TAX AVOIDANCE AND THE DEADWEIGHT LOSS OF THE INCOME TAX

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Abstract—Traditional analyses of the income tax greatly underestimate deadweight losses by ignoring its effect on forms of compensation and patterns of consumption. The full deadweight loss is easily calculated using the compensated elasticity of taxable income to changes in tax rates because leisure, excludable income, and deductible consumption are a Hicksian composite good. Microeconomic estimates imply a deadweight loss of as much as 30% of revenue or more than ten times Harberger's classic 1964 estimate. The relative deadweight loss caused by increasing existing tax rates is substantially greater and may exceed \$2 per \$1 of revenue.

I. Introduction

The traditional method of analyzing the distorting effects of the income tax greatly underestimates its total deadweight loss as well as the incremental deadweight loss of an increase in income tax rates. Ever since Harberger's classic 1964 paper, economists have focused on the effects of the income tax on the supply of labor and the rate of capital accumulation. The relatively low estimated elasticities of labor supply and of saving have led analysts to calculate a correspondingly small deadweight loss of the income tax. In Harberger's own analysis, the deadweight loss of using a tax on labor income instead of a lump-sum tax was only about 2.5% of the revenue raised (Harberger, 1964).[1]

The true deadweight losses are substantially greater than these conventional estimates because the traditional framework ignores the effect of higher income tax rates on tax avoidance through changes in the form of compensation (e.g., employer-paid health insurance) and through changes in the patterns of consumption (e.g., owner-occupied housing). The present paper shows that, when these forms of tax avoidance are taken into account, the deadweight losses of the income tax and of changes in income tax rates may be more than ten times as large as the traditional Harberger calculations imply.

The deadweight loss due to the increased use of exclusions and deductions is easily calculated even when the exclusions cannot be explicitly measured (e.g., improved working conditions). The key to the calculation is recognizing that the income tax does not change the relative prices of leisure and of the tax-favored forms of consumption that give rise to exclusions and deductions. Because the relative prices of leisure, excludable income, and deductible consumption are fixed, all of these can be treated as a single Hicksian composite good. The analysis in this paper shows that, even though the magnitude of the exclusions cannot be measured directly, the compensated change in taxable income induced by changes in tax rates provides all of the information that is needed to evaluate the deadweight loss of the income tax.[2]

Section II of this paper presents a formal analysis that incorporates tax avoidance into the measurement of the deadweight loss of the income tax. Section III reviews evidence on the magnitude of the key elasticity. Section IV uses the NBER's microeconomic TAXSIM model to evaluate the deadweight loss of the income tax as well as of a proportional rise in income tax rates and of the increased progressivity exemplified by the 1993 tax law. There is a brief concluding section that discusses some of the implications of this work and directions for further analysis.

II. Tax Avoidance and Deadweight Loss

The traditional Harberger analysis of the deadweight loss of a labor income tax specifies the individual's decision problem as a choice between leisure (L) and consumption (C) subject to a budget constraint in which consumption equals labor earnings minus the tax on those earnings:[3]

$$\max U(L, C) \qquad \text{subject to } C = (1 - t)w(1 - L) \tag{1}$$

where t is the proportional rate of income tax and w is the individual's pretax wage rate.

In reality, the individual's income tax liability is not based on total labor income. Some forms of compensation are excluded in the calculation of taxable income even though they enter the individual's utility function (e.g., health benefits, pleasant working conditions), and some forms of consumption are deducted by taxpayers (e.g., mortgage interest) who use the itemized deduction method of calculating taxable income. If we denote the exclusions by E and the deductions by D, the individual's decision problem can be

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[1] More-recent analyses using this same framework include Auerbach (1985), Ballard et al. (1985), Browning (1987), Hausman (1981, 1985), and Stuart (1984). Even within this framework, existing analyses may underestimate the deadweight loss because they define the nature of the labor-supply response too narrowly (in terms of just hours and participation) and therefore understate the magnitude of the labor-supply elasticity; see Feldstein (1995b).

[2] Tax avoidance through deductible spending and excludable income is very different from illegal tax evasion because evasion generally reduces spendable income in a nonlinear way, i.e., it is not part of a Hicksian compensated good. See Slemrod (1994) for a very interesting discussion of illegal evasion in this context. Similarly, changes in the timing of taxable income raise issues not dealt with in the current analysis. Triest (1992) incorporates deductible expenses in a model of labor supply but does not analyze the welfare implications or note that the deadweight loss depends on changes in taxable income rather than changes in labor supply.

[3] The current analysis does not deal with the issues of saving and deferred consumption.

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written:

$$\max U = U(L, C, E, D) \tag{2}$$

subject to the budget constraint

$$C = (1 - t)[w(1 - L) - E - D] \tag{3}$$

where C now refers to all general consumption that is not tax-favored through exclusion or deduction and $w(1 - L) - E - D$ is taxable income (TI).

An indication of the order of magnitude of the exclusions and deductions is suggested by the Treasury Department's estimates of tax expenditures in the personal income tax. These tax expenditures are defined as the revenue losses that result from reductions in taxable income due to certain exclusions and deductions. For 1993, the Treasury estimates that the total of all such individual income tax revenue losses is $388 billion.[4] This estimated revenue loss corresponds to deductions and exclusions that are approximately four times larger, i.e., larger by a factor equal to the inverse of the average of the individual marginal tax rates, or approximately $1,500 billion. To put this number in perspective, $1,500 billion is more than 60% of the estimated taxable income for 1993. Even this large amount understates the complete sum of exclusions and deductions, because the official tax expenditure list does not include a wide range of behavior that reduces taxable income, e.g., the choice of more-pleasant working conditions (larger offices, better furniture, air conditioning, location, etc.) instead of higher cash income.

Since the budget constraint of equation (3) can be rewritten as

$$(1 + \tau)C = w - wL - E - D \tag{4}$$

where $1 + \tau = (1 - t)^{-1}$, it is clear that the income tax is equivalent to an excise tax on ordinary consumption (i.e., on consumption that is not tax-favored).[5] The income tax therefore changes the relative prices of leisure and ordinary (i.e., not tax-favored) consumption, raising the price of ordinary consumption by a factor of $1 + \tau$ (or, equivalently, reducing the price of leisure in terms of foregone ordinary consumption from w per unit of leisure to $(1 - t)w$, but does not change the relative prices of leisure, excludable compensation, and deductible consumption. The key conclusion that the relative prices of L, E, and D remain unchanged is unaffected if the proportional income tax of equation (3) is replaced by a linear but not proportional tax or by a nonlinear income tax.

[4] The largest tax expenditure for an exclusion is the $51 billion for employer contributions to health insurance plans. The largest tax expenditure for a deduction is the $51 billion for mortgage-interest deductions. The total of the individual tax expenditures is only an approximation because eliminating any single tax expenditure would change the revenue loss of the others.

[5] Recall that the analysis excludes saving and deferred consumption.

The deadweight loss of the income tax can therefore be evaluated as the deadweight loss of an excise tax on ordinary consumption at rate τ. Measuring the change in the deadweight loss that would result from a change in the income tax therefore only requires estimating the change in ordinary consumption that the tax change would induce. More precisely, because the equivalent excise tax applies only to C as a whole and no taxes distort the relative prices of L, E and D, it is not necessary to know the substitution elasticities among C, L, E, and D in order to measure the deadweight loss of the tax. To see this explicitly, note that the traditional Hicks-Harberger approximation of the deadweight loss due to price distortions is $0.5\Sigma\Sigma S_{ij}dp_i dp_j$, where S_{ij} is the compensated substitution term between goods i and j and dp_i is the change in the price of good i. If ordinary consumption, C, is the first good, equation (4) implies that $dp_1 = d\tau$ and that $dp_j = 0$ for $j = 2$, 3, and 4. The deadweight loss therefore collapses to $0.5S_{11}(dp_1)^2$. The text that follows shows that this is equivalent in the current case to the product of the square of the tax rate and the elasticity of taxable income with respect to one minus the tax rate.

The calculation of the deadweight loss of the income tax is illustrated with the help of figure 1. The DD curve is the compensated demand for ordinary consumption relative to the alternatives of leisure and tax-favored consumption. The excise tax equivalent of the income tax raises the price of ordinary consumption from 1 to $1 + \tau$. The deadweight loss is the shaded area equal to $0.5\ \tau\ dC$. Thus,

$$\begin{aligned} DWL &= -0.5\tau dC \\ &= -0.5\tau[dC/d(1 + \tau)]d\tau \\ &= -0.5(\tau/(1 + \tau))[(1 + \tau)/C][dC/d(1 + \tau)]\tau C \\ &= -0.5(\tau/(1 + \tau))\epsilon_C \tau C \end{aligned} \tag{5}$$

Note that $(1 + \tau)^{-1} = (1 - t)$ implies that $(\tau/(1 + \tau)) = t$ and $\tau = t/(1 - t)$. Equation (5) therefore implies

$$DWL = -0.5t^2\epsilon_C C/(1 - t). \tag{6}$$

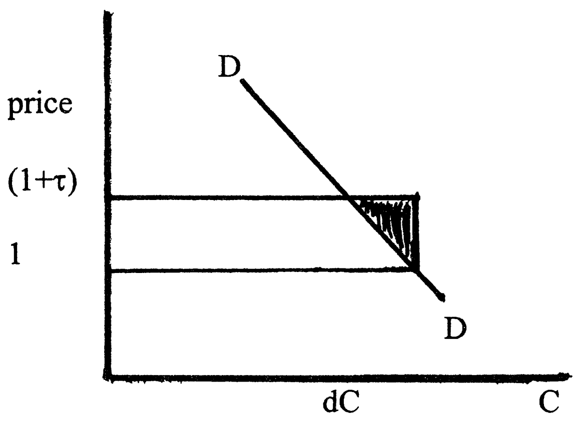
In the remainder of this section, I show that this can be stated in terms of the elasticity of taxable income with respect to the net of tax share.[6] More specifically, I now show that equation (6) is equivalent to

$$DWL = 0.5t^2(1 - t)^{-1}\epsilon_T TI,$$

the traditional Harberger-Browning formula (Harberger, 1964; Browning, 1987) for the deadweight loss of a tax system but with the usual compensated labor supply elasticity replaced by the compensated elasticity of taxable income

[6] In the special case in which there is no excludable income or deductible consumption, this analysis is equivalent to the traditional deadweight loss calculation, because changes in the demand for ordinary consumption are equivalent under those conditions to changes in labor supply.

FIGURE 1



with respect to the net-of-tax share (ϵ_T) and with labor income replaced by taxable income (i.e., *TI*, the labor income net of deductions and exclusions).[7]

The notion of an income-compensated elasticity of *TI* with respect to the net of tax share needs some further explanation. An increase in the net of tax share of money wages that the taxpayer can keep (i.e., $1 - t$) has both an income effect and a substitution effect. The compensated or substitution effect of an increase in $1 - t$ is to induce the taxpayer to consume less leisure and less of the tax-favored forms of consumption and therefore more of the ordinary consumption. The compensated effect of an increase in $1 - t$ is therefore to increase *TI*. However, a rise in the after-tax share causes an increase in disposable income at the initial levels of leisure and tax-favored consumption. This, in turn, causes the individual to want more leisure and more of the tax-favored consumption (i.e., less taxable income). This response to the increase in disposable income is the income effect of the change in the net of tax share. If dy is the increase in disposable income with no behavioral response, the income effect is the decrease in taxable income at a rate equal to dTI/dy. If there were no excludable income or deductible consumption, $-dTI/dy = wdL/dy > 0$, the value of the increase in leisure demanded per incremental dollar of lump sum income. More generally, an increase in exogenous income will induce an increase in excludable income (i.e., more fringe benefits) and an increase in deductible consumption. Thus, $dTI/dy = d[w - wL - E - D]/dy < 0$.

With this concept in mind, note that equations (6) and (7) are equivalent if $-\epsilon_C C = \epsilon_T TI$. Since $\epsilon_C = (1 + \tau)C^{-1} \times \{dC/d(1 + \tau)\}_{\mathrm{COMP}}$ and $(1 + \tau) = (1 - t)^{-1}$, it follows that $\epsilon_C = -(1 - t)C^{-1}\{dC/d(1 - t)\}_{\mathrm{COMP}}$. By definition, $\epsilon_T = (1 - t)(TI)^{-1}\{dTI/d(1 - t)\}_{\mathrm{COMP}}$. Since the uncompensated change in *TI* with respect to a tax change differs from the change in consumption only by the amount of the tax paid, the compensated effects are equal: $\{dC/d(1 - t)\}_{\mathrm{COMP}} = \{dTI/d(1 - t)\}_{\mathrm{COMP}}$. It follows that $-C\epsilon_C = (1 - t) \times \{dC/d(1 - t)\}_{\mathrm{COMP}} = (1 - t)\{dTI/d(1 - t)\}_{\mathrm{COMP}} = TI\epsilon_T$. This establishes the equivalence of equations (6) and (7) as measures of the deadweight loss.

III. The Elasticity of Taxable Income with Respect to the Net of Tax Share

In an earlier paper (Feldstein, 1995a), I estimated the value of ϵ_T on the basis of taxpayers' responses to the 1986 tax-rate reductions. That analysis used a panel of individual tax returns created by the Treasury Department that allows a comparison of each taxpayer's return for 1985 with the same taxpayer's return for 1988. I focused on married taxpayers who were under age 65 in 1988. Taxable income was adjusted for changes in the law in 1986 and was modified to exclude the portion of taxable income due to capital gains and to gross partnership losses. These adjustments permit the estimated change in taxable income to reflect the change in marginal tax rates rather than other changes in tax rules.[8]

To estimate the elasticity, taxpayers were grouped according to their 1985 marginal tax rate and the adjusted taxable incomes were compared for 1988 and 1985. Comparing the changes in taxable incomes to the changes in the net of tax shares in different marginal tax-rate groups provides alternative estimates of the elasticity of taxable income with respect to the net of tax share. This differences-in-differences approach avoids the identification problems of traditional regression estimates and the assumption that demographic and other factors affect taxable income in a linear additive way.

An example will indicate the nature of the differences-in-differences calculation. Taxpayers who were in the highest marginal tax rate class in 1985 (with marginal tax rates of 49% and 50%) had average marginal tax rates of approximately 28% in 1988, a 42.2% rise in the net of tax share. Taxpayers in the next group, with marginal tax rates of 42% to 45% in 1985, experienced a 25.6% rise in the net of tax share. The corresponding increases in the adjusted taxable income for the two groups were 44.8% and 20.3%. The comparison of changes in *TI* and in $1 - t$ implies an elasticity of 1.48. Similar comparisons between the taxpayers in the highest 1985 marginal tax-rate groups and those in the medium marginal tax-rate range (with 1985 marginal tax rates of 22% to 38%) implies an elasticity of 1.25. Finally, a comparison of the *TI* changes for those who started with marginal tax rates of 42% to 45% and those who started with marginal tax rates of 22% to 38% implies an elasticity of 1.04. The simple average of these three elasticities was thus 1.26.

Gerald Auten and Robert Carroll (1994) of the Treasury Department's Office of Tax Analysis subsequently reestimated the same elasticity using the much larger panel of tax

[7] Note that this measures the deadweight loss due to changes in the income tax rate and not the deadweight loss that results from changes in the list of deductions and exclusions or other changes in the structure of the income tax.

[8] The sample also excluded taxpayers who created a subchapter S corporation between 1985 and 1988. The specific reasons for excluding gross partnership losses and taxpayers who created subchapter S corporations are discussed in Feldstein (1995a).

returns for 1985 and 1989 that is available inside the Treasury but not available for outside use. Their sample of more than 14,000 returns includes more than 5,000 taxpayers with 1985 marginal tax rates of 50%. They report an estimated elasticity of 1.33 with a standard error of 0.15. The Feldstein (1995a) and Auten-Carroll (1994) estimates are broadly consistent with earlier elasticity estimates by Lindsey (1987) based on comparing cross-sections of ranked taxpayers before and after the 1981 tax-rate reductions and with Navratil's (1994) estimates based on panel data of taxable incomes for individuals before and after the rate reductions.

A more recent study by Auten and Carroll (1999) estimates the response of taxable income to the net-of-tax rate to be 1.19 with a standard error of 0.16 in their basic two-stage least-squares specification. That result is very robust to expanding the set of regressors to include a variety of nontax factors (a coefficient of 1.10 with a standard error of 0.17) and adding variables that indicate the taxpayer's occupation (a coefficient of 0.97 with a standard error of 0.17). Auten and Carroll also repeat their estimates with weights proportional to the sample selection probability, a procedure that gives greater weight to lower-income taxpayers and that reduces the estimated tax parameter from 1.19 to 0.75 in the basic regression and to 0.55 when all of the additional regressors are added. This reweighting has two effects: It corrects a potential panel-sampling bias, and it also produces a weighted average of the elasticities at different income levels if the true elastiticies differ by income. Such an overall elasticity estimate that gives equal weight to all taxpayers would underestimate the effect of a proportional tax change if low-income individuals have lower behavioral responses than high-income individuals.[9]

Because the 1986 tax reforms were designed to be revenue neutral and distributionally neutral (on the assumption of no change in economic behavior), the behavioral response should in principle be an estimate of ϵ_T, the income-compensated elasticity of taxable income with respect to the net of tax share.[10] This is of course only an approximation. Determining the extent to which the tax legislation was revenue neutral and distributionally neutral is complicated by, among other things, the uncertain incidence of the corporate tax changes that were part of the 1986 tax reform act.

It is important to emphasize that the elasticity of *TI* with respect to the net of tax share is conceptually very different from the more familiar elasticities of labor supply with respect to the net of tax share. A taxpayer can respond to a higher marginal tax rate not only by working fewer hours (the traditional labor-supply response) but also in a variety of other ways that reduce taxable income. These include working less hard per hour (including not only the amount of effort per hour but also such dimensions as the amount of travel, employee location, responsibility accepted, and so on), receiving compensation in ways other than cash that are excluded from taxable income (such as fringe benefits, office amenities, first-class travel, corporate health and fitness facilities, and subsidized corporate day-care for children), and spending money in ways that are deductible in the calculation of taxable income.[11]

It is not surprising therefore that the estimate of ϵ_T is substantially larger than the traditional estimates of the compensated labor-supply elasticity. The much broader range of responses implied by the change in *TI* than by the change in labor supply (or leisure) implies a substantially larger deadweight loss.[12]

IV. Microeconomic Estimates with the TAXSIM Model

This section presents estimates of deadweight losses calculated with the NBER's TAXSIM model, a microsimulation model based on a stratified random sample of more than 100,000 individual tax returns provided by the Internal Revenue Service. The estimates include the reduction in the deadweight loss associated with eliminating the personal tax completely and the changes in the deadweight loss and in tax revenue of a 10% increase in all marginal tax rates and of a repeal of the 1993 increase in tax-rate progressivity.

Because the deadweight loss is directly proportional to the elasticity of taxable income with respect to the net of tax share, readers can easily modify the estimates presented here if they believe that the true elasticity is different from the estimate of $\epsilon_T = 1.04$ used. An assumed alternative value of $\epsilon_T = 0.5$ would cut the implied deadweight losses approximately in half, while assuming the value of $\epsilon_T = 1.33$ (as estimated by Auten and Carroll (1994)) would raise the implied deadweight losses by about one-third.

The TAXSIM calculations are based on tax returns for 1991, the most recent data available when this study was done. These have been adjusted at the NBER to estimated 1994 income levels. The TAXSIM model incorporates the

[9] Footnote 17 notes that the overall revenue effect and deadweight loss of a proportional tax change depend almost completely on the elasticity of the higher-income taxpayers.

[10] Determining the extent to which the tax legislation was revenue neutral and distributionally neutral is complicated by the uncertain incidence of the corporate income tax changes that were part of the 1986 tax reform act.

[11] Some reductions in taxable income of the individual represent a transfer of taxable income from the individual to the corporate employer. Deferred compensation is a very clear example of this. Such intertemporal aspects are beyond the scope of this paper but are reflected in the empirically estimated elasticity of *TI* with respect to the $1 - t$ tax share.

[12] The estimated elasticity ϵ_T, as reported in Feldstein (1995a) and in Auten and Carroll (1994, 1999), is based on the experience of taxpayers with 1985 marginal tax rates over 20%. It is not clear a priori whether the elasticity would be lower or higher for taxpayers with lower marginal tax rates and lower incomes. Because such taxpayers may have less discretion about the form of compensation and are less likely to itemize deductions, the elasticity could be lower. However, even a small change in wages could imply a proportionately very large change in taxable income for lower-income taxpayers; for example, a couple with wage income of $25,000 and two children who use the standard deduction now has a taxable income of less than $9,000, so a 5% decrease in earnings translates into a 14% decline in taxable income. The analysis of a proportional change in all tax rates (reported in section IV) shows that the revenue and dead loss effects are almost unchanged if it is assumed that lower-income taxpayers (the 31 million taxpayers with adjusted gross income less than $25,000) do not respond at all to changes in marginal tax rates.

income tax rates and rules as of 1994. The initial marginal personal income tax rate is estimated for each individual on the basis of that individual's taxable income and the 1994 schedule of marginal tax rates. For individuals who are eligible for the earned-income tax credit, the marginal tax rate includes the increase or decrease in the credit per dollar of additional income. To capture the full complexity of the tax rules, the marginal tax rate for each taxpayer is calculated by comparing that taxpayer's liability with the initial taxable income to that individual's tax liability if his income rises by $100.

Because the 15.3% Social Security payroll tax is an important part of the marginal tax rate that most individuals face, we generally include the payroll tax as well as the income tax in our calculations. To calculate marginal tax rates for Social Security net of the present actuarial value of future benefits, the analysis divides the wage and salary income reported on each tax return into separate earnings of husbands and wives using a method described in Feldstein and Feenberg (1996). Married women are classified as potential retired workers (rather than potential dependent spouses) if their current wage and salary places them at a point in the earnings distribution at which their individual benefits would exceed the benefits to which they would be entitled as a dependent spouse.[13] The Feldstein and Samwick (1992) estimates of the net present value of future Social Security retirement benefits are then used to adjust the 15.3% employer-employee payroll tax rate based on imputed assumptions about ages and incomes.

A. The Deadweight Loss of the Personal Income Tax

Consider first the deadweight loss of the personal income tax as a whole if there were no Social Security payroll tax. Applying equation (7) with $\epsilon_T = 1.04$ to each individual return and then using the sample weights to find a national aggregate implies a deadweight loss of the income tax in 1994 of $181 billion or 32.2% of the TAXSIM estimate of the corresponding personal income tax revenue of $543 billion.[14] This 32% ratio of deadweight loss to revenue is about twelve times as large as the original Harberger estimate despite the decrease in the level of tax rates since the time when Harberger made his estimates. The primary reason for the difference is the current use of the taxable income elasticity of 1.04 instead of the much lower elasticity of labor supply (0.125) used by Harberger. The Harberger estimate was also biased downward by using an average marginal tax rate in each adjusted gross income class instead of separate marginal rates for each individual.[15]

The TAXSIM estimate of a $181 billion deadweight loss ignores the effect of the Social Security payroll tax on the deadweight loss of the income tax. An alternative calculation takes each individual's net Social Security marginal tax rate as given and calculates the total deadweight loss with and without the personal income tax. Treating the personal income tax as incremental in this way implies a substantially larger deadweight loss of $284 billion or 52% of the personal income tax revenue.

B. A 10% Increase in All Marginal Tax Rates

The TAXSIM calculation indicates that increasing all personal income tax rates by 10% creates a deadweight loss of $43 billion.[16] Since a 10% increase in all tax rates would raise $56 billion if there were no induced change in taxpayer behavior, this $43 billion represents a very high deadweight loss of $0.78 per $1 of potential additional revenue. Moreover, since the higher tax rate causes a decline in taxable income, the increase in revenue is substantially smaller than 10% of the original personal income tax revenue. The TAXSIM analysis implies that the personal income tax rises by $26 billion instead of the $56 billion with no behavioral response. The reduced labor supply and the shift away from taxable cash income to other types of compensation also reduces the payroll tax revenue by an estimated $4.1 billion, so that the total revenue gain from a 10% rise in all personal income tax rates is only $21.4 billion. Comparing the $44 billion deadweight loss to this additional revenue indicates that the incremental deadweight loss per dollar of additional revenue is $2.06.

Since the effects on deadweight loss and revenue are symmetric for small increases and decreases in tax rates, a 10% across-the-board reduction in all tax rates would be expected to lose only about $21 billion in revenue and to reduce the deadweight loss of the existing tax system by $44 billion. Real disposable household incomes (net of the value of foregone leisure) would rise by $65 billion or about $3 per $1 of revenue lost by the government.[17]

[13] A married woman is entitled to the higher of her own benefit and 50% of her retired husband's benefit. The choice is complicated by such things as the ability of women to claim benefits earlier than their husbands on their own and then shift to the status of dependent beneficiary when their husbands retire. Even those who do not ever claim benefits as a dependent spouse are likely to take the benefit based on husband's income after his death.

[14] Since the deadweight loss is proportional to the elasticity of taxable income with respect to the net of tax share, assuming any value of ϵ_T different from 1.04 changes this deadweight loss estimate in the same proportion.

[15] The deadweight loss for each individual depends on the square of that individual's marginal tax rate. Since the weighted mean of the squares of the individual marginal tax rates exceeds the square of the mean marginal tax rate, the use of the average marginal rate in each AGI class causes a downward bias in the estimated deadweight loss. See Feldstein (1996, section 6).

[16] In order to look at the pure effect of a 10% rise in marginal tax rates, the TAXSIM calculation of this tax change is based on a modified 1994 tax law that omits the alternative minimum tax, the earned-income tax credit, and the credits for child care and for the elderly. These features of the tax law are included in the analysis of repealing the 1993 tax-rate increases.

[17] As a test of the sensitivity of the results to using the estimated elasticity of taxable income of 1.04 for low-income groups as well as high-income groups, I have evaluated the effects of the 10% increase in all personal income tax rates with the compensated and uncompensated elasticities set equal to zero for the 31 million taxpayers with incomes of $25,000 or less. Doing so has almost no effect on both tax revenue and the deadweight loss. The tax revenue rises by $23.6 billion instead of $21.4 billion, and the deadweight loss is $41.4 billion instead of $42.8 billion.

C. *The Effect of Increases in Tax Progressivity*

An increase in tax progressivity raises the deadweight loss per dollar of tax revenue. This can be seen intuitively by noting that the deadweight loss of the tax depends on the weighted average of the squared marginal tax rates while the revenue depends on the same weighted average of the marginal tax rates themselves. The greater convexity of the more progressive marginal rate schedule raises the mean of the squared marginal rates proportionately more than it raises the mean of the rates themselves.

This is well illustrated by the 1993 tax legislation which raised the top marginal rate of personal income tax from 31% to 36% for married taxpayers with taxable incomes between \$140,000 and \$250,000 and from 31% to 39.6% for married taxpayers with taxable incomes over \$250,000. In addition, the \$135,000 income ceiling for the 2.9% health insurance payroll tax was eliminated, bringing the total marginal tax rates to 38.9% and 42.5% from the previous 31%.[18]

Before looking at the TAXSIM estimates, it is useful to study a few representative high-income taxpayers to see why the increased progressivity implies a very high ratio of incremental deadweight loss to incremental revenue.

Consider first a taxpayer with \$180,000 of taxable income, the median income level among those whose tax rates were increased in 1993. Since the taxpayer is above the maximum taxable income for the Social Security payroll tax, the rise in the marginal income tax rate from $t_1 = 0.31$ to $t_2 = 0.389$ increased the individual taxpayer's deadweight loss by $\Delta DWL = 0.5\epsilon_T\ [t_2^2 - t_1^2](1 - t_1)^{-1}TI = \$7461$. Because the increased tax rate applies only to income in excess of \$140,000, the increased revenue would be 7.9% of the income between \$140,000 and \$180,000, or \$3,160 if the taxpayer does not change his \$180,000 income. However, the 7.9% rise in the marginal tax rate reduces the individual's net-of-tax share of income from 0.69 to 0.611, a fall of 11.4%. The resulting compensated decline in taxable income would be $TI\epsilon_T[d(1 - t)/(1 - t)] = -21340$. Against this must be offset the income effect on taxable income, $(dTI/\,dy)$ $3160 = 1264$, assuming an income effect of 0.4.[19] The net decline in taxable income is therefore \$20,076, implying a loss of personal income tax revenue at $t = 0.36$ of \$7,227. There is also a decline of payroll tax revenue of \$181. The net revenue effect is therefore the difference between the \$3,160 additional revenue that would be collected with no behavioral response and the combined revenue loss of $\$7227 + \$181 = 7408$, a net revenue loss of \$4,248.

In short, for a taxpayer with initial taxable income of \$180,000, the rise in the marginal tax rate from 31% to 38.9% implies a deadweight loss of \$7,461 and a revenue loss of \$4,248. Since half of all taxpayers affected by the 1993 tax-rate increase had initial taxable incomes below \$180,000, the majority of those affected by the 1993 tax-rate increases experienced a substantially increased deadweight loss while paying a reduced amount of tax.

For taxpayers with high-enough income, the \$140,000 threshold becomes relatively less important, and the tax liability actually rises. Consider for example a married couple filing jointly with initial taxable income of \$500,000. Their marginal tax rate rose from 0.31 to 0.425, raising the deadweight loss by \$31,867 and the revenue by \$8,468, an incremental deadweight loss of \$3.76 for every \$1 of revenue.[20]

V. *Concluding Comments*

This paper has emphasized that the deadweight loss of the personal income tax on labor income reflects the induced changes in itemized deductions and in income exclusions as well as a broader than usual measure of changes in labor supply. Although the effects of taxes on all of these aspects of behavior cannot be estimated separately, the analysis shows that the deadweight loss of the labor income tax can be calculated in terms of the elasticity of taxable income with respect to the net of tax share. Because the response of taxable income involves much broader behavior than the traditional elasticity of labor supply, the taxable-income elasticity is larger than the traditional labor-supply elasticity and the resulting deadweight loss is correspondingly greater. This is borne out by the statistical estimates of the elasticity of taxable income based on the 1986 tax-rate reductions. These estimates imply that the deadweight loss per dollar of revenue of using a labor income tax rather than a lump-sum tax is more than twelve times as large as Harberger's classic estimate. If the existing Social Security tax and benefit structure is taken into account, the deadweight loss per dollar of personal income tax revenue is even greater.

The analysis implies that a marginal increase in tax revenue achieved by a proportional rise in all personal income tax rates involves a deadweight loss of two dollars per incremental dollar of revenue. This has important implications for the cost of financing incremental government spending. The relative cost of incremental revenue is even greater when it is achieved by a tax change that increases the progressivity of the rate structure, as the analysis of the 1993 tax changes showed.

The calculations could be improved in a variety of ways. The analysis deals only with a single period of time, ignoring both ordinary saving and tax-favored saving. Similarly, there is no attempt to deal with the deadweight losses that arise from the rules governing the taxation of investments in portfolio assets. Although state income and consumption taxes raise marginal tax rates, they have not been incorporated. It is clear, however, from the current analysis that the deadweight losses are of a substantial

[18] Since half of the 2.9% is paid by employers, the marginal tax rate on full pretax income is $38.9/1.0145 = 38.3\%$. I ignore this distinction in the current section.

[19] See Feldstein (1996, section 4) for a discussion of this income effect.

[20] See Feldstein (1996, section 5) for details of this calculation.

enough magnitude to make further research on these issues a high priority.

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