Tax Deductions, Consumption Distortions, and the Marginal Excess Burden of Taxation

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Abstract

Certain types of expenditure--e.g. mortgage interest and medical insurance--receive favorable tax treatment and are effectively subsidized relative to other (non-tax-favored) expenditures. Labor taxes (e.g. income taxes) can therefore produce efficiency losses by distorting the allocation of consumption, in addition to distorting the labor market. Using evidence on the responsiveness of taxable income to changes in tax rates, a seminal study by Feldstein (1999) estimates that the marginal excess burden of taxation (MEB) could exceed unity, when the effects of tax deductions are taken into account. This is several times larger than in previous studies of the MEB that focus exclusively on labor market effects.

This paper develops a "disaggregated" approach to estimating the MEB that decomposes welfare impacts in the market for labor and tax-favored consumption goods, and uses micro evidence on labor supply elasticities, the demand elasticity for mortgage interest, medical insurance, and so on. Based on Monte Carlo simulations, we find a 68 percent probability that the MEB lies between .31 and .48 for government transfer spending and between .21 and .35 for public goods. These estimates are below Feldstein's, but are still considerably higher (70 percent or more) than when we ignore tax deductions.

Key Words: welfare costs, tax system, tax deductions, simulations

JEL Classification Numbers: H21, H43

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TAX DEDUCTIONS, CONSUMPTION DISTORTIONS, AND THE MARGINAL EXCESS BURDEN OF TAXATION

Ian W. H. Parry*

1. INTRODUCTION

Public expenditure programs on defense, education, medical care, assistance for the poor, pensions, crime prevention, and so on, obviously produce potentially important benefits for society. But these programs also entail social costs and--at least on the criterion of economic efficiency--additional spending on any of these programs is worthwhile only if the social benefits that are generated exceed the extra social costs. Economists have long recognized that the social costs of public spending include not only the opportunity costs of the resources involved, but also the resulting deadweight loss from higher distortionary taxes that are necessary to finance the spending (Pigou, 1947; Harberger, 1964; Browning, 1976).[1] This paper is about the estimation of these deadweight losses for the US economy.

Over the years a number of studies have attempted to estimate the *marginal excess burden of taxation* (MEB).[2] This is the efficiency loss from the increase in distortionary taxes necessary to raise an extra dollar of tax revenue. Traditionally, studies have focussed on the efficiency impact of the tax increase in factor markets alone, particularly the labor market. Estimates of the MEB vary a lot due, among other things, to different assumptions about relevant elasticities, which tax is being increased, and what the extra spending is used for. But a central estimate from this literature for the MEB of labor taxation, when the dollar is returned to households in a transfer payment, is about 25 cents.[3]

However, some very recent studies have emphasized that the tax system distorts not only factor markets, but also the allocation of spending among different types of consumption, saving, and investment. This is because certain types of expenditures, such as mortgage

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[1] More generally, extra spending can be financed by cutting back other spending programs, or by increasing borrowing. In the latter case, tax increases are effectively delayed until a future period. We focus purely on the case when spending is financed from current taxes.

[2] This is sometimes referred to as the *marginal welfare cost of taxation*. A related concept is *the marginal cost of public funds* which we discuss below.

[3] Notable contributions that employ static models include Ballard (1990), Browning (1976, 1987, 1994), Mayshar (1991), Stuart (1984), and Wildasin (1984). Ballard *et al*. (1985) presents results from a dynamic computable general equilibrium model that allows for tax increases on both labor and capital (see footnote 31 below). Snow and Warren (1996) and Fullerton (1991) attempt to reconcile the variation in estimates across different studies.

interest, employer-provided medical insurance and other fringe benefits, pension and charitable contributions, interest on local government bonds, and so on, receive favorable tax treatment, and therefore are effectively subsidized relative to other types of spending. Increasing the rates of existing taxes may therefore produce efficiency losses not only by increasing tax distortions in factor markets, but also by increasing subsidy distortions for tax-favored expenditures.

The recent studies have attempted to estimate the *tax income elasticity* (TIE). This elasticity captures the effect of changes in marginal income tax rates on reducing peoples' reported taxable income, both through reducing labor supply and by substituting tax-favored spending for non tax-favored expenditure. Initially, estimates for the TIE using 1980's data were quite high--typically greater than one (e.g. Feldstein, 1995; Lindsey, 1987). An important paper by Feldstein (1999) demonstrates that such high elasticities would imply dramatically larger values for the MEB, well above one dollar for transfer spending. This is a very striking result: it would imply that the social benefits of (marginal) public spending may have to exceed two dollars per dollar of extra spending in order to be justified on the grounds of economic efficiency! More recent studies using 1990's data, however, point towards somewhat smaller values for the TIE (see e.g. Auten and Carroll, 1998; Carroll, 1998a), implying the MEB might be closer to 0.5 than unity.[4]

There are important advantages to using estimates of the TIE to infer the MEB. In particular, this approach minimizes information requirements because it involves the estimation of a single elasticity that summarizes a whole host of substitution possibilities for avoiding taxes. On the other hand, there are a number of respects in which the TIE literature is preliminary at this stage.

First, the studies typically estimate the TIE by comparing the changes in taxable income across taxpayer groups whose marginal tax rates were changed by different amounts following tax legislation. This "differences in differences" approach is designed to control for non-tax factors (e.g. business cycle effects) that have a proportional effect on the taxable income of all groups during the period before and after the tax legislation. However, this method does not control for factors that affect income inequality. In periods of increasing income inequality, such as the 1980s and 1990s, when marginal tax rates for higher income groups fall (rise) relative to those for other groups, comparing the change in taxable income of these groups can produce estimates of the TIE that are biased upwards (downwards). Since the 1986 Tax Reform Act reduced marginal tax rates, while the 1990 and 1993 Budget Agreements increased them, studies using 1980's data may overstate the TIE, while studies using 1990's data may understate it.

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[4] This is based on my own rough calculations, using estimates of the TIE in Carroll (1998b), Table 1. In addition to its use in project evaluation, the MEB is also a crucial determinant of the welfare effects of tax shifts (i.e. simultaneous changes in different tax rates that keep the overall level of tax revenue the same). For a discussion of how tax deductions, through their effect on the MEB, crucially influence the efficiency impact of swapping environmental taxes for other taxes see Parry and Bento (1999).

Second, what matters for the MEB is the long run equilibrium responses to changes in tax rates. The short run responses that are often the focus of the econometric studies may be more pronounced than the long run changes due to transitory shifts in taxable income. For example, people may temporarily postpone selling stocks in anticipation of lower capital gains taxation, thereby exaggerating the increase in taxable income before and after a tax reduction. In other respects the short run response may understate the long run response. For example, the full effects of changes in the effective tax-subsidy for mortgage interest on the stock of owner occupied housing may occur with a considerable lag.

Third, in practice the price distortions in the markets for tax-favored consumption goods often depend on a number of other factors besides the subsidy from federal tax provisions. For example, future income from pension accumulations is subject to taxation that offsets the subsidy for current, tax-deductible contributions, at least to some extent. More spending on charities may increase rather than reduce welfare if there are significant beneficial externalities. Economic efficiency in the housing market is affected by property taxes, housing assistance programs, external benefits and costs, and so on. These other types of pre-existing "distortions" are not taken into account when (unadjusted) estimates of the TIE are used to calculate the MEB.

In addition the studies focus on the behavior of subgroups of taxpayers rather than the behavior of all actual and potential taxpayers. These subgroups usually consist of higher income taxpayers that generally itemize deductions and therefore may be more responsive to tax changes than the average taxpayer. Some studies are based on the tax returns of married couples which may display a relatively high sensitivity to tax changes--for example, most of the responsiveness of labor supply comes from the participation decision of married (female) workers rather than the overtime behavior of non-married workers. Finally, to date studies have estimated only the compensated TIE. However, estimating the MEB for different types of public expenditure, and particularly public goods, can also require estimates of uncompensated price effects (see below).[5]

Many of these limitations should be overcome, at least to some extent, as econometric studies of the TIE are refined over time. However, particularly while there is still significant uncertainty over the TIE, it seems worthwhile to make use of other evidence that can be helpful in gauging the magnitude of the MEB. In this paper we present a "disaggregated" approach to estimating the MEB in the presence of tax deductions. This involves adding up the welfare impacts of tax increases in the labor market and the markets for individual tax-favored goods. One virtue of this approach is that it makes transparent the potential contribution of underlying parameters to the MEB--e.g. the demand elasticity for medical insurance, the magnitude of the assumed pre-existing distortion in the housing sector--which are not revealed in the TIE studies. Unfortunately, there is uncertainty about the values of these underlying parameters, and therefore we would not necessarily claim that our approach

[5] For a more comprehensive discussion of the methodological issues involved in estimating the TIE see Triest (1998), Slemrod (1998), and Carroll (1998b).

yields more accurate calculations of the MEB than those based on estimates of the TIE. Nonetheless, it is still helpful to explore the consistency between estimates of the MEB based on the TIE, with estimates based on micro evidence about underlying parameters.

We begin in the next section by deriving formulas for the MEB in the presence of tax deductions, under alternative assumptions concerning the disposition of government revenues. Our analysis is static--as in Feldstein (1999)--and captures the impact of the tax system on distorting the labor/leisure decision and the choice among consumption goods. This provides conservative estimates of the MEB (though how conservative is unclear), since we do not capture the impact of the tax system on distorting the consumption/savings decision and the choice among different types of investment. Thus, we do not model tax deductions for pension contributions, accelerated depreciation, and so on.

Section 3 presents calculations of the MEB based on what we believe are plausible parameter values. In the absence of tax deductions (i.e. focussing on efficiency impacts in the labor market alone) the MEB for government transfer payments ranges from 0.1 to 0.42, with a central value of 0.22.[6] Incorporating tax deductions, the range becomes 0.15 to 0.92, with a central value of 0.39. For individual deductions to make much difference to the MEB the tax expenditure involved must be significant relative to aggregate labor tax revenues, *and* they must be applied to spending that exhibits a fair amount of price sensitivity. The huge bulk of the increase in the MEB is due to welfare impacts in the housing and medical insurance markets alone.

Clearly, this is a wide range of possible outcomes for the MEB. We perform Monte Carlo experiments to try and narrow the range and perhaps make the results more useful for project evaluation. According to these results, we find a 68 percent probability that the MEB for transfer spending lies between 0.31 and 0.48. These results clearly underscore Feldstein's original insights about the importance of tax deductions--for example our central estimate is 77 percent higher when we include tax deductions. However, our estimates are lower than in Feldstein (1999), partly because we exclude certain deductions from our analysis that do not directly distort the consumption bundle.

For public goods (that are separable in the utility function) our central estimate for the MEB increases from 0.13 to 0.27 when we allow for tax deductions. Our Monte Carlo simulations suggest a 68 percent probability that the MEB for public goods lies between 0.21 and 0.35. These numbers are lower than for transfer spending, due to the familiar income effects than dampen the change in labor supply (see below). However, they are well above 0 unlike in some other studies that do not take account of tax deductions (see Ballard and Fullerton, 1992, for a good discussion).

In section 4 we briefly discuss the literature on distortions in tax-favored sectors (externalities, other regulations, etc.). These sources of non-tax distortion are sometimes offsetting and are generally difficult to quantify. Although we exclude most of these factors,

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[6] Loosely speaking, transfer payments may represent such things as social security benefits, and public spending that is a close substitute for private spending (e.g. medical services, education, food stamps).

it is straightforward to infer from our formulas how alternative assumptions about the size of these distortions, relative to the tax-subsidy, would affect our calculations of the MEB.

Section 5 concludes and discusses some limitations of our analysis. In particular, our analysis does not capture the discounted welfare effects from changes in the future path of investments in tax-favored and non-tax-favored assets.

2. DERIVING FORMULAS FOR THE MEB IN THE PRESENCE OF TAX DEDUCTIBLE SPENDING

In this section we describe the assumptions underlying our analytical model and derive formulas for the MEB for the case of government transfer payments and public goods.

A. Model Assumptions

We assume a static economy where the representative household has the following utility function:[7]

$$U = u\left(x_1,...,x_M, y, \bar{L} - L\right) + f\,(G^P) \tag{2.1}$$

where $u(.)$ is continuous and quasi-concave and $f' > 0$. The x_i's denote consumer goods that receive favorable tax treatment one way or another. These include untaxed, in-kind compensation for labor supply, or fringe benefits, and the most important example in this category is employer-provided medical insurance. The x_i's also include goods that can be deducted from taxable income. The most important example in this category is mortgage interest on owner occupied housing, which roughly reflects housing services for homeowners. y denotes an aggregate of all other "ordinary" consumption (i.e. that does not receive favorable tax treatment). $\bar{L} - L$ is leisure time, and this equals the household time endowment ($\bar{L}$) less labor supply (L). G^P is the quantity of a public good provided by the government.[8]

Competitive firms produce the consumption goods using labor as the only input. More generally of course, capital is an important input--although the labor market is about three times as large as the capital market. Incorporating capital goods would require a dynamic analysis in which the tax system distorts the labor/leisure decision, the

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[7] Our assumption of homogeneous agents implies that we abstract from distributional considerations. More generally, progressive increases in the rates personal income tax could produce non-economic gains for society that effectively reduce the MEB by creating a more equitable net-of-tax income distribution (see e.g. Mirrlees, 1994, p. 226, for more discussion).

[8] For our purposes we simplify by assuming public goods are separable in the utility function (or put another way, private consumption and public goods are "ordinary independents" (Wildasin, 1984). More generally if public goods are a complement (substitute) for leisure, then additional public spending will lead to a feedback effect that reduces (increases) labor supply (see Atkinson and Stern, 1974). As a result, the MEB for public goods will be higher (lower). In practice however, estimating these types of feedback effects is difficult. Moreover, in some important cases (e.g. national defense) it seems reasonable to assume that more of the public good would not affect the marginal value of labor time relative to leisure time for the representative household.

consumption/savings decision, and the choice among different consumption and different investment goods, across all future periods. Thus, this extension would add considerable complexity (see e.g. the modeling of capital taxes in Lucas, 1990). We assume that the marginal product of labor in each industry is constant, hence supply curves are perfectly elastic. We choose units to imply producer prices and a gross wage (or value marginal product) equal to unity. For the moment, the only sources of market distortion in the economy are assumed to be those created by the tax system.[9]

In addition to providing the public good, the government also provides a lump-sum transfer of G^T to households.[10] Public spending is financed by a proportional tax of t percent on labor income (as discussed in Section 3 we believe this is not such a restrictive assumption). However, each of the x_i goods is at least partially deductible from the labor tax. We define $s_i(t)$ as the effective tax-subsidy for these goods, that is, the reduction in tax payments that would result from substituting a dollar of spending on x_i for a dollar of spending on ordinary consumption Y. $s_i(t) < t$ when x_i is not fully deductible from all labor taxes. The government budget constraint amounts to:

$$G^T + G^P = tL - \sum_{i=1}^{M} s_i(t) x_i \tag{2.2}$$

that is, spending on the public good and the transfer payment equals labor tax revenues net of the sum of tax deductions. We assume the government budget constraint must always balance (there is no possibility of public borrowing in a static model).

The household budget constraint is:

$$\sum_{i=1}^{M} (1 - s_i(t)) x_i + y = (1-t)L + G^T \tag{2.3}$$

That is, spending on consumer goods equals net-of-tax labor income plus the government transfer, where consumer prices equal producer prices less the rate of tax-subsidy. The household utility maximization problem is defined by:

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[9] We abstract from non-tax distortions in the labor market created by minimum wage laws, trade unions, information asymmetries, and so on. The aggregate distortionary impact of these factors may be significant, but for the U.S. is still likely to be small relative to the wedge that taxes drive between demand and supply prices in the labor market. For some discussion of how interactions between taxes and non-tax factors in the labor market affect the MEB see Browning (1994). Also, we do not consider how the administrative and compliance costs of raising revenue may affect the MEB. On this see Slemrod and Yitzhaki (1996).

[10] As already mentioned G^T can approximately represent social security benefits, educational and medical expenditures, etc. Again, we abstract from possible feedback effects of this spending on labor supply (e.g. in practice social security payments can influence labor force participation decisions since 65-70 year olds must be non-workers in order to receive them).

$$V(t,G^T,G^P) = MAX\ u\left(x_1,x_2,...x_M,y,\bar{L}-L\right)+\mathsf{f}\ (G^P) \tag{2.4}$$
$$+\mathsf{l}\left\{G^T+(1-t)L-\sum_{i=1}^{M}(1-s_i(t))x_i-y\right\}$$

where V(.) is the indirect utility function and the Lagrange multiplier l is the marginal utility of income. The solution to this problem yields the uncompensated demand and labor supply functions:

$$x_i = x_i(t,G^T)\,; \qquad y = y(t,G^T)\,; \qquad L = L(t,G^T) \tag{2.5}$$

(these functions are independent of G^P, given the separability in (2.1)). From differentiating the indirect utility function (2.4) we obtain.

$$\frac{\partial V}{\partial t} = -\mathsf{l}\left\{L-\sum_{i=1}^{M}s_i'x_i\right\}; \qquad \frac{\partial V}{\partial G^T} = \mathsf{l}\ ; \qquad \frac{\partial V}{\partial G^P} = \mathsf{f}\,' \tag{2.6}$$

We now define the MEB for spending on the lump sum transfer (MEB^T) and on the public good (MEB^P). These cases correspond to when public spending is a perfect substitute for private consumption, and when it has zero substitutability with private consumption, respectively. More generally of course, public spending may be a partial substitute for private spending. We do not explicitly consider this case, since it can easily be inferred by taking the appropriate weighted-average of MEB^T and MEB^P.[11]

We define the MEB by the welfare loss arising from equilibrium quantity changes in markets distorted by the tax system, following an extra dollar of tax-financed spending. This is the welfare loss that should be subtracted from a partial equilibrium benefit/cost calculation of incremental public spending and corresponds to the definition that is often used in the literature (e.g. Stuart, 1984; Ballard and Fullerton, 1992; Ballard *et al*., 1985). We acknowledge that other definitions are possible, and perhaps preferable, and (as noted in Section 3) would imply somewhat different empirical results.[12]

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[11] Kormendi (1983) and Aschauer (1985) find that one dollar of general government spending (i.e. transfers plus public goods) reduces private spending by about 30 cents. In this case, using the results below, we would calculate the MEB as 0.3 MEB^T + 0.7 MEB^P. It is important to understand, however, that our analysis is not applicable to redistributive government programs. For these policies we would need to disaggregate the household sector into different income groups and explore how the policy affects the behavior of each group. The MEB tends to be much higher for redistributive programs relative to other government programs (see Browning, 1986).

[12] In Browning (1987) the MEB is the excess of social benefits over the dollar outlay that is necessary to keep households at the same level of utility, following a dollar increase in public spending financed by increasing a distortionary tax. In this case the MEB depends only on compensated elasticities. In contrast, some of the elasticities in our formulas are uncompensated reflecting income effects. This issue is discussed further below. See Browning *et al*. (1997) for a discussion of alternative definitions of the MEB.

B. The MEB for Transfer Spending

We define the MEB for an extra dollar of spending on the lump-sum transfer (holding G^P fixed) as follows:

$$MEB^T = \frac{-\frac{1}{\lambda}\frac{dV}{dt}}{\frac{dG^T}{dt}} \tag{2.7}$$

where

$$\frac{dV}{dt} = \frac{\partial V}{\partial t} + \frac{\partial V}{\partial G^T}\frac{dG^T}{dt} \tag{2.8}$$

The numerator in (2.7) is the utility loss, expressed in dollars, from an incremental increase in the labor tax. In (2.8) this is decomposed into the effect of the increase in tax and the increase in spending. The denominator in (2.7) is the (general equilibrium) increase in transfer spending enabled by the increase in labor tax. Thus the MEB is the welfare loss from increasing the labor tax, per dollar of extra spending on G^T.

From (2.6)-(2.8):

$$MEB^T = \frac{L - \sum_{i=1}^{M} s_i' x_i}{\frac{dG^T}{dt}} - 1 \tag{2.9}$$

From totally differentiating the government budget constraint (2.2) using (2.5) we can obtain:

$$\left\{1 - t\frac{\partial L}{\partial G^T} + \sum_{i=1}^{M} s_i \frac{\partial x_i}{\partial G^T}\right\} dG^T = \left\{L + t\frac{\partial L}{\partial t} - \sum_{i=1}^{M} s_i' x_i - \sum_{i=1}^{M} s_i \frac{\partial x_i}{\partial t}\right\} dt \tag{2.10}$$

From the Slutsky equations:

$$\frac{\partial L}{\partial t} = \frac{\partial L^c}{\partial t} - \frac{\partial L}{\partial G^T}\left(L - \sum_{i=1}^{M} s_i' x_i\right); \qquad \frac{\partial x_i}{\partial t} = \frac{\partial x_i^c}{\partial t} - \frac{\partial x_i}{\partial G^T}\left(L - \sum_{i=1}^{M} s_i' x_i\right) \tag{2.11}$$

where "c" denotes a compensated coefficient and $L - \sum s_i' x_i$ is the reduction in household income from an uncompensated increase in the labor tax rate. Substituting (2.10) and (2.11) in (2.9) and dividing through by L gives:

$$MEB^T = \frac{-\frac{t}{L}\frac{\partial L^c}{\partial t} + \sum_{i=1}^{M} \rho_i \frac{s_i}{x_i}\frac{\partial x_i^c}{\partial t}}{1 + \frac{t}{L}\frac{\partial L}{\partial t} - \left\{\sum_{i=1}^{M} s_i' \rho_i + \sum_{i=1}^{M} s_i \frac{\partial x_i}{\partial t}\frac{\rho_i}{x_i}\right\}} \tag{2.12}$$

where $\pi_i = x_i/L$ is the share of good x_i in the total value of output. We define:

$$\varepsilon_L^c = \frac{\partial L^c}{\partial(1-t)}\frac{1-t}{L};\ \varepsilon_L^u = \frac{\partial L}{\partial(1-t)}\frac{1-t}{L};\ \eta_{x_i}^c = -\frac{\partial x_i^c}{\partial(1-s_i)}\frac{1-s_i}{x_i};\ \eta_{x_i}^u = -\frac{\partial x_i}{\partial(1-s_i)}\frac{1-s_i}{x_i} \tag{2.13}$$

ε_L^c and ε_L^u are the compensated and uncompensated elasticity of labor supply with respect to the household wage respectively, and $\eta_{x_i}^c$ and $\eta_{x_i}^u$ are the compensated and uncompensated elasticity of demand for good x_i (defined as positive numbers). Noting that $\partial L/\partial t = -\partial L/\partial(1-t)$, $\partial x_i/\partial t = -s_i'(\partial x_i/\partial(1-s_i))$, and so on, then from (2.12) and (2.13) we can obtain:

$$MEB^T = \frac{\frac{t}{1-t}\varepsilon_L^c + \sum_{i=1}^{M}\pi_i\frac{s_i}{1-s_i}s_i'\eta_{x_i}^c}{1-\frac{t}{1-t}\varepsilon_L^u - \left\{\sum_{i=1}^{M}\pi_i s_i'\left(1+\frac{s_i}{1-s_i}\eta_{x_i}^u\right)\right\}} \tag{2.14}$$

There are several noteworthy points about this formula for the MEB.[13] In the absence of tax deductions ($s_i = 0$) the formula would be consistent with the MEB formulas derived in other studies for lump-sum transfers financed by proportional taxes (see e.g. Mayshar, 1991). The new terms in the numerator and denominator reflect the effect of higher taxes on increasing subsidy distortions for tax-favored goods, and both serve to raise the MEB. These terms are larger: (a) the greater the size of these markets relative to the labor market (π_i); (b) the greater the pre-existing wedge between the demand and supply price (s_i) (c) the greater the elasticity of demand for tax-favored goods (the $\eta_{x_i}^u$ and $\eta_{x_i}^c$'s) and (d) the greater the impact of higher taxes on increasing subsidy rates (s_i'). Finally, the MEB formula in (2.14) depends on both compensated and uncompensated elasticities. This is because the additional lump-sum income partially--but not fully--compensates households for the reduction in household surplus from the tax increase (in other words $dV/dt < 0$).[14]

C. The MEB for Public Goods

Suppose instead that the extra dollar of spending was on the public good rather than the lump-sum transfer. In this case we define the MEB as:

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[13] Note that we have not placed certain restrictions on the utility function in deriving this formula, such as the commonly used assumption in computable general equilibrium models that all consumption goods are equal substitutes for leisure. The formula would be more complicated if we allowed for differences in tax rates and elasticities across agents. In particular, if households facing higher than average tax rates also had higher (lower) than average labor supply and demand elasticities, then the MEB would be larger (smaller) than predicted by our model. Browning (1987, footnote 8) suggests that allowing for dispersion in parameters across households would not greatly affect the estimated MEB.

[14] The denominator in (2.14) is positive for the range of parameter values used below. It could only be negative in the (unlikely) case that the labor tax Laffer curve is downward sloping.

$$MEB^P = \frac{-\frac{1}{\lambda}\frac{dV}{dt}}{\frac{dG^P}{dt}} - (\phi'/\lambda - 1) \tag{2.7′}$$

where

$$\frac{dV}{dt} = \frac{\partial V}{\partial t} + \phi'\frac{dG^P}{dt} \tag{2.8′}$$

The expression in (2.7′) is the overall change in utility per dollar of additional spending on the public good, after netting out the direct benefit and resource cost of the extra spending. Again, this reflects the welfare impacts in markets distorted by the tax system.

Differentiating the government budget constraint holding G^T constant gives:

$$dG^P = \left\{ L + t\frac{\partial L}{\partial t} - \sum_{i=1}^{M} \frac{ds_i}{dt} x_i - \sum_{i=1}^{M} s_i \frac{\partial x_i}{\partial t} \right\} dt \tag{2.10′}$$

This expression is a little simpler than that in (2.10), since labor supply and the demand for goods are not affected by the increase in public spending (i.e. there is no positive income effect from the extra public spending to counteract the adverse income effect from the tax increase). Following the same procedure as before, but using (2.7′), (2.8′) and (2.10′), instead of (2.7), (2.8) and (2.10), we obtain:

$$MEB^P = \frac{\frac{t}{1-t}\varepsilon_L^u + \sum_{i=1}^{M} \pi_i s_i' \frac{s_i}{1-s_i}\eta_{x_i}^u}{1 - \frac{t}{1-t}\varepsilon_L^u - \left\{ \sum_{i=1}^{M} \pi_i s_i' \left(1 + \frac{s_i}{1-s_i}\eta_{x_i}^u \right) \right\}} \tag{2.14′}$$

The only difference between this formula and that in (2.14) is that all the elasticities are now uncompensated. This is because spending on the public good is not a substitute for disposable income, and therefore does not compensate households for the income loss from the tax increase. This point has long been recognized in the literature. Indeed it has been emphasized that the MEB for proportional labor taxes (without deductions) is negative if the uncompensated labor supply elasticity is negative (i.e. the labor supply curve is backward bending).[15] In practice this seems unlikely since the balance of empirical evidence suggests that the economy-wide uncompensated labor supply elasticity is positive (see below). Moreover, with tax deductions the MEB could still be positive even if the labor supply elasticity is negative. This is because tax-favored consumption is a normal good, hence, even if the first term in the numerator in (2.14′) is negative the second term is always positive.

[15] See e.g. Wildasin (1984), Stewart (1984), Ballard and Fullerton (1992).

Finally, we note that $1 + MEB^P$ is equivalent to the commonly used *marginal cost of public funds*. This is simply the full cost of incremental spending on public goods, which is the resource value of a dollar plus the incremental efficiency loss from higher taxes necessary to raise an extra dollar of revenue.

3. ESTIMATING THE MEB

In this section we discuss plausible parameter values and what they imply for our definitions of the MEB. We also present Monte Carlo simulations to indicate "most likely" outcomes from our range of possible values for the MEB.

A. Parameter Values

Labor supply elasticities

In our highly aggregated model, the labor supply response to changes in the net-of-tax wage reflects the impact on average hours per worker and the impact on the participation rate averaged across all members (male and female) of the labor force. There is a sizeable literature on labor supply elasticities for the United States (see e.g. the review in Killingsworth (1983)) and we do not go into the details here. Based on a recent survey of labor economists' views by Fuchs *et al*. (1998), we choose central values of 0.2 and 0.35 for the (economy-wide) uncompensated and compensated labor supply elasticities respectively, and plausible ranges for these elasticities of 0.1-0.3 and 0.2-0.5.[16] Note that there is a fair amount of uncertainty over these important parameters.

Labor tax rate

The calculation of the labor tax rate is a little involved, and we provide more details in the Appendix. We assume a central value of 36 percent for the labor tax, which we arrived at as follows. We estimate the average rate of labor tax, which is relevant for the labor force participation decision, at 33 percent for 1995 (see Appendix). The contribution of various taxes is as follows: federal income taxes 12.7 percent, state income taxes 3.0 percent, payroll taxes 10.8 percent, and sales and excise taxes 6.7 percent.[17] The marginal rate of labor tax

[16] These values are from Table 2 in Fuchs *et al*., assuming a weight of 0.6 and 0.4 for the male and female elasticities respectively. Taking labor supply elasticities averaged over all workers (rather than, for example, male workers only), more or less rules out the possibility of a negative uncompensated elasticity. The labor supply estimates reported in Fuchs *et al*. may understate the overall change in effective labor supply to some extent since they do not take account of the potential for lower net-of-tax wages to discourage effort on the job, or induce long run changes in occupational choice. In comparing our estimates of the MEB to those from computable general equilibrium models (e.g. Stuart, 1984; Ballard *et al*., 1985), it is noteworthy that the latter models often assume significantly higher values for the compensated labor supply elasticity (see the discussion in Browning, 1987, footnote 9).

[17] It is standard in the literature to assume in static models that sales and excise taxes are effectively borne by labor.

affects the amount of hours per worker over a year (overtime, willingness to take a second job, etc.) and we assume a value of 41 percent for the typical worker (see Appendix). Since roughly two thirds of the estimated labor supply responses come from changes in participation rates and one third from changes in average hours (see e.g. Russek, 1996), we attached weights of two thirds and one third for the average and marginal rate of tax, respectively, to obtain our value of 36 percent.[18]

This value is below labor tax rates assumed in most other studies of the MEB--for example Ballard (1990) and Stewart (1984) used 40 percent and Browning (1987) assumed a central value of 43 percent. The differences between these tax rates may seem small, but they imply noticeably different values for the MEB. We prefer the lower value for two reasons. First, other studies use marginal tax rates, rather than a weighted average of marginal and average tax rates; thus they implicitly attribute all of the labor supply response to changes in hours per worker and none to the participation decision. Second, other studies often assume all social security payments are effective taxes (though Feldstein, 1999, is a noticeable exception). In practice, workers do gain some offsetting benefits from these taxes in terms of future social security benefits in retirement--although expected benefits are typically lower than they would be if workers could invest social security contributions in private capital markets. Our figure includes an assumption that the effective burden of (non-Medicare) social security taxes is 30 percent lower than current tax payments due to future benefits, though there is much controversy surrounding this issue.[19]

Given the controversy about effective payroll taxes, variability in tax revenues over the business cycle, and allowing for measurement errors, it is appropriate to consider a range of values for labor tax rates. We assume a range of 32 to 40 percent.

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[18] To incorporate a non-proportional labor tax in our model (i.e. to have separate rates for average and marginal taxes) would require separating out the participation and hours worked decision. We think that the costs of this extra complexity probably outweigh any benefits from slightly more accurate estimates of the MEB. Other models do not decompose these two dimensions of labor supply either, and implicitly assume that the marginal rate of tax is relevant for determining the participation as well as the hours worked decision. In this respect they overstate the MEB to some extent.

Other models allow for the possibility that increases in the labor tax may be progressive (i.e. they increase the marginal rate of tax by more than the average rate), while our analysis is limited to proportional changes in taxes. This may not be a major drawback however, given that, as already explained, two thirds of the labor supply response is governed by the increase in average rate of labor tax and only one third depends on the increase in marginal rate of tax.

[19] This is because the link between future benefits and current payments is complicated by Social Security rules. For example, benefits are based on the 35 years of highest earnings, so that people under 30 may receive no benefits for their current contributions. If 65-70 year olds decide to continue working they forgo benefit payments. Benefits may be linked to a spouse's earnings, therefore someone may receive no benefits from their own contributions. In addition, there is uncertainty over the amount of social security taxes that will be raised from future workers to pay for the retirement benefits of current workers. See Feldstein and Samwick (1992) for a good discussion of these issues.

Components of the tax-favored sector

Table 1 shows estimates of federal revenue losses for various categories due to deductions and exemptions built into the income tax system for 1995, as reported in the Statistical Abstract of the United States. We divide these figures by 0.24--a typical estimate of the marginal rate of federal income tax faced by the average household (Feldstein, 1999)--in order to obtain dollar estimates of total spending on tax-favored goods. In turn, these numbers are divided by gross labor income ($3,849 billion--see Appendix) to obtain the π_i's reported in the last column.[20]

The two most important sectors that receive tax-subsidies are employer-provided medical insurance and owner occupied housing services. These sectors amount to 5.6 and 5.0 percent respectively of gross labor income. There are a variety of much smaller items that add another 1.5 percent (child-care, employee parking, and so on.).[21]

We exclude from our analysis a variety of other tax exemptions, shown in the lower half of Table 1. These include deductions for savings and investment--pension contributions, interest on state and local bonds, capital gains at death, corporate income tax deductions, and interest on life insurance savings. As already noted, a proper treatment of these deductions would require a dynamic model with investment in different types of assets that are taxed or subsidized at different rates, and is beyond the scope of this paper.[22] Clearly these are sizeable deductions, however, which suggests that our static analysis is missing a significant part of the story. Deductions for state and local income taxes affect the overall level of labor taxation--and this is implicitly taken into account in our estimates of t--but do not distort the allocation of consumption expenditures. We also exclude charitable contributions, implicitly assuming that there are external benefits that just offset the tax-subsidy at the margin (this issue is discussed further below). Finally, property taxes and (to some extent) capital gains taxes on home sales, can be deducted from income taxes. These provisions affect the size of the price distortion in the housing sector (s_i), but do not directly affect the share of housing services in total output (p_i).[23]

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[20] Using direct estimates of these spending categories can be problematic. For example, estimates of mortgage payments include repayment of principal, which is not tax-deductible. They also reflect payments of all taxpayers, including those that do not itemize deductions, and therefore do not receive the tax subsidy.

[21] We ignore some relevant tax expenditures that are not quantified, such as business lunches, employer-provided health clubs, debt-financed spending secured by real estate, and so on. However, these are probably of very minor importance since these expenditures are very small relative to total labor income in the economy.

[22] For some discussion of how the deduction for pension contributions might be modeled see Feldstein (1999).

[23] At first glance it might seem that tax-favored consumption should also include black market activities where cash transactions are not reported as taxable income (possible examples include the hiring of nannies and gardeners). However since these activities are not observed they are implicitly counted as leisure activities, and hence are captured in studies that estimate how taxes affect the substitution from observed labor supply into leisure.

Table 1. Estimated Losses in Personal Income Tax Revenues by Function (1995)

	In $billion	p_i
Included categories		
Health	64.4	.056
Employer provided medical insurance	60.7	
Medical expenses	3.7	
Housing	57.9	.050
Mortgage interest on owner-occupied homes	51.3	
Exemption from passive loss rules for $25,000 of rental loss	4.3	
Credit for low income housing investments	2.3	
Miscellaneous[a]	17.7	.015
Total	140.0	.121
Excluded categories (greater than $10 billion)		
Pension contributions (employer and employee)	55.5	
Set-up basis of capital gains at death	28.3	
Deductions for state and local income tax	27.3	
Accelerated depreciation of machinery and equipment	19.4	
Charitable contributions	18.9	
Deferral of capital gains on home sales	17.1	
OASI benefits for retired workers	16.9	
Property tax on owner occupied homes	14.8	
Interest deduction for state and local debt	12.4	
Interest on life insurance savings	10.4	
Total	221.0	.192

Source: *Statistical Abstract of the United States*, 1995, Table 523. p_i is the revenue loss divided by 0.24 times gross labor income (equal to $4657 billion).

[a] Includes group life insurance (2.9), child care (2.9), employee parking (1.9), workman's compensation benefits (4.5), disability insurance benefits (1.9), benefits for dependents and survivors (3.6).

To allow for measurement errors, we consider ranges of .045-.055 for the share of housing services in labor income, .051-.061 for the share of medical services, and .012-.018 for the share of miscellaneous fringe benefits.

We focus purely on increases in the personal income tax therefore $s_i' = 1$ for all the x_i's. In contrast, if payroll taxes were increased $s_i' = 0$ for housing, since this sector is not deductible from payroll taxes. However, since payroll taxes are specifically earmarked for the social security trust fund it is unlikely that they would be increased to finance general government spending.

Demand elasticities for tax-favored goods

Based on the literature, we think that a reasonable range of values for (the magnitude of) the uncompensated demand elasticity for owner occupied housing is 0.5-1.5 with a central value of unity.[24] For the medical insurance demand elasticity we assume a range of .75-1.75, with a central value of 1.25, and for the uncompensated demand elasticity for miscellaneous tax-favored goods we assume a range of 0.5 to 1.5 with a central value of 1.[25] In each of these cases we infer values for the compensated elasticity from the Slutsky equation, assuming unitary income elasticities.[26]

Tax-subsidy rates

For the tax-subsidy rates ($s_i(t)$) we use the following values: a central value of .41 and a range of .37 to .45 percent for both health services and miscellaneous tax-favored goods; and a central value of .31 and a range of .23 to .39 for housing services. Note that it is the avoided marginal (rather than average) rate of tax that determines the marginal tax-subsidy.

The effective tax subsidies differ among different tax-favored goods. When workers receive medical insurance and other fringe benefits, rather than wage income to be spent on ordinary consumption goods, they avoid income, social security, and sales and excise taxes. Thus, the tax-subsidy in this case is simply the sum of marginal rates across these three

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[24] The central values come from a careful study by Rosen (1979). Note that the demand elasticities reflects substitution possibilities between owner occupied and rented housing, in addition to those between housing services in aggregate and other consumption goods. A more recent study by Hoyt and Rosenthal (1992) finds similar values. There are a number of methodological difficulties involved in estimating these elasticities (see Rosen, 1985) hence the "central value" should be treated with caution.

[25] For surveys of the medical insurance demand elasticity see Pauly (1986), pp. 644-46 and Phelps (1992), chapter 12. Gruber and Poterba (1994) point out some methodological problems with these earlier studies and therefore the results should be treated with a good deal of caution. Gruber and Poterba estimate a demand elasticity at the top end of our assumed range. However, their estimate is not directly applicable since it reflects the sensitivity in the numbers of people insured to changes in the tax subsidy rate. Ideally, we would want a weighted-average of this and the sensitivity of insurance expenditures among those who already have coverage.

[26] That is, the compensated elasticity equals the uncompensated demand elasticity, less the product of the income elasticity (unity) and the share of the particular tax-favored good in total output (ρ_i).

taxes, .41.[27] In contrast, if wage income is spent on housing rather than ordinary consumption, only income and sales taxes are avoided. The tax subsidy in this case is the marginal income tax rate plus the sales and excise tax rate, .31 (see the discussion of marginal tax rates in the Appendix).

Certain sector-specific tax provisions further complicate the wedge between the supply and demand price in the housing market (we discuss non-tax distortions in Section 4). In particular, property taxes are levied on the value of the housing stock. Based on the literature (see e.g. Oates, 1994) our view of the efficiency impact of this tax is as follows. Differences in average property tax rates between jurisdictions are reflected in differences in the value of local services (e.g. schools, parks). To this extent, higher property tax rates are essentially a user fee for higher quality local services and, roughly speaking, are not distortionary. Within a jurisdiction however, buying a larger house leads to higher property tax payments but no change in the value of local services for that individual household. To this extent, higher property taxes distort the choice between housing and other consumption goods. In our central case we assume that 75 percent of the variation in property tax rates is between jurisdictions and 25 percent within jurisdictions. However, property tax payments are also deductible from personal income taxes and are therefore subsidized at about 25 percent. In our central case therefore, these two effects are completely offsetting. More generally, if we assume, say, that 0 percent and 50 percent of the property tax is assumed to be a tax on the consumption of housing services, this would alter our central estimate for the tax-subsidy by ± 0.6 (see Appendix).

Housing also receives favorable tax treatment through exemptions for the imputed income from owner occupation and capital gains on house sales (e.g. when people move to more expensive homes). These provisions distort the choice between housing and other investment goods, but not the choice between housing and other consumption goods.[28] Therefore they are not applicable for our static analysis. To allow for uncertainty over the distortionary effect of the property tax and other factors, we consider a wide range of values for the pre-existing subsidy distortion in the housing market.

B. Results

Table 2 presents calculations of the MEB based on equations (2.14) and (2.14′) and using the above parameter values. To compare with earlier studies, we begin in the third column by setting the demand elasticity for tax-favored goods equal to zero, which eliminates the effect of tax deductions. Thus, accounting for distortionary impacts in the labor market alone, our central values for the MEB would be 0.22 for government transfers and 0.13 for

[27] This estimate is similar to that obtained by Phelps (1983).

[28] That is, if people invested in other physical capital they would effectively pay taxes on the income earned by that asset and any capital gains realized from selling the asset. In contrast, there are no analogous taxes on consumption goods. The subsidies from the exemptions for imputed income and capital gains are respectively about one half and one third the size of the mortgage interest subsidy (based on Table 1 and Nakagami and Pereira, 1996).

public goods. The smaller value in the latter case reflects the fact that the labor supply response to higher taxes is weaker, because this effect is uncompensated. Even ignoring tax deductions there is considerable variability in the MEB under alternative assumptions about labor tax rates and labor supply elasticities: the MEB for transfers varies between 0.10 and 0.42 and for the public good between 0.05 and 0.25. Our central estimate for the MEB for transfer payments is somewhat below Browning (1987)'s central estimate of 0.30, mainly because, as discussed above, we use a lower tax rate.[29]

Table 2. Calculations of the MEB

(a) For Transfer Payments

		demand elasticity for, and share of, tax-favored consumption			
Labor tax rate	labor supply elasticity	0	low	medium	high
0.32	low	.10	.15	.22	.35
	medium	.18	.25	.34	.49
	high	.27	.37	.47	.65
0.36	low	.12	.17	.25	.38
	medium	.22	.30	.39	.56
	high	.34	.45	.56	.77
0.40	low	.14	.20	.28	.42
	medium	.27	.36	.46	.64
	high	.42	.55	.68	.92

(b) For Public Goods

		demand elasticity for, and share of, tax-favored consumption			
Labor tax rate	labor supply elasticity	0	low	medium	High
0.32	low	.05	.10	.16	.29
	medium	.10	.16	.24	.39
	high	.16	.24	.33	.50
0.36	low	.06	.11	.18	.31
	medium	.13	.19	.27	.43
	high	.20	.29	.39	.57
0.40	low	.07	.12	.19	.33
	medium	.15	.23	.31	.48
	high	.25	.35	.46	.67

[29] Also, it is easy to verify that if we adopted parameter values used by Ballard (1990) our results would be very similar to those he obtained from a computable general equilibrium model with a uniform labor income tax (see his figures 1 and 2).

When we allow for tax deductions our central estimate for the MEB for transfer payments becomes 0.39--an increase of 77 percent--and the range of possible outcomes becomes 0.15-0.92.[30] At first glance, it may seem surprising that tax deductions make such a large difference to the MEB, given that the markets for medical and housing services are small in size relative to the labor market. However the welfare impacts in these markets can still be relatively important because the elasticity of response to tax changes in these markets is much larger than in the labor market. Our central estimate for the MEB for public goods is 0.27--about double the value in the absence of tax deductions--and the range of possible values is 0.10-0.67.

Clearly, our results support Feldstein's (1995, 1999) insights about the empirical importance of tax deductions for the MEB. However, Feldstein (1999) obtains much higher estimates for the MEB (for transfer spending)--typically in excess of unity. We have suggested some possible explanations for the differences in these results in the Introduction. In addition, we note that estimates of the tax income elasticity based on how federal income taxes respond to changes in federal tax rates incorporate additional spending on all of the deductions listed in Table 1. As discussed above, we think it is appropriate to exclude many of these categories--in fact over 60 percent of them--although the deductions for investment and savings would be relevant for a dynamic analysis.[31]

A striking, and troublesome, feature about Table 2 is the wide range of values for the MEB under different plausible assumptions about parameter values. It is not that much help for someone doing a cost/benefit analysis of a government transfer program to learn that the extra deadweight losses from financing the program could be anywhere between 15 and 92 percent of dollar outlays. We really need to attach some probabilities to these different outcomes to make the results more practical. To do this we now turn to some Monte Carlo simulations.

C. Monte Carlo Analysis

For these simulations we assume that possible outcomes for each parameter value are uniformly distributed across the ranges we specified earlier.[32] Our program picks a value at random for each parameter from its distribution and calculates the resulting MEB using the above formulas. This process is repeated 10,000 times and the normal distributions that most

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[30] As noted above, Browning *et al*. (1997) prefers an alternative definition of the MEB that depends only on compensated elasticities. For this case, the range for the MEB would be .15-.1.17 with a central value of .43.

[31] Ballard *et al*. (1985) estimated the MEB for public goods using a dynamic computable general equilibrium model of the US economy. Their treatment of the tax system incorporates deductions for housing and certain capital assets, but not for medical services or fringe benefits. They found that the MEB for payroll taxes was about 0.23 and for income taxes about 0.29. The income tax is more distortionary because it distorts investment behavior and biases spending in favor of housing--but the contribution of these factors is not decomposed in their analysis.

[32] Assuming parameters are uniformly distributed (as opposed to, say, normally distributed) provides conservative estimates of confidence intervals, for assumed parameter ranges.

closely fit the resulting probability distributions are shown in Figure 1.[33] In these graphs the solid vertical lines indicate mean values and the dashed vertical lines indicate 1 and 2 standard deviations from the mean. Note that there is a 68 percent probability of a generated value lying between ±1 standard deviation of the mean, and a 96 percent probability of lying between ±2 standard deviations.

The upper and lower two graphs show probability distributions for the MEB without and with tax deductions respectively. Thus, from the top graphs we see that there is a 68 percent probability that the MEB for transfer payments lies between 0.16 and 0.28, and between 0.08 and 0.17 for public goods, when tax deductions are ignored. In the lower graphs, where we properly account for tax deductions, the MEB for transfer payments lies between 0.31 and 0.48, and for public goods between .21 and .35, each with a 68 percent probability.

Of course we have only made our "best guess" about the ranges for the underlying parameter values. Nonetheless, given these ranges, the Monte Carlo exercises clearly help to reduce uncertainty about possible outcomes for the MEB.

4. FURTHER DISCUSSION: NON-TAX DISTORTIONS IN MARKETS WITH TAX-SUBSIDIES

In this section we briefly comment on non-tax factors that impinge on markets receiving favorable tax treatment.[34]

Housing

Subsidies for home ownership have been justified on externality grounds. For instance, people tend to take better care of their property when they own it, and this provides aesthetic benefits for other people in the neighborhood, besides increasing neighboring property values. In addition, homeowner subsidies can encourage new housing developments and thereby alleviate problems of congestion, pollution concentrations, noise, and so on, as people migrate out of densely populated inner cities. Some studies have found some empirical support for these types of externalities, though on balance the evidence is probably fairly weak (see e.g. Rosen, 1985). Moreover, there are external costs to housing development, such as the destruction of nature.[35]

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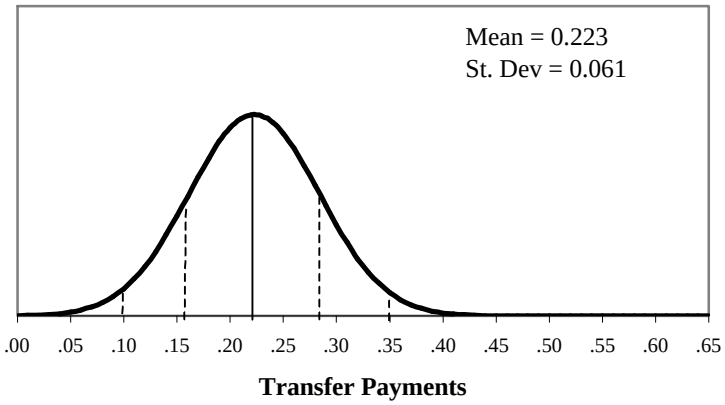
[33] We used *Analytica* for these simulations. We assume that parameter distributions are statistically independent. This seems a plausible approximation for example the degree of substitution between individual consumption goods is not obviously related to the overall degree of substitution between consumption and leisure.

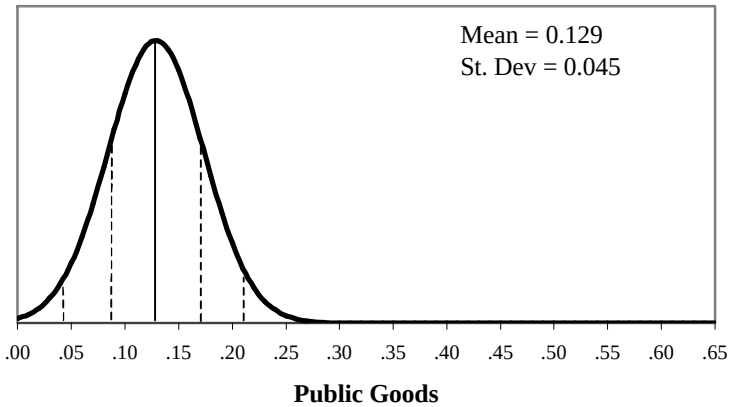
[34] For much more comprehensive discussions see for example Rosen (1985) on housing and Pauly (1986) and Phelps (1992) on health care.

[35] In any case, general housing subsidies are very blunt instruments to address any positive externalities. Many investments that homeowners undertake to improve their properties are inside the house, and therefore do not really confer external benefits. Even external improvements may have little externality benefits, if they are undertaken by people living in more remote areas.

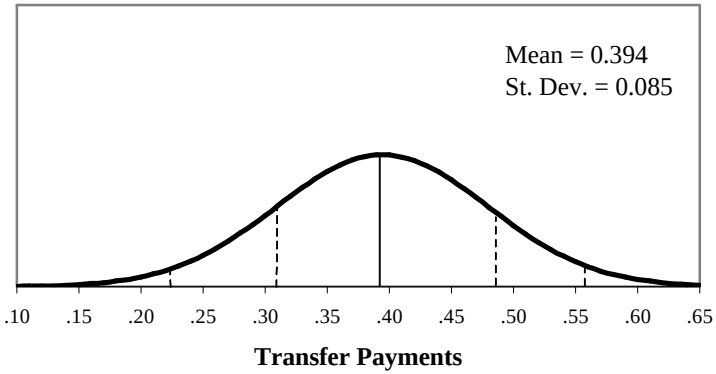
Figure 1. Probability Distributions for the MEB

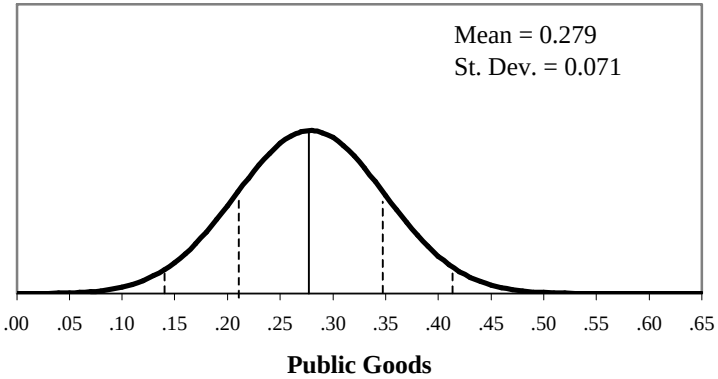
(a) Ignoring Tax Deductions





(b) With Tax Deductions





Housing subsidies have also been defended on the grounds that the average citizen may gain utility when the poorest members of society increase their consumption of certain "basic needs" goods (besides housing, these may also include food, education, and medical care--see e.g. Harberger, 1984, for a discussion). Mortgage interest tax relief is clearly ill-suited for this purpose: many poor people live in rented accommodation, hence most of the benefits from this provision "leak away" to the better off. Instead, this basic needs externality provides a possible justification for housing assistance programs. The subsidy from these programs amounted to a very substantial $27 billion in 1995--probably more than enough to compensate for any externality.[36]

The market for housing services is also complicated by a number of other policy interventions, though these are much less important in empirical terms than the tax subsidy. On the one hand, such things as building codes, zoning laws, and rent controls are implicit taxes on housing, while urban renewal programs and the public provision of roads, schools, and other community facilities subsidize development.

Medical Services

The free market may provide a sub-optimal level of health insurance because of moral hazard. When insurance companies pay for expenses in the event of illness, the price of treatment for the individual is zero rather than reflecting the marginal social costs of provision. As a result people may demand a socially excessive amount of treatment, and may take less care to avoid incurring medical expenses.[37] These effects raise the costs of insurance, thereby reducing coverage below economically efficient levels (i.e. some people do not receive any health insurance at all, while others cut back on, for example, insurance for dental and eye care). The tax-subsidy may counteract this source of inefficiency--but the effectiveness is dampened by the impact of higher demand on raising the average quality of health care, and hence premiums (40 million people remain without health insurance, despite the tax subsidy). Moreover, the tax-subsidy exacerbates the excessive provision of treatment for insured events, and this can produce substantial welfare losses (Feldstein and Friedman, 1977).

There are some notable externalities associated with health care, but again they operate in opposing directions. In particular, when one person is treated for an infectious disease this reduces the probability that other people will catch the disease. On the other hand, the more people use antibiotics, the greater the potential for new strains of diseases to develop that are immune to current antibiotics. The first externality may be the more important, but in empirical terms is probably not that significant relative to total spending on medical insurance. Efficiency in the health care market is also complicated by implicit taxes such as drug regulations and occupational licensing for health care providers, and additional subsidies such as the Medicaid program.

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[36] This figure is from the *Statistical Abstract of the United Sates*, 1995, Table 520.

[37] These perverse incentives are mitigated to some extent by deductions and co-insurance payments.

In short, based on our understanding of the housing and health care literature, we draw the following conclusions. In principle, there are market failures that could justify some level of tax-subsidy. However it is difficult to quantify the optimal level of subsidies given the existing evidence--and at any rate they are probably well below the rate of existing subsidies from the tax system (41 percent for health, 31 percent for housing). Moreover, there are some negative externalities that serve to dampen the optimal subsidy (and possibly even reverse its sign). On top of this, matters are complicated by a whole array of additional regulations and subsidies, and whether the net impact of these other policies is to increase or reduce the optimal subsidy is unclear. At any rate, we can make some crude estimate of how these factors might affect the MEB using the formulas in Section 2. Suppose, for example, that there are net social benefits from health care equal to 20 percent of the market price, and therefore neutralize half of the tax-subsidy. This would reduce our central estimate of the MEB for transfers from 0.39 to 0.35.

Charitable Contributions

We prefer not to include the tax deduction for charitable contributions in our MEB estimates, since the subsidy may correct for positive externalities. As already mentioned, the provision of basic needs goods for the poor may confer consumption externalities that raise the utility of the better-off, although there is not concrete evidence on this. At any rate, if instead we did include charitable contributions this would change our results by a fairly modest amount: our central estimates for the MEB for transfer spending would rise from 0.39 to 0.42.[38]

5. CONCLUSION

Estimating the economically efficient amount of expenditure on government programs requires knowledge about the marginal excess burden of taxation (MEB). This is the efficiency cost from financing an additional dollar of government spending that arises from the impact of incrementally higher taxes on the deadweight costs of the tax system. Recent studies have drawn attention to the importance of tax deductions for the MEB. These deductions effectively subsidize consumption goods that receive favorable tax treatment relative to other consumption goods. As a result, higher taxes on labor income induce efficiency losses by aggravating distortions in the consumption bundle, in addition to aggravating distortions in the labor market.

In previous work, Feldstein (1999) estimated the MEB using evidence on how peoples' taxable income responds to changes in tax rates. This paper uses an alternative "disaggregated" approach that adds up the welfare impacts in markets for tax-favored goods and the labor market. Our approach is meant to be a complement, rather than a substitute, for earlier work. In particular, it sheds light on the potential contribution of underlying parameters to the MEB,

[38] This calculation assumes a price elasticity of demand for charitable contributions of unity (see Auten *et al*, 1999, for a recent discussion of the price elasticity), a tax-subsidy of 31 percent (contributions escape income and sales taxes but not payroll taxes), and a share of labor income equal to 0.016 (from Table 1).

and explores the consistency of previous results with micro evidence about underlying parameter values.

Using Monte Carlo simulations, we estimate that there is a 68 percent probability that the MEB lies between 0.31 and 0.48 for government transfer spending, and between 0.21 and 0.35 for spending on public goods. These estimates are substantially higher (about 70 percent or more) than when we ignore the effect of tax deductions. However they are somewhat below the estimates obtained by Feldstein (1999).

There are a number of important qualifications to our results. First, easily the two most important tax deductions for our purposes are those for owner occupied housing and for medical insurance. As discussed above, our analysis ignores a number of non-tax factors that affect the magnitude of the overall economic distortion in these markets. Unfortunately, until more evidence becomes available, it is difficult to quantify the net impact of these factors.

Second, there is a fair amount of uncertainty surrounding certain key parameter values--namely labor supply elasticities, and the demand elasticity for owner occupied housing and medical insurance. We consider a wide range of values for these parameters, but obviously our estimated "most likely" ranges for the MEB are sensitive to our assumptions about where the underlying parameter distributions are centered.

Third, our analysis focuses purely on the impact of the tax system on distorting labor supply and consumption decisions. In principle, an important extension for future research would be to explore how the tax system distorts the consumption/savings decision and the allocation of investments among different types of assets. For this purpose, potentially important tax deductions include those for pension contributions, accelerated depreciation of physical capital, and the exemption of imputed income from owner occupied housing. However, the key parameters for this extension--namely the consumption/savings elasticity and the elasticity of demand for individual assets--are even more uncertain than the underlying parameters in our static analysis.

Fourth, the analysis in this paper may have less importance for estimating the MEB in other countries. For instance, income tax deductions for mortgage interest and private medical insurance have now been phased out in the United Kingdom.

APPENDIX

CALCULATING THE AVERAGE RATE OF LABOR TAX

For this calculation we used figures from Tables B-28, -80, and -84 of the Economic Report of the President (1998) and Table 500 of the Statistical Abstract of the United States (1998). In 1995 federal income tax revenues amounted to $590 billion and state income tax revenues $138 billion. These include revenues from taxes paid on capital as well as labor income, though the effective contribution from capital is probably small.[39] Revenues from other labor taxes in 1995 included $659 from social security taxes and $312 billion from sales and excise taxes.

We make some adjustment to social security taxes because they are offset to the extent that higher current contributions lead to higher social security benefits in retirement. However, since social security is a pay-as-you-go system, the base for funding is proportional to the growth of the real wage base in the economy (which reflects growth in the labor force and growth in average real wages). We assume that the expected future growth in the real wage base is 2 percent per year. In contrast, if a dollar of savings for retirement were invested in a typical retirement account the expected rate of return would be around 8 percent, based on previous experience. Thus, the effective tax per dollar of social security payments for a worker is $(1.02/1.08)^n$, where n is the number of years to retirement. Averaging over workers with 10, 20, 30, and 40 years to retirement gives 0.3. Currently, 81 percent of social security taxes are linked to future income benefits, and 19 percent are used to finance Medicare. Medicare benefits are not linked to a person's previous social security contributions. Thus, we assume that one dollar of current social security taxes yields a present value of additional benefits of 24 cents (=0.81×30 cents); hence we assume the effective burden of social security taxes is reduced to $501 billion.

Gross labor income was $3849 billion in 1995, which consists of wages, salaries, and some fringe benefits. To this we add sales and excise tax revenues, since these taxes are borne by labor in our model and widen the gap between the marginal social benefit and marginal social cost of labor. Proprietary income also reflects some labor earnings, though the amount is not decomposed in the data. We follow Browning (1987) and assume that half of the reported proprietary income in 1995 is labor income, which gives an additional $245 billion. Employer social security taxes are also part of gross labor earnings. These amounted to one half of total social security payments ($330 billion) and we reduce this by 24 percent because of the benefit offset, leaving $251 billion. Thus we estimate effective labor income as 3849+312+245+251 = $4657 billion.

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[39] First, many special provisions contained in the income tax system erode the revenues from capital income. For example, the maximum rate of tax for capital gains income is 20 percent while that for labor income is 36 percent, and taxes are only paid on realized not actual gains. Second, in a life-cycle context most of a typical worker's future capital income results from savings out of labor income. In this sense future taxes paid on savings are effectively born by current labor income.

The average rate of labor tax is labor tax revenues over labor income, i.e. (590 + 138 + 501 + 312)/4684 = 0.33. This can be decomposed into 12.7 percent for federal income taxes, 3.0 percent for state income taxes, 10.8 percent for social security taxes, and 6.7 percent for sales and excise taxes.

CALCULATING THE MARGINAL RATE OF LABOR TAX

Due to the progressivity of the personal income tax system the marginal rate of tax exceeds the average rate. Feldstein (1998) uses a value of 24 percent for the marginal rate of federal income tax for the average worker. To apply this figure to our definition of labor income--as opposed to pre-income tax household earnings--we multiply by (3849 + 245)/(3849 + 245 + 312 + 251), which gives 21.1 percent. Adding on the rate of state income tax (3.0) gives 24.1.[40]

The social security tax is a proportional tax on wage earnings, except that the non-Medicare component (81 percent of the tax) is zero above a threshold level. In 1995, 6 percent of workers were above this threshold (*Statistical Abstract*, 1997, Table 585). Thus we calculate the marginal tax rate from the average tax rate (10.8) as: $10.8 - (0.81 \times 0.06 \times 10.8) = 10.3$. Since sales and excise taxes are proportional the marginal rate equals the average rate (6.7). Adding up all these marginal tax rates gives 41 percent.

ADJUSTING THE TAX-SUBSIDY IN HOUSING FOR THE PROPERTY TAX

We calculate property tax payments by owner occupiers by dividing the revenue loss from the income tax deduction for property taxes, $14.8 billion (see Table 1), by the marginal rate of income tax, 0.24, which gives $61.7 billion.[41] From Table 1 the value of housing services is $57.9/.24 = $241.25. When 50 percent of the property tax is distortionary, and property taxes are deductible from income taxes, the net additional tax rate is given by (.5-.24)(61.7/241.25) = .06. Conversely, when the property tax is not distortionary, but is deductible from income taxes, the net additional subsidy is -.24(61.7/241.25) = .06.

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[40] The marginal rate of state income tax is a little higher than the average rate due to income tax deductions, although making this adjustment (if the data were available to do it) would not have a noticeable effect on our overall labor tax figures. Browning's (1987) tax estimates also includes the implicit tax on the labor supply of low-income families due to the withdrawal of benefits (e.g. food stamps, Medicaid, and housing benefits) as income rises. However the empirical significance of this effect on the labor tax rate averaged across all workers may not be that large, since only a minor fraction of workers receive benefits.

[41] Using an estimate of total property tax revenues would overstate payments by homeowners, since property taxes are also paid on rented housing and commercial real estate.

REFERENCES

Aschauer, D. A. 1985. "Fiscal Policy and Aggregate Demand," *American Economic Review*, 75, pp. 117-127.

Atkinson, Anthony A., and Nicholas H. Stern. 1974. "Pigou, Taxation and Public Goods," *Review of Economic Studies*, 41, pp. 119-128.

Auten, Gerald, and Robert Carroll. 1998. "The Effect of Individual Income Taxes on Household Behavior," *Review of Economics and Statistics*, forthcoming.

Auten, Gerald, Holger Sieg, and Charles Clotfelter. 1999. *Charitable Giving and Income Taxation in a Life-Cycle Model: An Analysis of Panel Data*, Discussion Paper, U.S. Treasury, Washington D.C.

Ballard, Charles L. 1990. "Marginal Efficiency Cost Calculations: Differential vs. Balanced-Budget Analysis," *Journal of Public Economics*, 41, pp. 263-276.

Ballard, Charles L., and Donald Fullerton. 1992. "Distortionary Taxation and the Provision of Public Goods," *Journal of Economic Perspectives*, 6, pp. 117-131.

Ballard, Charles L., John B. Shoven, and John Whalley. 1985. "General Equilibrium Computations of the Marginal Welfare Costs of Taxes in the United States," *American Economic Review*, 75, pp. 128-138.

Browning, Edgar K. 1976. "The Marginal Cost of Public Funds," *Journal of Political Economy*, 84, pp. 283-298.

Browning, Edgar K. 1986. "The Marginal Cost of Raising Tax Revenue," in Phillip Cagan, ed., *Essays in Contemporary Economic Problems* (Washington, D.C.: American Enterprise Institute).

Browning, Edgar K. 1987. "On the Marginal Welfare Cost of Taxation," *American Economic Review*, 77, pp. 11-23.

Browning, Edgar K. 1994. "The Non-Tax Wedge," *Journal of Public Economics*, 53, pp. 419-433.

Browning, Edgar K., Timothy Gronberg, and Liqun Liu. 1997. *Alternative Measures of the Marginal Costs of Funds*, Working Paper 9803, Private Enterprise Research Center, Texas A&M University, College Station, Texas.

Carroll, Robert. 1998a. *Do Taxpayers Really Respond to Changes in Tax Rates*, Working Paper No. 78, Office of Tax Analysis, U.S. Treasury, Washington, D.C.

Carroll, Robert. 1998b. "Tax Rates, Taxpayer Behavior, and the 1993 Tax Act," paper presented at the National Tax Association Meetings, Austin, Texas.

Feldstein, Martin. 1995. "The Effect of Marginal Tax Rates on Taxable Income: A Panel Study of the 1986 Tax Reform Act," *Journal of Political Economy*, 103, pp. 551-572.

Feldstein, Martin. 1999. "Tax Avoidance and the Deadweight Loss of the Income Tax," *Review of Economics and Statistics*, forthcoming.

Feldstein, Martin, and Bernard Friedman. 1977. "Tax Subsidies, The Rational Demand for Insurance and the Health Care Crisis," *Journal of Public Economics*, 7, pp. 155-178.

Feldstein, Martin, and Andrew Samwick. 1992. "Social Security Rules and Marginal Tax Rates," *National Tax Journal*, XLV, pp. 1-22.

Fuchs, Victor R., Alan B. Krueger, and James M. Poterba. 1998. "Economists' Views about Parameters, Values and Policies: Survey Results in Labor and Public Economics," *Journal of Economic Literature*, 36, pp. 1387-1425.

Fullerton, Donald. 1991. "Reconciling Recent Estimates of the Marginal Welfare Cost of Taxation," *American Economic Review*, 81, pp. 302-308.

Gruber, Jonathan, and James M. Poterba. 1994. "Tax Incentives and the Decision to Purchase Health Insurance," *Quarterly Journal of Economics*, CIX, pp. 701-734.

Harberger, Arnold C. 1964. "The Measurement of Waste," *American Economic Review*, 54, pp. 58-76.

Harberger, Arnold C. 1984. "Basic Needs versus Distributional Weights in Social Cost-Benefit Analysis," *Economic Development and Cultural Change*, 32, pp. 455-474.

Hoyt, William H., and Stuart S. Rosenthal. 1992. "Owner-Occupied Housing, Capital Gains, and the Tax-Reform Act of 1986," *Journal of Urban Economics*, 32, pp. 119-139.

Killingsworth, Mark R. 1983. *Labor Supply* (Cambridge, Mass.: Cambridge University Press).

Kormendi, R. C. 1983. "Government Debt, Government Spending and Private Sector Behavior," *American Economic Review*, 73, pp. 994-1010.

Lindsey, Lawrence. 1987. "Estimating the Behavioral Responses of Taxpayers to Changes in Tax Rates: 1982-1984. With Implications for the Revenue-Maximizing Tax Rate," *Journal of Public Economics*, 33, pp. 173-206.

Lucas, Robert E. 1990. "Supply-Side Economics: An Analytical Review," *Oxford Economic Papers*, 42, pp. 293-316.

Mayshar, J. 1991. "On Measuring the Marginal Cost of Funds Analytically," *American Economic Review*, 81, pp. 1329-1335.

Mirrlees, James A. 1994. "Optimal Taxation and Government Finance," in John M. Quigley and Eugene Smolensky, eds., *Modern Public Finance* (Cambridge, Mass.: Harvard University Press).

Nakagami, Yasuhiro, and Alfredo M. Pereira. 1996. "Budgetary and Efficiency Effects of Housing Taxation in the United States," *Journal of Urban Economics*, 39, pp. 68-86.

Oates, Wallace E. 1994. "Federalism and Government Finance," in J. Quigley and E. Smolensky, eds., *Modern Public Finance* (Cambridge, Mass.: Harvard University Press).

Parry, Ian W. H., and Antonio M. Bento. 1999. *Tax Deductible Spending, Environmental Policy, and the "Double Dividend" Hypothesis*, Discussion Paper 99-24, Resources for the Future, Washington, D.C. (December 1998).

Pauly, Mark V. 1986. "Taxation, Health Insurance, and Market Failure in the Medical Economy," *Journal of Economic Literature*, vol. 24, no. 2, pp. 629-675.

Phelps, Charles E. 1983. *Taxing Health Insurance: How Much is Enough?*, Report P-6915, Rand Corporation, Santa Monica, California.

Phelps, Charles E. 1992. *Health Economics* (New York: Harper Collins).

Pigou, Arthur C. 1947. *A Study in Public Finance*, Third edition (London: Macmillan).

Rosen, Harvey S. 1979. "Housing Decisions and the U.S. Income Tax: An Econometric Analysis," *Journal of Public Economics*, 11, pp. 1-23.

Rosen, Harvey S. 1985. "Housing Subsidies: Effects on Housing Decisions, Efficiency, and Equity," in Alan J. Auerbach and Martin Feldstein, eds., *Handbook of Public Economics*, Vol. 1 (New York: North-Holland).

Russek, Frank R. 1996. *Labor Supply and Taxes*, Discussion Paper, Congressional Budget Office, Washington, D.C.

Slemrod, Joel. 1998. "Methodological Issues in Measuring and Interpreting Taxable Income Elasticities," *National Tax Journal*, 51, pp. 773-788.

Slemrod, Joel, and Schlomo Yitzhaki. 1996. "The Cost of Taxation and the Marginal Efficiency Cost of Funds," *IMF Staff Reports*, vol. 43, no. 1, pp. 172-198.

Snow, Arthur, and Ronald S. Warren. 1996. "The Marginal Welfare Cost of Public Funds: Theory and Estimates," *Journal of Public Economics*, 61, pp. 289-305.

Stuart, Charles. 1984. "Welfare Costs per Dollar of Additional Tax Revenue in the United States," *American Economic Review*, 74, pp. 352-362.

Triest, Robert K. 1998. "Econometric Issues in Estimating the Behavioral Response to Taxation: A Nontechnical Introduction," *National Tax Journal*, LI, pp. 761-772.

Wildasin, David E. 1984. "On Public Good Provision with Distortionary Taxation," *Economic Inquiry*, 22, pp. 227-243.