The Economic Burden of Taxation

William A. Niskanen

The many burdens of government include those attributable to taxation, monetary policy, regulations, and restrictions on civil liberties. This paper is specific to the economic burden of taxation, without in any way minimizing the other types of burdens.[1]

THE MODEL

The economic burden of taxation is a function of three conditions: the level of the average tax rate, the relation of the marginal tax rate to the average tax rate, and the response of the tax base to changes in the marginal tax rate.[2]

Start with the basic relation of the size of the economy to the two major fiscal decisions:

$$Y = aG^b(1 - R)^c \tag{1}$$

where Y = GDP per potential worker,
G = expenditures for government services (excluding defense) per potential worker, and
R = the *average* tax rate.

The two major fiscal decisions, of course, are the level of expenditures for government services (excluding defense) and the level of the average tax rate. This equation is expressed in terms of output per potential worker to capture the effects of G and (1 – R) on both hours worked per potential worker and on output per worker hour. The implicit assumption in this equation is that government expenditures for defense, transfer payments, interest payments, and subsidies have no significant net effect on the output per potential worker; there is ample evidence, of course, that most transfer payments reduce output per potential worker. The elasticity *c*, as I will demonstrate, reflects the combined effects of the relation of the marginal tax rate to the average tax rate times the elasticity of Y with respect to one minus the marginal tax rate. For the moment, pay no attention to the G variable; at the end of the paper, I will return to discuss the effects of the combination of G and R on the optimal size of government.

Given Equation 1, tax revenues per potential worker are

$$T = RY = aG^{b}R(1 - R)^{c} \tag{2}$$

and the output per potential worker net of taxes is

$$N = Y - T = aG^{b}(1 - R)^{(1 + c)}. \tag{3}$$

The marginal economic burden of taxation, thus, is the change in net output per unit increase in tax revenues. Some manipulation of Equations 1 and 2 yields the following equation for the marginal economic burden:

$$\partial N/\partial T = - [(1 + c)(1 - R)]/[1 - (1 + c)R]. \tag{4}$$

Equation 4, plus the observed data for the average tax rate and an estimate of the elasticity *c*, thus, is sufficient to estimate the quantitative magnitude of the marginal economic burden of taxation. If the elasticity $c = 0$, of course, the reduction in net GDP is equal to the increase in tax revenues, and there is no deadweight loss of the additional taxes. The marginal cost of taxation, however, increases rapidly as a function of both *c* and R.

Before presenting my estimates of the relevant parameters, however, I promised to address the effects of the structure of the tax system, more specifically the relation between the marginal and average tax rates. A more precise formulation of Equation 1 would include the marginal tax rate M rather than the average tax rate R in the term in parentheses. For two reasons, however, I have chosen to use the average tax rate R: There are no available data on the income-weighted aggregate marginal tax rate or agreed procedures for estimating this rate. And, since T = RY, the average tax rate must be used in Equation 2, adding an undetermined variable to the model. If the marginal tax rate M, however, is a function of the average tax rate R, the average tax rate can be used in both equations. For example, if

$$M = -x + yR, \tag{5}$$

then

$$(1 - R)^{c} = (1 + x - yR)^{z} \tag{6}$$

and the relation between *c* and z is

$$c = yz[(1 - R)/(1 + x - yR)]. \tag{7}$$

The elasticity *c*, thus, is seen to be the product of the marginal effect of R on M and the marginal effect of (1 – M) on Y. An increase in the elasticity *c* may reflect either an increase in the progressivity of the tax structure (the parameter y) or an increase in the adverse economic effect of the marginal tax rate (the parameter z).

THE ELASTICITIES

For this study, the elasticities *b* and *c* of Equation 1 are estimated by two independent techniques. The first technique is to estimate the long-term relation between fiscal choices and economic outcomes in the United States. For this purpose, several economic growth equations were estimated by two-stage least squares regressions, based on a sample of annual U.S. data from 1964 through 1999. Equations were estimated for the annual change of three dimensions of economic growth:

– real GDP per potential worker,
– output per hour in the business sector, and
– hours worked in the business sector per potential worker.

The primary fiscal measures in these regressions are the annual change in real expenditures for government services (excluding defense) per potential worker, one minus the average tax rate, and one minus the average tax rate in the second prior year. The first equation is sufficient to estimate the elasticities for this study, but the other equations were estimated to identify the relative effects of the fiscal choices on productivity and hours worked.

The second technique is to estimate the elasticities *b* and *c* that are implicit in the actual levels of G and R for the United States in 1996, given the model of the fiscal choices of democratic governments developed in my book. In effect, this involves solving my model of democratic government backwards from the known fiscal choices in 1996 to the elasticities that are consistent with these choices. The finding that the elasticities estimated by these two techniques are quite close may be an indirect validation of my model of the fiscal choices of democratic governments.

Table 1 presents the estimates of the elasticities of fiscal effects from these two techniques.

The other regressions on the changes in productivity and hours worked suggest that about half of the effect of tax changes on short-run economic growth operate through changes in productivity and about half through changes in hours worked. The estimated effect of the after-tax rate on hours worked is consistent with a large number of other studies, most of which have neglected to estimate the effect on productivity. In the long run, however, about two-thirds of the effect of tax changes on economic growth operate through changes in productivity, because there is no significant difference between the short-run and long-run effects on hours worked. The finding that the implicit estimate of the elasticity *c* is quite close to the short-run estimate from the time-series regression may suggest that our government takes into account only the short-run effects on output of changes in taxes.

THE MARGINAL ECONOMIC BURDEN OF TAXATION

Now we can address the primary topic of this paper. Table 2 presents estimates of the marginal economic burden of taxation from Equation 4 for a range of the variable R and the elasticity *c*. These numbers, again, are the marginal reduction in output (or income) after taxes per additional dollar of government tax revenue.

Given that the elasticity *c* implicit in recent U.S. fiscal conditions is about 0.8 and the average tax rate is about 0.3, the marginal cost of government spending and taxes in the United States may be about $2.75 per additional dollar of tax revenue. One wonders whether there are *any* government programs for which the marginal value is that high. Given the estimate of the long-term elasticity *c* from the U.S. time-series data, the marginal cost of government spending and taxes may be as high as $4.50 at the current average tax rate. The cost estimate in a benefit-cost study of any program financed by general taxes

Table 1

Estimates of the Elasticities of the Fiscal Effects on Economic Growth

	Estimated	**Implicit**
b	.200 (.036)	.220
c (short run)	.748 (.127)	.772
c (long run)	1.212 (.164)	

NOTE: Numbers in parentheses are the standard errors of the estimates from the regression equation.

Table 2

The Marginal Economic Burden of Taxation

	R		
	.2	**.3**	**.4**
c			
.4	1.556	1.690	1.909
.8	2.250	2.739	3.857
1.2	3.143	4.529	11.000

should be multiplied by the relevant number from this table. All of these estimates, of course, increase as a function of both c and R and approach infinity as R nears the revenue-maximizing tax rate.

SOME OTHER INTERESTING ESTIMATES

The model and the empirical estimates of Equation 1 also provide a basis for estimating several other interesting magnitudes: the revenue-maximizing average tax rate, the net output maximizing level of G, and the net excess burden of maintaining a 30 percent average tax rate given the optimal level of G.

The maximum average tax rate is determined from Equation 2 by setting the derivative of T with respect to R equal to zero; this yields the following equation for the maximum R:

$$R = 1/(1 + c). \tag{8}$$

As the equation indicates, the revenue-maximizing average tax rate declines with an increase in the elasticity c, whether caused by an increase in the progressivity of the tax system or an increase of the elasticity of output with respect to one minus the marginal tax rate.

The level of G that maximizes net output is determined from Equation 3 by setting the derivative of N with respect to G equal to zero; this yields the following equation for the optimal ratio of G to Y:

$$G/Y = b/(1 + c). \tag{9}$$

As this equation indicates, the optimal domestic spending share of GDP increases with the elasticity b and declines with the elasticity c. This has always presented somewhat of a dilemma for tax reformers; a reduction of the progressivity of the tax structure is likely to lead to an increase in the relative size of government spending because it reduces the marginal cost of additional spending. My own suggestion is that approval of any broad-based, flat-rate tax reform should be accompanied by a change of the voting rule to require a supermajority vote for any subsequent increase in the base or rate.

The net excess burden of taxation is also estimated from Equation 3 by calculating the net output if R = .3 (roughly what it has been in the United States for some years) relative to the net output if R is sufficient to finance only the optimal level of G. This is a rough estimate of the loss of net output from setting an average tax rate sufficient to finance government spending for defense, transfer payments, etc., in addition to the optimal level of G.

Table 3 presents these other interesting estimates for several levels of the elasticity c. All of the calculations of the optimal level of G/Y and the net excess burden are based on the elasticity b = .2, as there seems little uncertainty about this elasticity.

Table 3
Some Other Interesting Estimates

	Maximum R	Optimal G/Y	Net Burden
c			
.4	.714	.143	.247
.8	.556	.111	.350
1.2	.455	.091	.437

As expected, the revenue-maximizing average tax rate declines sharply with an increase in the elasticity *c*; this rate would be the peak of any Laffer curve expressed in terms of the average tax rate and is the ultimate limit on the sustainable level of government spending relative to GDP. The optimal level of expenditures for government services (excluding defense) relative to GDP also declines with an increase in the elasticity *c* but to a level that is not much lower than recent experience; in 2001, for example, government consumption expenditures and gross investment, excluding defense, were 14.5 percent of GDP. Given an estimate of the elasticity *c* that reflects the effects of the after-tax rate on both the supply of labor and on productivity, the optimal level of G is about 10 percent of GDP, a relative level of G that Milton Friedman has supported for many years. The net excess burden of taxation beyond that necessary to finance the optimal level of G, however, increases with the elasticity *c*. This column indicates that the net economic cost to the economy of a level of total spending and taxes beyond that necessary to finance the optimal level of G increases from about 25 percent of net potential output if $c = .4$ to about 44 percent of net potential output if $c = 1.2$. This does not suggest that there is no value to government spending above the optimal level of G, only that the net cost to the economy of this spending is much higher than the direct expenditures for these programs.

For those of you who may wish to pursue these issues in the larger context of the fiscal choices of alternative political regimes, I encourage you to read my book.

NOTES

[1] Most of this paper is a summary of some footnotes in my new book, *Autocratic, Democratic, and Optimal Government: Fiscal Choices and Economic Outcomes*, published by Edward Elgar in February 2004.

[2] The standard reference article on this issue is by Edgar K. Browning (1987), "The Marginal Welfare Cost of Taxation," *American Economic Review* 77: 11–23.