	-970	-1,052	-1,139	-7,186
$C = 0.9*C_{PRIVATE} + C_{SL}$	-384	-382	-368	-450	-551	-618	-695	-762	-824	-993	-1,147	-1,238	-1,331	-1,432	-9,591
$C = 0.8*C_{PRIVATE} + C_{SL}$	-547	-543	-539	-632	-743	-820	-908	-985	-1,058	-1,238	-1,403	-1,506	-1,611	-1,724	-11,996
$C = C_{PRIVATE}$	-367	-365	-350	-431	-531	-597	-673	-739	-800	-968	-1,120	-1,210	-1,302	-1,401	-9,340
$C = 0.9*C_{PRIVATE}$	-530	-526	-521	-613	-723	-799	-885	-962	-1,034	-1,213	-1,376	-1,478	-1,582	-1,693	-11,745
$C = 0.8*C_{PRIVATE}$	-694	-687	-693	-795	-914	-1,001	-1,098	-1,185	-1,268	-1,458	-1,633	-1,746	-1,862	-1,985	-14,150

Source: See text and Appendix tables 1 to 5.

[1] $t_i = t_e/(1+t_e)$

Appendix Table 7. Results, 2003-2015, for Replacing the Personal Income, Corporate Income, Payroll, and Estate Taxes (Baseline = Tax Cuts Extended)

	NIPA	CBO													
Tax Base	2003	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2006-2015
Tax Exclusive Rate (t_e)															
$C = C_{PRIVATE} + C_{SL}$	0.358	0.359	0.349	0.364	0.383	0.392	0.401	0.406	0.412	0.411	0.414	0.422	0.430	0.437	0.413
$C = 0.9*C_{PRIVATE} + C_{SL}$	0.420	0.421	0.408	0.427	0.451	0.463	0.474	0.480	0.489	0.487	0.491	0.501	0.511	0.521	0.489
$C = 0.8*C_{PRIVATE} + C_{SL}$	0.508	0.510	0.493	0.517	0.548	0.564	0.579	0.588	0.600	0.597	0.603	0.617	0.630	0.644	0.600
$C = C_{PRIVATE}$	0.413	0.414	0.401	0.420	0.443	0.454	0.465	0.471	0.479	0.477	0.482	0.492	0.501	0.511	0.480
$C = 0.9*C_{PRIVATE}$	0.497	0.499	0.482	0.506	0.536	0.552	0.566	0.575	0.586	0.583	0.589	0.603	0.615	0.628	0.586
$C = 0.8*C_{PRIVATE}$	0.625	0.627	0.605	0.638	0.680	0.703	0.724	0.736	0.752	0.750	0.758	0.778	0.796	0.816	0.753
Tax Inclusive Rate (t_i)[1]															
$C = C_{PRIVATE} + C_{SL}$	0.264	0.264	0.258	0.267	0.277	0.282	0.286	0.289	0.292	0.291	0.293	0.297	0.300	0.304	0.292
$C = 0.9*C_{PRIVATE} + C_{SL}$	0.296	0.296	0.290	0.299	0.311	0.316	0.321	0.324	0.328	0.327	0.329	0.334	0.338	0.342	0.328
$C = 0.8*C_{PRIVATE} + C_{SL}$	0.337	0.338	0.330	0.341	0.354	0.361	0.367	0.370	0.375	0.374	0.376	0.382	0.386	0.392	0.375
$C = C_{PRIVATE}$	0.292	0.293	0.286	0.296	0.307	0.312	0.317	0.320	0.324	0.323	0.325	0.330	0.334	0.338	0.324
$C = 0.9*C_{PRIVATE}$	0.332	0.333	0.325	0.336	0.349	0.356	0.362	0.365	0.369	0.368	0.371	0.376	0.381	0.386	0.370
$C = 0.8*C_{PRIVATE}$	0.385	0.385	0.377	0.389	0.405	0.413	0.420	0.424	0.429	0.428	0.431	0.438	0.443	0.449	0.430
Revenue Loss (in $ Billions) Under a 23% Tax-Inclusive (30% Tax-Exclusive) Rate															
$C = C_{PRIVATE} + C_{SL}$	-220	-221	-196	-268	-357	-412	-471	-516	-571	-588	-631	-701	-771	-847	-5,865
$C = 0.9*C_{PRIVATE} + C_{SL}$	-384	-382	-368	-450	-548	-614	-684	-739	-805	-833	-888	-969	-1,050	-1,140	-8,270
$C = 0.8*C_{PRIVATE} + C_{SL}$	-547	-543	-539	-632	-740	-816	-897	-962	-1,039	-1,078	-1,144	-1,237	-1,330	-1,432	-10,675
$C = C_{PRIVATE}$	-367	-365	-350	-431	-528	-593	-662	-716	-781	-808	-861	-941	-1,021	-1,109	-8,019
$C = 0.9*C_{PRIVATE}$	-530	-526	-521	-613	-720	-795	-874	-939	-1,015	-1,053	-1,117	-1,209	-1,301	-1,401	-10,424
$C = 0.8*C_{PRIVATE}$	-694	-687	-693	-795	-911	-997	-1,087	-1,162	-1,249	-1,298	-1,374	-1,477	-1,581	-1,693	-12,829

Source: See text and Appendix tables 1 to 5.

[1] $t_i = t_e/(1+t_e)$

Appendix Table 8. Results, 2003-2015, for Replacing the Personal Income and Corporate Income Taxes (Baseline = Current Law Revenues)

	NIPA	CBO													
Tax Base	**2003**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2006-2015**
Tax-Exclusive Rate (t_e)															
$C = C_{PRIVATE} + C_{SL}$	0.169	0.168	0.163	0.174	0.184	0.190	0.197	0.202	0.207	0.227	0.239	0.244	0.248	0.252	0.222
$C = 0.9*C_{PRIVATE} + C_{SL}$	0.193	0.192	0.186	0.199	0.211	0.218	0.227	0.233	0.239	0.262	0.277	0.283	0.288	0.293	0.256
$C = 0.8*C_{PRIVATE} + C_{SL}$	0.226	0.225	0.218	0.233	0.248	0.257	0.268	0.276	0.282	0.311	0.329	0.337	0.343	0.350	0.304
$C = C_{PRIVATE}$	0.190	0.189	0.184	0.196	0.208	0.215	0.224	0.230	0.235	0.258	0.272	0.278	0.283	0.288	0.252
$C = 0.9*C_{PRIVATE}$	0.222	0.221	0.214	0.229	0.244	0.252	0.263	0.271	0.277	0.305	0.323	0.330	0.336	0.343	0.298
$C = 0.8*C_{PRIVATE}$	0.267	0.265	0.257	0.276	0.294	0.305	0.319	0.329	0.337	0.374	0.397	0.406	0.414	0.423	0.364
Tax-Inclusive Rate (t_i)[1]															
$C = C_{PRIVATE} + C_{SL}$	0.144	0.144	0.140	0.148	0.155	0.160	0.165	0.168	0.171	0.185	0.193	0.196	0.199	0.201	0.181
$C = 0.9*C_{PRIVATE} + C_{SL}$	0.162	0.161	0.157	0.166	0.174	0.179	0.185	0.189	0.193	0.208	0.217	0.220	0.223	0.227	0.204
$C = 0.8*C_{PRIVATE} + C_{SL}$	0.185	0.184	0.179	0.189	0.199	0.204	0.211	0.216	0.220	0.237	0.248	0.252	0.255	0.259	0.233
$C = C_{PRIVATE}$	0.160	0.159	0.155	0.164	0.172	0.177	0.183	0.187	0.190	0.205	0.214	0.218	0.221	0.224	0.201
$C = 0.9*C_{PRIVATE}$	0.182	0.181	0.176	0.187	0.196	0.201	0.208	0.213	0.217	0.234	0.244	0.248	0.252	0.255	0.229
$C = 0.8*C_{PRIVATE}$	0.211	0.210	0.204	0.216	0.227	0.234	0.242	0.247	0.252	0.272	0.284	0.289	0.293	0.297	0.267

Source: See text and Appendix tables 1 to 5.

[1] $t_i = t_e/(1+t_e)$

Appendix Table 9. Results, 2003-2015, for Replacing the Personal Income and Corporate Income Taxes (Baseline = Tax Cuts Extended)

	NIPA	CBO													
Tax Base	**2003**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2006-2015**
Tax-Exclusive Rate (t_e)															
$C = C_{PRIVATE} + C_{SL}$	0.169	0.168	0.163	0.174	0.184	0.189	0.196	0.199	0.204	0.207	0.208	0.213	0.217	0.222	0.205
$C = 0.9*C_{PRIVATE} + C_{SL}$	0.193	0.192	0.186	0.199	0.211	0.218	0.226	0.229	0.236	0.238	0.240	0.246	0.251	0.257	0.237
$C = 0.8*C_{PRIVATE} + C_{SL}$	0.226	0.225	0.218	0.233	0.248	0.256	0.266	0.271	0.278	0.282	0.284	0.291	0.298	0.305	0.280
$C = C_{PRIVATE}$	0.190	0.189	0.184	0.196	0.208	0.214	0.222	0.226	0.232	0.235	0.236	0.242	0.247	0.252	0.233
$C = 0.9*C_{PRIVATE}$	0.222	0.221	0.214	0.229	0.243	0.252	0.261	0.266	0.273	0.277	0.279	0.286	0.292	0.299	0.275
$C = 0.8*C_{PRIVATE}$	0.267	0.265	0.257	0.276	0.294	0.304	0.317	0.323	0.332	0.337	0.340	0.349	0.357	0.366	0.334
Tax-Inclusive Rate (t_i)[1]															
$C = C_{PRIVATE} + C_{SL}$	0.144	0.144	0.140	0.148	0.155	0.159	0.164	0.166	0.170	0.171	0.172	0.176	0.178	0.181	0.170
$C = 0.9*C_{PRIVATE} + C_{SL}$	0.162	0.161	0.157	0.166	0.174	0.179	0.184	0.187	0.191	0.193	0.194	0.198	0.201	0.204	0.191
$C = 0.8*C_{PRIVATE} + C_{SL}$	0.185	0.184	0.179	0.189	0.199	0.204	0.210	0.213	0.218	0.220	0.221	0.226	0.230	0.233	0.219
$C = C_{PRIVATE}$	0.160	0.159	0.155	0.164	0.172	0.177	0.182	0.184	0.188	0.190	0.191	0.195	0.198	0.202	0.189
$C = 0.9*C_{PRIVATE}$	0.182	0.181	0.176	0.187	0.196	0.201	0.207	0.210	0.215	0.217	0.218	0.222	0.226	0.230	0.215
$C = 0.8*C_{PRIVATE}$	0.211	0.210	0.204	0.216	0.227	0.233	0.240	0.244	0.249	0.252	0.254	0.259	0.263	0.268	0.250

Source: See text and Appendix tables 1 to 5.

[1] $t_i = t_e/(1+t_e)$