

## **Towards a More Consistent Distributional Analysis**

Leonard E. Burman  
Tax Policy Center and Urban Institute

Jane G. Gravelle  
Congressional Research Service

Jeffrey Rohaly  
Tax Policy Center and Urban Institute

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Guildestern: "Consistency is all I ask!"  
Rosencrantz: "Immortality is all I seek..."

Tom Stoppard, *Rosencrantz and Guildenstern are Dead*.

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On November 1, 2005, the President's Advisory Panel on Federal Tax Reform released a report recommending two options to overhaul the federal income tax. The first, called a Simplified Income Tax (SIT), would eliminate a host of deductions and credits, simplify others, and reduce income tax rates—all part of the classic recipe for improving the income tax. The second option, called the Growth and Investment Tax, would replace the current income tax with a so-called x-tax, which is a somewhat progressive kind of consumption tax. That plan, however, also includes a small add-on tax on capital income, as well as several credits and deductions in the SIT.

Part of the assessment of these options (and any tax reform proposal) will rest on how they affect the distribution of tax burdens. But there is not widespread agreement on how to measure these burdens. For example, an x-tax is essentially a value added tax (VAT) with the wage portion collected from workers rather than employers (and subject to progressive rates). Does the fact that workers pay part of the tax affect the distribution of burdens? Economic theory suggests that it should not matter, but standard distributional methodology allocates tax burdens based on statutory incidence—the wage tax would be allocated to the workers who earn the wages, while the consumption tax would be allocated to consumers in proportion to their spending—with very different implications for equity.

Tax reform is likely to combine elements of income and consumption taxes. Special problems arise in developing consistent methods for allocating incremental options that transcend the boundaries between income and consumption taxes. For example, specific consumption taxes such as excise taxes have been typically distributed to consumption, but corporate tax reductions such as investment tax credits and bonus depreciation

(partial expensing) are often allocated to capital in general, following a general rule that assigns the corporate tax to capital income, even though these provisions move the income tax in the direction of a consumption tax.

Penner (2003) presented a cogent critique of some of the inconsistencies of standard distribution methodology. Some of the issues were also addressed in a set of papers on distributional issues (Bradford 1995), in a study by the Joint Tax Committee (1993), in a Treasury Department study (1999), and in Gravelle and Shvedov (2004).

This paper discusses issues in allocating consumption taxes and shows how the choice of allocation method affects conclusions for two prototypes. It then discusses how hybrid income-consumption taxes and corporate taxes ought to be allocated under different scenarios. A concluding section sums up.

## **Allocating a Consumption Tax**

### *Theoretical Considerations*

Modeling consumption taxes presents some challenges to consistent distributional analysis. The most important arises from the pattern of consumption versus income across the income distribution. If the consumption-to-income ratio were constant across the income distribution, these problems would not arise, but low-income people spend a much larger share of their income than those with higher incomes. Thus, a flat rate consumption tax is regressive as a share of income.

Inconsistencies can also arise when economically equivalent taxes are distributed in different ways. For example, a retail sales tax or a value added tax might be allocated to consumption, but elements of an income tax that are partly consumption in nature, such

as investment credits and accelerated depreciation, are usually allocated by capital income. In some cases the flat tax, a consumption tax that is collected in part from workers, has been distributed according to income rather than spending.

The first step in thinking about these inconsistencies is to determine the appropriate way to allocate a pure consumption tax.

There are several reasons for the falling pattern of consumption relative to income, and they suggest different approaches to distributing a consumption tax. First, people tend to smooth consumption over the life cycle. They spend more than their incomes when they are young and old, and less during their peak-earning years. This life cycle pattern would, indeed, produce a pattern in which “low-income” young and old people consume more than their incomes and “high-income” middle-aged people consume less. If this were the only source of variation—i.e., people were identical but for their age and stage in the life cycle—consumption would be a better measure of well-being than income and, indeed, distributing tax burdens by income would provide a misleading picture. For example, a flat consumption tax appears to be regressive, whereas (in this case) it treats everyone identically on a lifetime basis.

Even in this very simplified case, the equivalence applies only in the steady state (after everyone alive at the time of introduction of the tax has died). People of different ages would be treated differently during the transition period (which would last 50 to 60 years). For example, a consumption tax imposes a lump sum tax on capital and therefore a significantly larger burden on those who consume out of accumulated capital.

An illustration of the relationship between tax allocation rules and lifetime tax burdens can be shown in a simple model with a shift from a 25% flat income tax to a

consumption tax (requiring a 27% rate); this model has adequate bequests to permit a realistic calibration to the economy. Assuming a representative agent, the lowest income and oldest individual would have a 41% lifetime burden (present value of taxes divided by present value of income), a 41% current burden under a consumption tax allocation, but an 18% burden if the wage tax is allocated to wages and the cash flow tax to assets. For all of the retired individuals in this model, the consumption tax allocation more reflects lifetime burdens because the cash flow tax greatly understates the lump sum burden. The highest income individual (who is about to retire) has a lifetime tax of 30% in this example, an 18% rate under consumption allocation and a 23% rate under the income allocation, so that the wage/asset allocation is better in this case. This illustration is only suggestive, but it does indicate that, at least with respect to individuals who are in the lower income brackets because of life cycle elements, the wage/asset allocation rule would show the tax to be much less burdensome than it actually is.

The life cycle aspects may create more significant problems for allocating a consumption tax according to income than in the case of allocating income taxes, but in neither case is a full picture of distributional consequences captured by a single snapshot of the tax and income distribution. With progressive taxes rates, individuals in the middle of their life cycle would pay a higher effective tax rate, but lower-income individuals either have had or will have a period of higher incomes.

Other uncertainties and inconsistencies also occur because of life cycle elements under an income tax. For example, contributions to pensions and traditional IRAs are often excluded from taxable income while benefits are included. For private savings, however, there is no exclusion for contributions, but earnings are taxed, so that a person

drawing down savings will be taxed differently than one drawing down a pension. There are other complications in the income tax law that are difficult to treat consistently, including back-loaded (Roth) IRAs and annuities and life insurance where taxes on earnings are deferred. Similar complications arise with certain types of investment incentives such as partial expensing, accelerated depreciation, and investment tax credits.

Even if taxpayers had identical lifetime incomes, income might be a better measure of economic status and ability to pay for the young if they face liquidity constraints. If the interest rate on unsecured debt is greater than the rate paid lenders, then a tax based on consumption may place a greater burden on the young (who have lower incomes) than a tax based on income, even though the lifetime present value of the two taxes is the same when discounted at the lending rate.

A second reason lower-income individuals may have a higher ratio of consumption to income is because they are lifetime poor and cannot accumulate much (if anything) in assets. To the extent that disparities in *permanent* income cause the consumption-to-income pattern, the regressivity of a flat consumption tax is real: because higher income individuals save some of their income and pass it on to heirs, they do not consume their lifetime income and benefit from a consumption tax base as compared to an income tax base. For very high-income individuals, this effect may be quite important, as much of lifetime earnings may be diverted to the estate; as a result, consumption may be a consistently small fraction of income for very high-income taxpayers.

A third reason is that income may vary considerably from year to year because of random events. The marginal propensity to consume out of transitory income is smaller than the marginal propensity to consume out of permanent income. An individual who

loses a job or has a bad year in his or her business may nevertheless try to maintain the previous level of consumption. Similarly, the additional earnings from a good year may be set aside as a reserve for the future.

A final reason is that personal transfers are not included in income, but may show up in the consumption of individuals. Some lower-income individuals receive transfers from relatives. While the transfers are not counted as income, they do lead to consumption. If these individuals are in independent households they have consumption and effectively pay consumption taxes, which under a consumption allocation would be treated as their tax burden, while under an income tax system, transfers of this type are taxed to the donor. (However, any earnings of transferred assets would be taxed to the recipient.) Public transfers, such as Social Security and welfare, are included in income, but present their own problems with a consumption tax.

### *Potential Allocation Mechanisms*

There are two allocation issues: how to classify taxpayers and how to allocate the tax. The classifier is a measure of economic status or ability to pay tax. Typically, the classifier is a measure based on annual income. The problem with such measures is that annual income is a poor measure of economic status if life cycle factors are the prime source of variation in annual income. In that case, consumption would be a better measure of lifetime income than annual income is. In the case of transitory shocks, consumption is also a better measure if there are no liquidity constraints, but the right choice is less clear if borrowing is costly or impossible. To the extent that differences in

income reflect permanent differences in economics status, however, income is a better choice of qualifier.

The most obvious way to distribute a consumption tax would be to allocate it based on consumption, which is, after all, the behavior that triggers a tax (just as owning or renting property triggers a property tax or smoking cigarettes triggers a cigarette tax). The objection to this method arises from the problems described above. Indeed, if the only reason that the consumption to income ratio fell with income was due to transitory or life cycle effects (and there are no liquidity constraints), the best measure of effective tax rate would be obtained by classifying by consumption and allocating the tax by consumption. If the classifier is income, however, it is less clear what the best allocation method should be.

If the decline were only due to a difference between the lifetime poor and the lifetime rich, it would make sense to classify by income (a better measure of ability to pay) and allocate by consumption, which would capture the regressive pattern of a consumption tax base.

A further complication is that burdens are different during the transition period than over the long run. In the short run, a consumption tax is economically equivalent to a tax on wages and a lump sum tax on old capital. In the long run, the consumption tax, in the absence of bequests, is equivalent in present value to a tax on wages, and people should be indifferent (assuming no liquidity constraints and no super-normal returns) between a straight wage tax and a consumption tax (since the tax when assets are consumed is offset in present value terms by the exemption of savings when assets are created).



This equivalence adds to the ways in which a consumption tax might be distributed. For distributions where the tax distributed sums to total tax, two options have been used: to distribute the tax according to consumption, or to distribute the wage tax according to wages and the cash flow tax according to assets. Two other options, to treat the tax as a wage tax or to treat the tax as a wage tax plus tax on existing assets, are not likely to be practical, not only because they do not add up to revenue collections (one being too small and the other being much too large), but because they are also likely to misrepresent the distributional effects. Low income individuals under the first of these options who are in the lower income categories because they are older would have no tax in the first case, and an enormous tax relative to income in the second.

#### *Sources of Variation in Incomes*

While it is difficult to measure the relative importance of these effects, Fullerton and Rogers (1993) present data on the relationship between annual household income and lifetime income that provides some insight. They report a correlation between lifetime income and annual income of 0.67, with a coefficient of variation of annual income of 1.3 and a coefficient of variation of lifetime income of 0.46. They also report a coefficient of variation of the wage of 0.55 at age 20, 0.81 at age 49, and 0.74 at age 79. These measures suggest significant variation in permanent income. Their data also suggest that high-income individuals observed in the annual data are lifetime rich: 59 percent of individuals in the top decile of the annual distribution are in the top decile of the lifetime distribution and 86 percent are in the top quintile. All are in the top half.

While it is not possible to decompose the annual variation not explained by permanent differences into transitory versus lifecycle variations, there is some indication that these transitory effects, while present, may not be very important. In the lowest decile, where one might be concerned about finding high-income households that are temporarily poor through business failure, only 3 percent were actually in the top lifetime decile, and none were in the 70 percent to 90 percent group. The majority of those observed in the bottom decile were lifetime poor: 40 percent were in the bottom lifetime income decile, and 53 percent were in the bottom annual income quintile. Fully 91 percent were in the bottom half of the income distribution.

#### *The Issue of Price Changes, Debt Finance, and Housing*

An important complication of allocating a consumption tax involves the division of the tax on assets to debt versus equity. If the price level does not change, then the burden of the lump sum tax, which reduces the value of capital and is realized over time on the basis of consumption, falls only on equity claims to capital, since financial instruments retain their purchasing power. If the price level rises by the full amount of the tax, the nominal value of capital does not change, but the price of consumption goods rises, which means that the lump sum tax is shared equally by all capital assets.

The need for a price change is likely to be affected by the choice of consumption tax. For a VAT or retail sales tax there is much more of a need to raise prices to avoid short-run recessions if wages are sticky. For a Hall-Rabushka tax a price change is not likely to be necessary.

Owner-occupied housing is a major asset in the economy and typically is excluded from the consumption tax base, but this exclusion can be dealt with by excluding the imputed rental value of owner occupied housing from the consumption base.

Making an adjustment for debt and equity shares of financial and directly held business assets could be done by an allocation rule that adjusts the burden on consumption in excess of wages. For example, if the overall debt share is a third, an individual with all equity holdings would have a 50 percent increase in the fall in asset value, while the person with all debt would have no asset effect. This effect would only matter in an aggregate distribution if debt and equity are held in different shares across the income distribution. To the extent that lower and middle income individuals tended, when they held assets, to hold debt instruments, the tax would be less regressive.

#### Transfers, Public and Private

The treatment of private transfers depends on the plan used to allocate the tax. If consumption is used, transfers are taxed to the recipient when they are transformed into consumption. If the allocation of tax with the wage tax assigned to wages and the cash flow tax assigned to assets is used, transfers are taxed in the hands of the donors unless they are transferred and saved (become assets). A transfer that is immediately consumed would be taxed to the donor.

The treatment of public transfers such as Social Security also depends on the allocation method. If the consumption method is used, those transfers will be taxed as they are transformed into consumption. However, most (although not all) transfer payments will increase in relative value to keep their consumption value whole. If prices

do not rise, they retain their purchasing power and will not bear any of the burden (which falls on wages and old capital). If prices rise, some transfers will increase automatically via price indexing (as in Social Security) and a fixed claim to benefits (as in Medicare). Some will not. An adjustment should be made in these transfers, although in kind benefits such as health care may generally be excluded from the distributional analysis.

### **Empirical Results: Measuring the Distribution of Consumption Taxes Using the TPC Model**

The preceding analysis suggests that the two prime candidates for distributing the burden of consumption tax/flat tax proposals are on the sources (wage tax allocated to labor plus business cash flow tax allocated to owners of capital) or uses (consumption tax allocated to consumers) sides. This section empirically examines the difference these two allocation methods make in the picture of how a consumption tax is distributed.

The first issue is the choice of indicator to use for economic status. Because of data limitations, we are restricted to annual measures of either income or consumption. We choose to proxy ability to pay by income. We believe that this is the best measure among a set of imperfect proxies because many of the differences in income reflect differences in lifetime income. Also, because of liquidity constraints, even those with transitory low-income have less ability to pay tax than those with higher incomes.

Another question is how to measure income. The Tax Policy Center has developed two measures of income that attempt to capture well-being—cash income and economic income. These measures are similar to those developed by the Treasury Department (Cronin 1999). Cash income includes wages and salaries, employee contributions to tax-

deferred retirement savings plans, business and investment income (including realized gains) and cash transfers. Cash income also includes imputed corporate income tax liability and the employer's share of payroll taxes in order to put it on a pretax basis. (Rohaly, et al, 2005)

Economic income is a more comprehensive measure of economic status. Economic income includes wages and salaries, other returns to labor, imputed returns to capital, and other income and is adjusted for family size.

Individual income tax returns do not include direct information about consumption so we impute it, using the consumer expenditure survey (CEX) and the medical expenditure panel survey (MEPS) to produce statistical imputations of the presence of each category of consumption and the level of consumption given rise to an expenditure. (Burman, Gravelle, and Rohaly, forthcoming)

#### *Distributing tax reform proposals*

For illustration, we look at two relatively simple policy options. The first is a comprehensive value-added tax and the second is a similarly comprehensive x-tax. We compare the distribution if the tax is allocated to consumption alone (with rebates based on earnings allocated to households in the case of the x-tax) with the same tax allocated to wages and capital. We also compare the implications of allocating the capital tax to all capital (as might occur if prices increase as a result of the tax) or only to equity (assuming prices are fixed). In both cases, we assume that government transfers are excluded from the tax base, either explicitly, or implicitly because the revenues raised are spent on indexing adjustments to transfers payments.

To allocate the tax to capital in the case of a simple VAT, we measure the revenue gained from the VAT and subtract the revenue gained from a wage tax at the same rate. The difference is the business cash flow tax. We treat a progressive x-tax as a flat VAT assessed at the highest tax rate with a rebate to individuals based on wages. For example, an x-tax with two rates, 15 percent and 30 percent, and a \$2,000 demogrant for individuals, would be treated as a 30-percent VAT with a rebate of \$2,000 plus 15 percent of any earnings taxed at the 15-percent rate. To allocate this tax to consumption, we simply allocate the flat 30-percent VAT to consumption and the rebate to wages.<sup>1</sup> To allocate the tax to wages and capital, the wage tax is assessed according to the progressive rate schedule (including demogrant) and the shortfall in revenue between this tax and the VAT is allocated to capital.<sup>2</sup>

The basic VAT is a 20-percent tax on all consumption (net of government transfer payments) with no exemptions. The tax rate is measured on a “tax-inclusive” basis—as a percentage of the price including tax—so as to be directly comparable to the equivalent wage tax. On the more usual tax-exclusive basis, it would be a 25-percent VAT.<sup>3</sup>

Table 1 shows that the choice of allocation method has a very significant effect on the distribution of the VAT. If distributed according to consumption, the tax is extremely regressive. Low-income people consume all or more of their measured income (noting that transfers from friends and family members are not included in income, as discussed earlier), whereas high-income people consume only a fraction. As a result, the bottom quintile would face an effective tax rate of 77.9 percent if the qualifier is cash income, the middle quintile would face a 25.7 percent rate, whereas the top 20 percent of households would pay an average of 11.0 percent of income in tax. The skew continues at the very

top of the income distribution—the top 0.1 percent would face an effective tax rate of 2.3 percent under the VAT distributed to consumption.<sup>4</sup>

If instead, the tax is modeled as a pure flat tax—a 20 percent tax on wages (with no exemptions) and a 20 percent tax on company cash flow—with the incidence for the wage tax assigned to compensation and the cash flow tax assigned to owners of equity, the story changes markedly. The tax appears to be slightly progressive, except at the top. The lowest-income quintile faces an average tax rate of 12.4 percent of income, the middle quintile, 17.9 percent, and the top quintile, 18.0 percent. The effective tax rate drops from the fourth to the fifth quintile, and drops precipitously within the top quintile. These patterns are even more pronounced if economic income is used as the qualifier. Based on economic income, the top 0.1 percent face a much lower effective tax rate than any other income group.

In fact, the choice of allocating the capital tax is not qualitatively very important, because the capital tax is a small portion of the total. Indeed, the picture is qualitatively similar if the tax is distributed to wages alone (last two columns of Table 1).

The pattern is similar under the x-tax. (See Table 2.) Allocated to consumption, a two-rate x-tax with a demogrant is only slightly less regressive than the flat-rate VAT. Average effective tax rates still decline throughout the income distribution. Perhaps surprisingly, the VAT with rebates imposes a higher effective tax rate on the bottom quintile than the flat VAT. This occurs because the base consumption tax rate is higher with the progressive VAT (30 percent versus 20 percent), and very-low income households consume much more than their incomes and have little or no wages and thus receive relative little benefit from the wage-based rebate.

Modeled as a wage tax plus a capital tax, the x-tax appears to be progressive through most of the income distribution. The bottom quintile pays a negative average tax rate, while the top 10 percent faces an average tax rate that is more than twice the rate facing the middle quintile. Only at the very top of the income distribution does the x-tax appear to become somewhat regressive.

Finally, Table 3 shows the distribution of the flat 20-percent VAT by age. The table illustrates the problems with both measures of tax burden. Distributing the VAT by wages and capital income (or wages alone) makes the tax appear to be quite light on older people, even though a consumption tax assesses them much higher burdens than an equal-yield flat-rate income tax. Distributing the tax based on consumption more accurately shows the burden on the old. On the other hand, however, to the extent that young people's low incomes are transitory, the moderate burden shown under the income allocation appears more consistent than the burden shown based on a consumption allocation.

These results are difficult to reconcile. The VAT and the flat tax/x-tax are economically equivalent taxes (at least in the long run), but modeling them based on who nominally pays the tax produces starkly different policy implications.

### **Hybrid Consumption-Income Systems**

To move from a pure income base to a pure consumption base in a simple world of equity capital only requires that new investments, including the acquisition of inventory and land, be expensed rather than depreciated, while existing depreciation and inventory cost is no longer deductible. There are many partial moves in that direction that have



been made within an income tax system, which do not typically include the loss of existing depreciation. They include accelerated depreciation, full or partial expensing and investment credits. Indeed, accelerated depreciation is a feature of the current income tax system, even though the present value of depreciation deductions is relatively close to economic depreciation; accelerated depreciation increases the value of depreciation but failure to index deductions for inflation reduces the present value.

Table 4 illustrates the effects of various tax provisions under a fixed capital stock assumption, on the ratio of market value to replacement cost of the capital stock. In the base case, with economic depreciation that ratio is equal to one. The second row shows the steady state effect of a system with declining balance tax depreciation that is accelerated but not indexed. This approach, even when the present value of tax and economic depreciation are equated, can produce a small effect on market value.

A shift to a consumption tax base produces a value of one minus the tax rate. Such a fall should occur immediately with a fixed capital stock. This is the value that would occur in the long run even if deductions for depreciation and inventories were allowed.

Retaining these deductions would significantly reduce the lump sum tax on old capital. Averaged across all assets (inventories, equipment, structures, and land) it would reduce the lump sum tax by about one half, assuming economic depreciation.

Currently the effects of these provisions are allocated based on assets. The following discussion explains how to allocate consistent with the consumption allocation method.

We suggest two roughly equivalent ways: allocating it as a consumption tax and making an adjustment for the benefits of the transitional relief, or allocating it as an income tax and making an adjustment for the partial asset values.

Consider the first approach. Expensing should be treated as a consumption tax, but the transitional benefit, which, in the example above is about half the value of expensing, be distributed based on capital income minus saving. The basic logic for that can be seen in a one-year budget constraint, beginning with an income tax:

$$(1) \quad C_t = w(1-\tau)L_t + r(1-\tau)K_t - (1+g)K_{t+1}$$

which basically states that consumption is the sum of after tax income ( $wL$  is wages times labor income and  $rK$  is the return to capital times capital) minus savings, where savings is  $(1+g)K_{t+1}-K_t$ .

If we were to substitute (using the same tax rate,  $\tau$ ) a consumption base, savings would be deducted:

$$(2) \quad C_t = w(1-\tau)L_t + r(1-\tau)K_t + (1-\tau)[K_t - (1+g)K_{t+1}]$$

What transitional relief means is that the  $\tau$ 's associated with the  $K$ 's (but not with the wage) are effectively smaller, and the actual budget constraint, using the formula from table 3 (that the effect on asset prices is to raise them by the tax rate times  $\delta/(r+\delta)$ ):

$$(3) \quad C_t = w(1-\tau)L_t + r(1-\tau)K_t + (1-r)[K_t - (1+g)K_{t+1}] + \tau \frac{\delta}{r+\delta} [rK_t + (K_t - (1+g)K_{t+1})]$$

but the last term is simply capital income minus savings. Thus, to allocate an expensing provision with retention of current deductions would suggest that the consumption tax itself be distributed based on consumption and the present value of the depreciation deductions (and deductions for inventory) be distributed as a benefit to capital income minus saving (which can be either positive or negative).

An equivalent way of distributing the tax is to impose it as a wage tax along with a smaller tax to reflect the transitional relief, equal to  $\tau - \tau \delta/(r+\delta)$ , imposed as a tax on capital income minus savings (or consumption plus taxes minus wages).

The same rule could be imposed for more limited provisions. As an example, consider a permanent 50 percent bonus depreciation rule for equipment, which is about 21 percent of the capital stock. Therefore, the tax system is a combined consumption tax at  $0.5 \times 0.21$  percent, or 10.6 percent of the statutory rate, and an income tax rate at 89.4 percent of the statutory rate. (This is not precisely true as the new effective tax rate is  $0.5u/(1-0.5u)$ , which is actually slightly over half, but it is a fair approximation.) The corporate or business tax would be imposed on capital income as if the expensing provision did not exist. Suppose the statutory tax rate is 30 percent. A tax subsidy of 0.106 times 0.30 or 3.18 percent should then be applied to saving, to reflect the consumption tax element of the bonus depreciation and the transitional relief allowed by retaining old depreciation on half of equipment investment would be captured as a tax. With a value of  $\delta/(r+\delta)$  equal to about 0.7, and a 3.18 percent tax rate, this tax would be 2.26 percent of capital income minus savings.

The other method of allocating consumption taxes (the wage tax to wages and cash flow taxes to assets) is the usual approach for these partial provisions. One of the disadvantages of using this approach with transitional relief is that it can be very distorted by cash flow. The tax cut will be very large initially as full depreciation continues alongside the expensing provisions. The deductions for depreciation will, however, decline over time. Thus cash flow taxes are much smaller in the short run than they will be in the long run. The consumption approaches adjust the lump sum tax on old capital for the present value of the transitional relief, which provides a more complete picture.

The investment credit differs because it does not replace part of the income tax with a consumption tax although it does reduce the effective tax rate. In addition, with no basis adjustment, it has a steady state effect on cash flow because there is no transitional depreciation effect (there is a slight one with basis recovery because depreciation deductions that are disallowed begin at a small level and grow). But in other respects it acts very much like a consumption tax, by reducing the cost of new investment (in the case with no basis adjustment) and reducing the value of old capital.

Consider, for example, a 10 percent investment tax credit on equipment without basis adjustment. Based on the formulas in the appendix, this tax credit would lead to an approximate zero effective tax rate on new investment in equipment with economic depreciation. Thus the tax rate is similar to that with a consumption tax, and we should set the tax rate on capital income 21 percent lower (to reflect the share of assets in equipment) and reduce the 30 percent rate to 23.7 percent. At the same time the value of old capital and the cost of new will fall by 10 percent (and thus average asset prices by

approximately 2.1 percent, so there should also be a *tax* of 2.1 percent on the difference between capital income and saving).

### **Allocation of the Corporate Tax**

Based on the Harberger (1962) and similar models that show that the corporate tax, under reasonable assumptions about factor and product substitution elasticities, is spread to all capital income, it is common to allocate the corporate tax based on the distribution of capital ownership rather than to the owners of equity capital. This practice has led to some distributional inconsistencies. A reduction in the corporate tax at the corporate level benefits all owners of capital, while a reduction in the corporate tax at the individual level is generally assigned to the owners of corporate equity. Thus two equivalent policies, a partial dividend deduction for corporations and a partial dividend exclusion for individuals, would be measured differently. To the extent that the ownership of corporate equity is more concentrated among higher income individuals than other assets, this assignment would lead to different distributions.

To explore this issue further, first assume that the only tax, at rate  $u$ , is a corporate tax in one sector. In equilibrium, investors in both the corporate and the noncorporate sectors earn a common after-tax return at rate  $r$ . The corporate sector is subject to a tax at rate  $u$ , and the pre-tax return is therefore  $r/(1-u)$ . The difference between the pretax and after tax return is the tax that is spread to all owners of capital. That difference is:

$$(4) \quad \frac{r}{1-u} - r = \frac{ur}{1-u}$$

and since corporate tax revenue is the tax rate times the pretax income, or  $ur/(1-u)$ , corporate taxes should be allocated to all owners of capital.

This treatment also holds when personal taxes on corporate and noncorporate income are added, as long as they are equal in each sector. If tax rate  $\tau$  is imposed on earnings from unincorporated businesses and on dividends and capital gains on corporate stock, then the pretax return on corporate earnings is  $r/[(1-u)(1-\tau)]$  and the pretax return on noncorporate earnings is  $r/(1-\tau)$ , then the spread between pretax returns is:

$$(5) \quad \frac{r}{(1-u)(1-\tau)} - \frac{r}{1-\tau} = \frac{ur}{(1-u)(1-\tau)}$$

and as before the right hand side of the equation is corporate tax revenue.

In our current tax system capital gains and dividends are not subject to full taxation. Even prior to the dividend relief enacted in 2003, the personal tax on corporate profits was lower than the tax on unincorporated businesses because capital gains were subject to lower tax rates and are gains are deferred and, if held until death, ultimately not subject to tax. If we define the personal tax at the corporate level as a fraction,  $a$ , of the tax on noncorporate business:

$$(6) \quad \frac{r}{(1-u)(1-a\tau)} - \frac{r}{1-\tau} = \frac{r[u + a\tau(1-u) - \tau]}{(1-u)(1-\tau)(1-a\tau)}$$

The right hand side is no longer equal to corporate revenues which are  $ur/[(1-u)(1-a\tau)]$ .

We can divide the wedge on the right hand side of (6) by corporate revenues to obtain the share of corporate tax revenue to be allocated, which, after factoring and rearranging terms is:

$$(7) \quad \frac{r \frac{u + at(1-u) - t}{(1-u)(1-t)(1-at)}}{\frac{ur}{(1-u)(1-at)}} = 1 - \frac{(1-u)(1-a)t}{u(1-t)}$$

This formula can be used to measure the share of the corporate tax that should be allocated to capital in general and the share that should be allocated to owners of corporate equity capital. To illustrate, assume that corporate profits after tax are approximately 7 percent of which 4 percent is paid as a dividend and 3 percent as a capital gain (numbers are consistent with estimates of rates of return and a steady state growth rate of 3 percent) and about half of capital gains is not taxed because of deferral and exclusion at death. Prior to 2003, when dividends were taxed at full rates and capital gains at 20 percent, assuming a 28 percent personal rate, only about 80 percent of the corporate tax should be allocated generally. For current law, where both dividends and capital gains are taxed at 15 percent and the personal rate is 25 percent, about 2/3 should be allocated.

There are several challenges in implementing this concept. The basic challenge is in determining what a representative tax rate is and it is further complicated because the average marginal tax rate on businesses tends to be a little lower than that on holders of corporate stock. Owners of capital tend to be in relatively higher income brackets, so that

under prior law about 65 percent to perhaps 80 percent of the tax should be allocated to capital in general, while under current law about 40 percent to 65 percent should be.

A second problem is that there are other investments. Some of these assets, such as debt finance, can be treated as similar to the non-corporate sector. However, investment in owner occupied housing is subject to taxes that are close to zero. Averaging in assets that are not subject to tax lowers the tax rate of the alternative investment, or the  $t$  in the formula, by approximately one half, depending on which years are used to weight assets (this number is based on about 1/3 of each asset being debt financed). The calculations use an average of the asset distributions in Gravelle (1994, p. 300) and Congressional Budget Office (2005, p. 19) and suggest that the 80 percent share under prior law for the 28 percent bracket should be increased to 113 percent, while the 2/3 share should be increased to about 98 percent.

Another problem is that a significant portion of capital gains and dividends, about half, are not subject to tax because they are in pensions, IRAs and other tax-exempt forms. There is an issue about the extent to which all of these investments are marginal although even those investments not under the direct control of individuals (such as those in defined benefit pension plans) can be allocated at least across financial assets by pension funds. However, they also alter the effects because these forms of subsidy are only available for passive forms of investment (debt and corporate equity). If one-half of these assets is simply averaged in, they create zero tax rates on half of the debt invested the corporate and noncorporate sectors and in corporate equity and negative tax rates (at  $-t$ ) on half of the debt in home mortgages. Overall, averaging in these assets and including owner occupied housing reduces the tax rate on alternative investments, making the it



about one quarter of the statutory rate. The personal level tax rate is reduced by 50 percent. Incorporating these effects along with owner occupied housing suggests about the same share, 106 percent.

These findings indicate that the standard of allocating the corporate tax to assets in general is, at least for the current tax regimes, and the tax rate assumptions, probably a pretty reasonable assumption that did not significantly affect the distributional picture, although the share allocated should have been reduced for the 2001-2003 tax cuts. Further changes could also affect the outcome. For example, if all taxes were eliminated at the personal level on corporate equity, then only about 85 percent of the tax should be allocated to capital in general.

Arguments are made that the corporate tax falls partly on labor due to either capital flowing abroad or saving. Gravelle and Smetters (2001) find that the international issue may be significantly overstated and that it is actually not likely that labor bears the burden when factors such as portfolio substitution, product substitution, debt finance, imperfect competition, and imperfect territorial taxation are taken into account. The effect of saving would extend far beyond corporate taxes, to affect all taxes on capital income. Despite many claims made for this incidence on labor, neither empirical evidence nor economic theory presents a clear case that a corporate tax would lead to less saving (see Gravelle 2004 for a discussion).

## **Conclusions**

Consistent distribution of consumption taxes is not straightforward in light of data limitations. The different components of income variation in the population—life cycle,

transitory, and permanent—present different implications for measuring economic status and tax burdens. If life cycle and transitory factors dominate, consumption is probably a better measure of economic status than annual income, although even that conclusion depends on other factors such as liquidity constraints. If income is used as a qualifier, however, it is unclear whether burden should be distributed based on consumption or income. If income differences are primarily permanent, then annual income is a better measure of economic status and consumption is a better measure of burden.

Given that all three factors affect the distribution of income, it is unclear which is the best measure of burden. In that light, it would be reassuring if it did not matter much which measure is used. In fact, simulations based on the Tax Policy Center microsimulation model show that there are significant differences depending on how burden is distributed.

Hybrid consumption-income tax rules are currently distributed consistent with the wage/asset allocation approach, but it would be possible to make such distributions consistent with consumption allocations. Adjustments can be made for transitional relief as well.

Consistent distribution of the corporate tax is relatively straightforward. The corporate level and individual level tax on corporations must be considered as a whole, so that either part of the corporate tax should be distributed to all capital and part to owners of corporate equity, or the full corporate tax should be distributed to all capital along with part of the individual level tax. Currently, allocating all of the corporate tax to capital in general seems about right, but if all individual taxes are eliminated, part of the corporate tax should be allocated to equity.

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## Appendix. Effects of Tax Regimes on Asset Value

The marginal product of capital (the sum of the pre tax real return and the geometric economic depreciation rate  $\delta$ ), denoted as  $c$ , can be expressed as:

$$(A1) \quad c = (r + \delta) \frac{1 - uz - k(1 - auz)}{1 - u}$$

where  $r$  is the after tax discount rate,  $u$  is the statutory tax rate,  $z$  is the present value of depreciation,  $k$  is the investment tax credit, and  $a=1$  with a basis adjustment for the investment credit and zero otherwise.

A single period cash flow for the firm is:

$$(A2) \quad \text{cash flow} = c(1 - u)K - I + uD + kI - uklaD_k$$

where  $K$  is the capital stock,  $I$  is investment,  $D$  is tax depreciation deductions and  $D_k$  is the reduction in depreciation deductions due to a basis adjustment for an investment credit.

The value of the firm is the present discounted value of this cash flow and recognizing that investment is the sum of the depreciation rate and the growth rate of capital, or  $I = (\delta + g)K$ , and recognizing that in a steady state the value of future cash flows is discounted at rate  $r$  but grows at rate  $g$ , the value of the firm,  $V$ , can be written as:

$$(A3) \quad V = \int_0^{\infty} e^{-(r-g)t} dt [c(1 - u)K - (\delta + g)K + k(\delta + g)K] + uPVD - uakPVD_k$$

where the last two terms represent the present value of depreciation and the present value of the depreciation offset for a basis adjustment for the investment tax credit.

For the basic tax depreciation term, it will be necessary for some cases to separate tax depreciation deductions between those associated with existing capital and those associated with new capital investment. For that purpose, the analysis is restricted to geometric depreciation (which is currently allowed, at least initially, for equipment, although a slower method is allowed for structures). The analysis considers two cases: with economic depreciation, and with accelerated depreciation, where deductions are not indexed. In the latter case, tax depreciation is at rate  $d$  and the deductions are discounted at rate  $r+\pi$ , where  $\pi$  is the inflation rate. We also denote  $z_g$  as the amount of depreciation per dollar of investment; this value is calculated the same way as  $z$ , but discounted at the growth rate,  $g$ , rather than the after tax return,  $r$ . Thus  $z$  would be  $d/(r+\pi+d)$  while  $z_g$  equals  $d/(g+\pi+d)$ . For economic depreciation, set  $d$  to  $\delta$  and  $\pi$  to zero in both formulas.

The value of tax depreciation on old capital is, therefore,  $(\delta+g)Kz_g$ . This value declines at rate  $d$ , and is also discounted at the nominal rate of return  $(r+\pi)$ . Thus:

$$(A4) \quad PV(old) = \int_0^{\infty} (\delta + g)Kz_g e^{-(r+\pi+d)t} dt = \frac{(\delta + g)Kz_g}{r + \pi + d}$$

For depreciation on new investment, the present value of each vintage's depreciation is  $z$  (discounted at the return not the growth rate), and this value grows at rate  $g$  and is discounted at rate  $r$ ) thus

$$(A5) \quad PV(new) = \int_0^{\infty} (\delta + g)Kz_g e^{-(r-g)t} dt = \frac{(\delta + g)Kz_g}{r - g}$$

If we add old and new depreciation we obtain:

$$PVD = \frac{(\delta + g)Kz_g}{r - g}$$

(A6)

By setting  $k = 0$  (no investment tax credit), solving the integral in A3, and substituting from (A1) and (A6) and dividing by  $K$ , we obtain a general expression for the value of the firm under an income tax:

$$(A7) \quad \frac{V}{K} = 1 - u \frac{(r + \delta)z - (\delta + g)z_g}{r - g}$$

Note that with economic depreciation  $V/K = 1$ , so that there is no difference between the value of the firm and the replacement cost of its capital with economic depreciation.

These formulas are used in turn to calculate the remaining asset effects. For expensing, only depreciation on new investment is included and  $z$  is set to 1; with retention of depreciation, the old depreciation is retained. Investment credits do not affect the standard depreciation, but new depreciation is lost for the share of assets paid for by the investment credit.

## Notes

<sup>1</sup> Wages includes all compensation, including fringe benefits (which are assumed to be taxed under the broad-based tax) and self-employment income (a portion of the income of schedules C and E).

<sup>2</sup> We allocate the business portion of the tax either to equity or to all real and financial assets. These assets are imputed based on data from the Survey of Consumer Finances. See Rohaly, et al (2005) for a description.

<sup>3</sup> If the tax-inclusive rate is  $\tau_I$ , the tax-exclusive rate,  $\tau_E$ , is defined as:  $\tau_E = \tau_I / (1 - \tau_I)$ . Thus, for  $\tau_I = 0.20$ ,  $\tau_E = 0.2 / (1 - 0.2) = 0.25$ .

<sup>4</sup> Note that these estimates are likely to be very imprecise because consumption is estimated. Nonetheless, the strong skew with income is likely to be robust to different measures of consumption.

**Table 1**  
**VAT with 20 Percent Tax-Inclusive Rate**  
**Average Tax Rate<sup>4</sup> by Distribution Method**  
**by Income Percentiles, 2006<sup>1</sup>**

<b>Income Percentile<sup>2</sup></b>	<b>Consumption</b>		<b>Wages and Equity</b>		<b>Wages and All Capital</b>		<b>Wage Portion Only</b>	
	Cash Income	Economic Income	Cash Income	Economic Income	Cash Income	Economic Income	Cash Income	Economic Income
<b>Lowest Quintile</b>	77.9	72.4	12.4	13.5	13.2	13.9	12.0	13.2
<b>Second Quintile</b>	37.8	33.3	15.2	14.3	15.7	14.7	14.7	14.0
<b>Middle Quintile</b>	25.7	23.4	17.9	15.7	18.2	16.0	17.3	15.2
<b>Fourth Quintile</b>	19.4	18.2	18.4	18.0	18.6	18.1	17.8	17.4
<b>Top Quintile</b>	11.0	9.2	18.0	15.5	17.7	15.3	16.5	14.1
<b>All</b>	17.8	15.9	17.8	15.9	17.8	15.9	16.7	14.9
<b>Addendum</b>								
<b>Top 10 Percent</b>	9.2	7.4	17.5	14.7	17.2	14.4	15.8	13.1
<b>Top 5 Percent</b>	7.6	5.9	16.8	13.8	16.4	13.5	14.8	12.0
<b>Top 1 Percent</b>	4.5	3.4	15.3	12.4	14.6	11.8	12.9	10.2
<b>Top 0.5 Percent</b>	3.6	2.7	14.8	12.0	13.9	11.3	12.2	9.7
<b>Top 0.1 Percent</b>	2.3	1.6	13.6	10.9	12.6	10.2	10.8	8.4

Source: Urban-Brookings Tax Policy Center Microsimulation Model (version 0305-4).

(1) Calendar year.

(2) Tax units with negative income are excluded from the lowest quintile but are included in the totals. For a description of cash and economic income, see <http://www.taxpolicycenter.org/TaxModel/income.cfm>

(3) Includes both filing and non-filing units. Tax units that are dependents of other units are excluded from the analysis.

(4) Average tax as a percentage of average cash income.

**Table 2**  
**X-Tax with 15-30 Percent Rate Structure and Demogrant**  
**Average Tax Rate<sup>4</sup> by Distribution Method**  
**by Cash Income Percentiles, 2006<sup>1</sup>**

Cash Income Percentile <sup>2</sup>	Consumption	Wages and Equity	Wages and All Capital
<b>Lowest Quintile</b>	79.2	-19.3	-17.5
<b>Second Quintile</b>	34.8	0.2	1.3
<b>Middle Quintile</b>	23.3	10.8	11.4
<b>Fourth Quintile</b>	18.1	16.0	16.4
<b>Top Quintile</b>	12.1	23.0	22.5
<b>All</b>	17.8	17.8	17.8
<b>Addendum</b>			
<b>Top 10 Percent</b>	10.7	24.0	23.3
<b>Top 5 Percent</b>	9.3	24.2	23.2
<b>Top 1 Percent</b>	6.1	23.6	22.0
<b>Top 0.5 Percent</b>	5.0	23.1	21.4
<b>Top 0.1 Percent</b>	3.3	21.8	19.8

Source: Urban-Brookings Tax Policy Center Microsimulation Model (version 0305-4).

(1) Calendar year.

(2) Tax units with negative cash income are excluded from the lowest quintile but are included in the totals. For a description of cash income, see

(3) Includes both filing and non-filing units. Tax units that are dependents of other units are excluded from the analysis.

(4) Average tax as a percentage of average cash income.



**Table 3**  
**VAT with 20-Percent Tax-Inclusive Rate**  
**Average Tax Rate<sup>4</sup> by Age of Tax Unit Head**  
**and Distribution Method**

Age of Tax Unit Head	Consumption	Wages and Equity	Wages and All Capital	Wage Portion Only
<b>Under 25</b>	32.9	20.1	20.3	19.9
<b>25-34</b>	19.2	20.4	20.6	20.2
<b>35-44</b>	16.5	20.3	20.5	19.7
<b>45-54</b>	16.2	19.9	20.1	18.9
<b>55-64</b>	18.1	18.8	18.7	17.2
<b>65-74</b>	15.7	8.3	7.5	5.2
<b>75 and over</b>	18.9	5.6	5.3	3.3
<b>All</b>	17.8	17.8	17.8	16.7
<b>Addendum</b>				
<b>Under 65</b>	18.0	19.9	20.1	19.1
<b>65 and over</b>	16.9	7.3	6.7	4.5

Source: Urban-Brookings Tax Policy Center Microsimulation Model (version 0305-4).

(1) Calendar year.

(2) Tax units with negative cash income are excluded from the lowest quintile but are included in the totals. For a description of cash income, see

(3) Includes both filing and non-filing units. Tax units that are dependents of other units are excluded from the analysis.

(4) Average tax as a percentage of average cash income.

**Table 4: Effect on Asset Values of Hybrid Consumption Tax Provisions**

<b>Tax Treatment</b>	<b>Formula for Asset Value</b>	<b>Estimated Percentage Reduction in Asset Value</b>
Economic Depreciation	1	NA
Accelerated Geometric Depreciation with Inflation, Steady State	$1 - u(\pi + d - \delta) / (g + \pi + d)$	With present value equal to economic: 6%
Shift to a Consumption Tax, Expensing in Steady State	$1 - u$	30%
Shift to Expensing Retaining Existing Economic Depreciation	$1 - u + u\delta / (r + \delta)$	16%
Shift to Partial Expensing Retaining Economic Depreciation	$1 - ux + ux\delta / (r + \delta)$	Proportional (e.g. for 50% expensing, 8%)
Investment Credit	$1 - k$	Equipment, at 10% rate: 2.1%
Shift to Investment Credit with Basis Adjustment	$1 - k + uk\delta$	Equipment, at 10% rate: 2%

Note:  $u$  is tax rate (set at 30% to reflect corporate-noncorporate average),  $z$  is present value of depreciation deductions,  $\delta$  is economic depreciation rate,  $d$  is tax depreciation rate when different from economic,  $\pi$  is inflation rate (set at 2.5%),  $r$  is real discount rate (6%),  $x$  is share expensed under partial expensing,  $k$  is rate of investment tax credit. Shares of assets in economy are 15% inventories, 49% structures, 21% equipment, 14% land; economic depreciation rates are respectively: 100%, 3%, 15%, and 0%. With economic depreciation  $z$  is  $\delta / (r + \delta)$ ;  $z$  in the accelerated depreciation case is  $d / (r + \pi + d)$ .