The Social Cost of Canadian Labour Taxes

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PRÉCIS

Lorsque l'on compare les avantages d'un projet gouvernemental avec son coût, on est tenté d'évaluer la valeur de ce projet en fonction de ce qu'il coûtera. Cette méthode est cependant erronée parce qu'elle ne tient pas compte des coûts occultes des impôts qui servent à financer le projet. Ces coûts occultes constituent des pertes en bien-être imposées aux ménages lorsque les impôts altèrent leurs décisions dans le marché, et les incitent à éviter une partie du fardeau fiscal. Cet article examine les distortions que l'ensemble des impôts canadiens sur la main-d'oeuvre provoquent dans le marché du travail. Les effets de l'impôt sur le revenu des particuliers, des taxes de vente et d'accises, et des cotisations aux régimes de pensions et à l'assurance-chômage sont considérés.

Étant donné que les décisions politiques sont prises à la marge, nous estimons le coût marginal en bien-être par dollar de revenu supplémentaire en appliquant une méthode utilisée par Browning pour les États-Unis. Nos résultats sont influencés par l'ampleur de l'élasticité compensée de l'offre de travail, le type d'impôt sur le travail et l'effet des dépenses gouvernementales sur l'offre de travail. Nous constatons que pour chaque dollar supplémentaire de revenu, le coût marginal en bien-être de l'imposition du travail pourrait être aussi minime que 18 ¢ et aussi élevé que 1,97 $. Cependant les résultats de calculs basés sur des valeurs de paramètre intermédiaires sont de l'ordre de 30 ¢ à 43 ¢ par dollar de revenu supplémentaire. En d'autres termes, les avantages que les dépenses gouvernementales marginales apportent aux ménages doivent valoir entre 1,30 $ à 1,43 $ pour chaque dollar dépensé à un projet afin de ne pas amoindrir le bien-être collectif des Canadiens.

ABSTRACT

In comparing the benefits of a government project with its costs, it is tempting to use project costs as the basis for measurement. This approach is a mistake, however, since it ignores the hidden costs of the taxation that supplies the funds for the project. These hidden costs are the welfare losses that are imposed on households when

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taxes distort their decisions in the marketplace and induce them to avoid some of the burden of taxation. The present article considers the labour-market distortions caused by Canadian labour taxes, which include the personal income tax, sales and excise taxes, and public pension and unemployment insurance contributions.

Since policy decisions are made at the margin, we estimate the marginal welfare cost per dollar of added revenue, following an approach used by Browning for the United States. Our estimates are sensitive to the size of the compensated labour supply elasticity, the type of labour tax imposed, and the influence of government spending on labour supply. We find that for an additional dollar of revenue the marginal welfare cost of labour taxation can be as low as 18 cents or as high as $1.97. A conservative range of estimates, one that relies on intermediate parameter values, is 30 to 43 cents per dollar of additional revenue. In other words, unless the benefits that marginal government spending confer on households are worth somewhere between $1.30 and $1.43 per dollar of project cost, the spending will diminish the collective welfare of Canadians.

Are Canadians overtaxed? To be more specific, would the welfare of the average Canadian increase if government spending were trimmed somewhat and tax rates were cut accordingly? As topics for cocktail conversation, these questions often implicitly assume that the expenditure of an additional dollar of tax revenue is justified if it yields social benefits in excess of one dollar. At a time when top bracket marginal income tax rates easily surpass 50 percent, however, we need to recast the issue by recognizing that the economic or social cost of an additional dollar of tax revenue is significantly more than one dollar. The important question for policy purposes is how much more.

The concept of the marginal welfare cost of taxation is a useful basis for addressing this question, since one can apply it with some quantitative precision. It compares the loss in economic welfare that arises from an increase in the tax rate with the additional revenue that is collected. Unless the extra government spending confers benefits on households that at least match this welfare loss, the increase in taxation will make households worse off and the expenditure cannot be justified on economic grounds. Measurements of marginal welfare cost have been made for countries such as the United States and Sweden, but there are almost none, at least not in widely available published form, for Canada. In response to this empirical void, we offer some estimates of marginal welfare cost obtained by adapting a well-known and frequently used partial equilibrium methodology to the Canadian context. The first section below describes our methodological framework in graphical terms and proceeds from there to develop the algebraic equations required for measuring the marginal welfare costs of taxes on labour

income.[1] The section concludes with a brief treatment of the results of this mode of analysis for other countries. The second section discusses the appropriate range of parameter values for the Canadian case. The final section presents the results of our analysis and some interpretation of their significance.

A METHODOLOGY FOR MEASURING THE MARGINAL WELFARE COST OF LABOUR TAXES

Our framework for estimating the marginal welfare cost of labour taxes derives from a spate of articles by Browning,[2] whose work has been inspired in its turn by the earlier efforts of Harberger.[3] The analytical approach can be explained with the aid of figure 1, in which it is assumed that the wage rate, w, is constant and that workers make their choices between work and leisure according to the upward sloping compensated labour supply curve, L_S. The compensated labour supply curve is the relevant supply curve because it allows one to compare the labour-market effects of a tax on labour income and a neutral, lump-sum tax that yields the same revenue. By definition, the social cost of another dollar from the neutral revenue source is one dollar. When labour income is taxed initially at a marginal rate of m, the amount of labour actually supplied is shown as L_2. If the level of expenditure supported by this tax were financed instead by a neutral tax, the larger amount of labour shown as L_1 would be offered. Alternatively, if the neutral tax were replaced with the tax on labour income, the labour supply would decline from L_1 to L_2.

If government expenditure is constant, households' real income, and hence their utility, is invariant along the compensated labour supply curve, in which case only the substitution effect of a wage change will influence the choice between work and leisure. Our hypothetical tax substitution removes any income effect of a tax-induced wage change and forces workers to make labour supply decisions along the compensated supply curve. If taxes and

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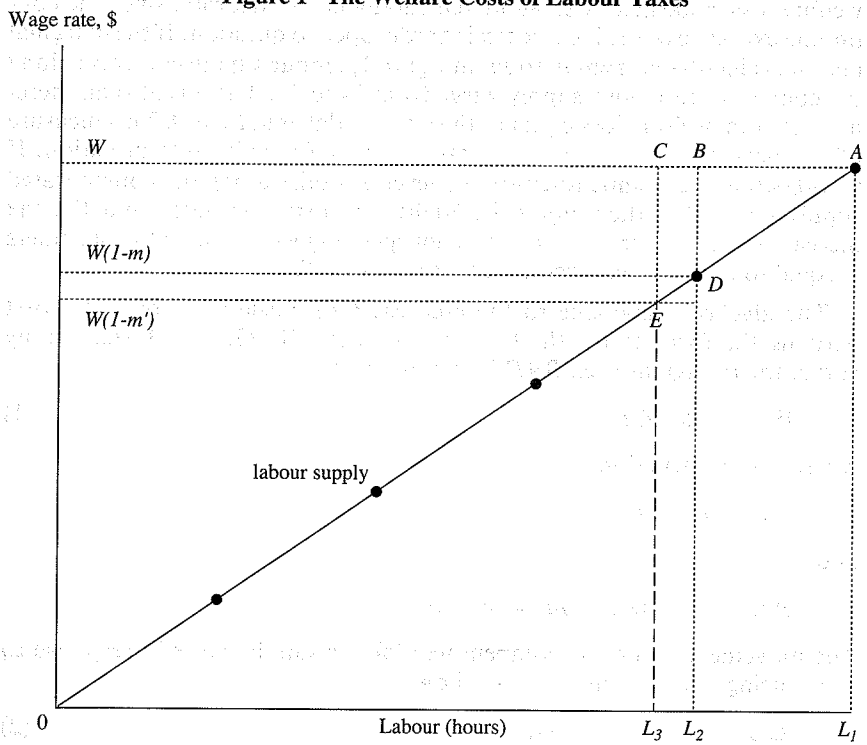
[1] All taxes except poll and benefit taxes cause welfare losses. Taxes on capital income, for example, distort decisions about the intertemporal use of resources—that is, they distort the choice between current consumption and future consumption or savings. The methodology we use here can be adapted to measure the marginal welfare cost of taxes on capital income and it could be extended to consider the joint cost of taxes on labour income and taxes on capital income along the lines of J. Gregory Ballentine and Wayne R. Thirsk, "Labour Unions and Income Distribution Reconsidered" (February 1977), 10 *The Canadian Journal of Economics* 141-48.

[2] Edgar K. Browning, "The Marginal Cost of Public Funds" (April 1976), 84 *Journal of Political Economy* 283-98; "The Marginal Social Security Tax on Labor" (July 1985), 13 *Public Finance Quarterly* 227-51; "The Marginal Cost of Raising Tax Revenue," in P. Cagan, ed., *Essays in Contemporary Economic Problems* (Washington, DC: American Enterprise Institute, 1986); and "On the Marginal Welfare Cost of Taxation" (March 1987), 77 *The American Economic Review* 11-23.

[3] Arnold C. Harberger, "Taxation, Resource Allocation, and Welfare," in *The Role of Direct and Indirect Taxes in the Federal Revenue System*, Conference Report of the National Bureau of Economic Research and the Brookings Institution (Princeton, NJ: Princeton University Press, 1964), 25-70.

Figure 1 The Welfare Costs of Labour Taxes



Note: area *BAD* = total welfare cost; area *BCED* = marginal welfare cost.

government spending were constant, a wage change would provoke opposing income and substitution effects on labour supply and generate an observable labour supply function. Since our tax experiment excludes income effects, the labour supply response along the compensated supply curve is not readily observable. It can, however, be estimated.

Unlike the neutral tax, the tax on labour income distorts labour supply decisions and creates a welfare loss. Workers are initially taxed at a marginal tax rate of m and are observed to supply the amount of labour L_2. Point D is a point on both the observed and the compensated labour supply curves. Substitution of the labour tax for the neutral tax causes the supply of labour to shrink from L_1 to L_2, and the value of workers' output lost to the economy is the rectangular area BAL_1L_2. The value of the additional leisure consumed by workers is the area beneath their compensated labour supply curve DAL_1L_2 (the amount of money workers would require in order to forgo this leisure consumption and be no worse off than they are in the post-tax equilibrium). Thus there is a net loss to society from imposing taxes on labour income at rate m—a loss represented by the triangular area BAD.

The welfare loss BAD measures the welfare consequences of imposing income taxes on labour. More relevant for policy purposes is the additional

welfare loss associated with an incrementally higher tax rate, since the continuing existence of the income tax is hardly open to question. If the marginal tax rate is increased from m to m^1 in figure 1, labour supply contracts along the compensated labour supply curve from L_2 to L_3. There is also an increment to total welfare loss equal to the trapezoidal area *ECBD*. This measure of the marginal welfare cost of taxation has the following interpretation. If workers are to continue to enjoy the level of utility along the compensated supply curve that they enjoyed initially, the extra revenue from the tax increase must finance extra government spending whose value to consumers is equal to the marginal welfare cost of area *ECBD*.

The algebraic analogue to the area *ECBD* is easiest to obtain by first deriving the formula for the total welfare cost, W. Given a linear supply curve, the triangular area *BAD* is expressed as

$$W = \tfrac{1}{2} \Delta w \Delta L, \tag{1}$$

where, by construction,

$$\Delta L = L_1 - L_2$$

and

$$\Delta w = w - w(1 - m) = w \cdot m.$$

The movement along the compensated labour supply curve in response to introducing a tax at rate m is as follows:

$$\Delta L = \partial L/\partial w \cdot w \cdot m. \tag{2}$$

Substitution of this expression into equation 1 and multiplication by $L_2(1 - m)/L_2(1 - m)$ gives this result:

$$\begin{aligned} W &= 0.5[\partial L/\partial w \cdot w(1 - m)/L_2]m^2/(1 - m) \cdot wL_2 \\ &= 0.5\, u \cdot m^2/(1 - m) \cdot \sum_i Y_i, \end{aligned} \tag{3}$$

where $u = \partial L/\partial w \cdot w(1 - m)/L_2$ is the compensated labour supply elasticity evaluated at point D in figure 1, Y_i is labour income in a particular rate bracket, and

$$\sum_i Y_i = wL_2$$

is total labour income. Notice that m must be interpreted as a weighted average of the marginal tax rates in each bracket, with weights representing the share of labour income in each bracket, if figure 1 refers to total labour supply rather than to the amount of labour offered by workers in a particular rate bracket.

The marginal welfare cost (MWC) is by definition the derivative of W with respect to m times dm, the incremental change in the tax rate:

$$\text{MWC} = dW = \partial W/\partial m \cdot dm = u \cdot m/(1 - m) \cdot \sum_i Y_i dm. \tag{4}$$

One can express the revenue from labour taxes as the product of the average tax rate, t, and the amount of taxable labour income, $\sum_i Y_i$:

$$R = t \cdot \sum_i Y_i. \tag{5}$$

The revenue impact of a higher marginal tax rate is a function of how that rate affects the average tax rate and how the actual amount of labour supplied responds to the combined tax and expenditure change:

$$dR = \sum_i Y_i\, dt + mwdL. \tag{6}$$

Equivalently,

$$dR = \partial R/\partial m \cdot dm = \sum_i Y_i(\partial t/\partial m)\, dm + mw\, \partial L/\partial m \cdot dm.$$

To proceed further requires some assumption about the effect of government spending on the amount of labour actually supplied to the economy. Because a large number of assumptions are equally plausible, it is desirable to consider two extremes that encompass the range of likely possibilities. At one extreme is the assumption that marginal expenditure provides no benefits and that the negative income effect resulting from higher revenue and no expenditure benefits negates the substitution effect of the wage change. In this case, dL is zero, the actual supply curve is the vertical line L_2DB in figure 1, and equation 6 simplifies to

$$dR = \sum_i Y_i(\partial t/\partial m) \cdot dm. \tag{6.1}$$

At the other extreme is the assumption that the benefits of the marginal spending are sufficient to restore households to their original level of welfare before the marginal change in taxation. Under this assumption, dL becomes the compensated change in labour supply and the actual labour supply curve coincides with the compensated supply curve shown in figure 1. In this case, wdL is the compensated change in labour earnings and

$$wdL = \left[\left(\frac{\partial L}{\partial w}\right)\left(\frac{w}{L_2}\right)(m - m^1)\right]\frac{L_2(1-m)}{(1-m)}w = -u\sum_i Y_i\frac{dm}{(1-m)}.$$

Substitution of this expression for wdL into equation (6) gives

$$dR = (\partial R/\partial m)\, dm = \sum_i Y_i(\partial t/\partial m)\, dm - u\sum_i Y_i\frac{m}{1-m}dm. \tag{6.2}$$

Equations 6.1 and 6.2 generate two alternative calculations for the marginal welfare cost per dollar of extra tax revenue. If one combines equations 4 and 6.1, the result is

$$\frac{dW}{dR} = u\left(\frac{m}{1-m}\right)\left(\frac{dm}{dt}\right). \tag{7}$$

If one uses equation 6.2 in place of equation 6.1, the result is

$$\frac{dW}{dR} = \frac{u\left(\frac{m}{1-m}\right)\left(\frac{dm}{dt}\right)}{1 - u\left(\frac{m}{1-m}\right)\left(\frac{dm}{dt}\right)}. \qquad (7.1)$$

Notice that equation 7.1 will always indicate a higher marginal welfare cost per dollar of revenue, since the denominator will always be less than one as long as the labour supply elasticity, u, is positive. When the actual supply of labour contracts in response to a higher tax rate, the revenue yield is smaller than it otherwise would be and therefore the marginal welfare cost per dollar of revenue is larger. Ironically, the cost of labour income taxation is smaller if a profligate public sector wastes the revenue it receives. The negative income associated with this waste compels more work effort and offsets the tendency of higher taxes to reduce labour supply.

In both equations 7 and 7.1, three unknown parameters, u, the labour supply elasticity, m, the average marginal tax rate, and dm/dt, the progressivity of the change in tax structure, together determine the marginal welfare cost of labour taxation. Higher values for each of these parameters will produce a higher estimate of welfare cost. Browning's preferred estimates of marginal welfare cost for the United States vary between 32 and 47 cents per dollar of extra revenue.[4] This range corresponds to values for u, m, and dm/dt of 0.3, 0.43, and 1.39 respectively. Browning surveys a wide range of econometric efforts to estimate the labour supply elasticity and concludes that the relevant range is 0.2 to 0.4. Research suggests that it would be appropriate to use a similar range of elasticity values for the Canadian labour market.[5]

Stuart[6] and Ballard et al.[7] use general equilibrium techniques to obtain slightly lower estimates of marginal welfare cost for Sweden and the United States respectively. Stuart's measure of marginal welfare cost, however, is slightly different from Browning's. It considers the marginal welfare cost of another dollar of tax revenue when that dollar is returned to households as a lump sum transfer. Since households are not restored to their original level of utility, their welfare loss reduces their real income and induces them to work more. This extra work effort leads to an increase in revenue and hence

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[4] "On the Marginal Welfare Cost of Taxation," supra footnote 2.

[5] See, for example, Samuel A. Rea Jr., "The Impact of Taxes and Transfers on Labour Supply: A Review of the Evidence" (unpublished report, Ontario Economic Council, Toronto, 1983). More recent estimates of labour supply elasticities by Shelley A. Phipps, "The Impact of the Unemployment Insurance Reform of 1990 on Single Earners" (September 1990), 16 *Canadian Public Policy* 252-61, also lend support to choosing this range of values.

[6] Charles E. Stuart, "Swedish Rax Rates, Labor Supply, and Tax Revenues" (October 1981), 89 *Journal of Political Economy* 1020-38.

[7] Charles L. Ballard, John B. Shoven, and John Whalley, "General Equilibrium Computations of the Marginal Welfare Costs of Taxes in the United States" (March 1985), 75 *The American Economic Review* 128-38.

necessarily produces a lower estimate of welfare cost than the Browning approach. Stuart obtains an estimate of 24 cents as the marginal welfare cost per dollar of revenue for Sweden. The Ballard et al. study for the United States produces estimates of welfare cost that range between 17 and 56 cents per dollar and centre around a value of 33 cents.

MARGINAL EFFECTIVE TAX RATES ON LABOUR INCOME IN CANADA

The latest available data from Revenue Canada on the distribution of labour income by tax bracket is for the year 1987, when, if one takes into account the surtax on higher incomes, there were 11 separate tax brackets.[8] Workers must consider more than personal income taxes, however, in making their labour supply decisions. Labour incomes are also reduced by payroll taxes such as unemployment insurance (UI) and Canada Pension Plan (CPP) contributions and by sales and excise taxes.

For our purposes, the effective marginal tax rate (EMTR) for workers in different tax brackets is as follows:

$$EMTR = CPP + UI + PIT + CT(1 - PIT)/(1 + CPP^* + UI^*) \quad (8)$$

This formula can be rationalized along the following lines. In the denominator, for every dollar of income that a worker receives, he must produce enough income to pay for the employer's portion of CPP and UI contributions. We denote those contributions as CPP* and UI*. Thus the denominator of equation 8 captures a worker's total before-tax income. Out of the income (one dollar) that he receives, the worker is assumed to be liable for both the employer's and the employee's portions of CPP and UI premiums, personal income tax (PIT) payments, and commodity tax (CT) obligations on expenditures made from after-tax (1 − PIT) income.[9]

In 1987, if a worker earned less than $27,560 annually, he was subject to a payroll tax of 2.35 percent of his earnings for UI and the employer paid a UI contribution of 3.29 percent. Since the UI program covers most workers in Canada, and therefore imposes a general payroll tax, the employer's

[8] As part of its reform of personal income taxation in 1988, the federal government collapsed the 10 marginal rate brackets into 3. The data from Revenue Canada necessary for a calculation of marginal welfare costs for 1988 are not yet available, but it seems likely that marginal income tax rates have fallen slightly. At the same time as the government reformed the structure of the personal income tax, however, it also increased the manufacturers' sales tax, so it is unlikely that the effective marginal tax rate on labour income has declined. Equation 8 below shows how direct and indirect taxes must be combined in order to measure the total marginal tax burden on labour incomes. Since 1988, the "clawback" of old age pensions and family allowances has also raised effective marginal tax rates for many taxpayers.

[9] For low-income workers who earn incomes below the CPP and UI thresholds, the interaction between direct and indirect taxes takes the form CT(1 − PIT − UI − CPP). For higher-income workers, CPP and UI become inframarginal taxes and the expression in equation 8, CT(1 − PIT), is applicable. This formula also makes it clear that the effective marginal tax rate on labour incomes is independent of the mix of commodity and income taxes for a given amount of revenue, unless workers are subject to some form of money illusion and base their labour supply decisions on money wages rather than real wages.

portion of UI is most likely borne by the workers themselves. Thus UI equals 5.64 percent and UI* equals 3.29 percent in equation 8 for lower-income workers. For workers who earned more than $27,560 in 1987, UI is an inframarginal levy and its value in equation 8 is effectively zero.

CPP contributions operate in a similar fashion, except that in their case there is a much stronger element of quid pro quo. If the CPP functioned on an actuarial basis, the value of contributions would be matched by the present value of future pension benefits and no element of taxation would exist. The presence in the CPP program of significant redistributive elements, however, means that there is no explicit link between benefits and contributions. For the purposes of our exercise, we assume that for workers who make less than the earnings ceiling ($25,900 in 1987) the CPP is a genuine tax and hence is fully distortive of labour supply decisions. Given the current contribution rates of 1.9 percent for both employers and employees, CPP equals 3.8 percent and CPP* equals 1.9 percent in equation 8. For workers who earn more than the ceiling, CPP is an inframarginal imposition and its value in equation 8 is zero.

The PIT rate incorporates the combined federal and provincial PIT rates plus any provincial and federal surtaxes. We obtained weighted average marginal PIT rates, by taxable income class, by multiplying each province's combined rate by its share of total provincial PIT revenue. These rates are, however, effective statutory rates on taxable income rather than effective rates on before-tax income, which rely on actual tax payments by income group; the latter are preferable to the former but much more difficult to estimate.[10] Because of the presence of the federal surtax on higher incomes in 1987, we distinguished 11 marginal rate categories in the data rather than the 10 statutory rate brackets.

We derived our commodity tax rate estimates from Kuo et al.,[11] who calculated that federal and provincial sales and excise taxes accounted for 8.3 percent of total household consumption in 1980. We used the ratio of consumption taxes to disposable income in 1987 relative to 1980 to obtain an adjusted tax rate for 1987 of 10.8 percent.

The results of factoring all of these tax rates into equation 8 appear in table 1. In the smallest range of labour incomes, between $5,000 and $7,162 in 1987, the effective marginal tax rate was 27.2 percent. Effective marginal tax rates rise steadily as labour income increases, until, in the highest range of $87,163 to $99,999, the rate becomes 58.8 percent. We obtained the values

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[10] We know of no study in Canada on this subject. For the United States, Browning, "On the Marginal Welfare Cost of Taxation," supra footnote 2, indicates that the effective tax rates on adjusted gross income are lower than the rates calculated by using the statutory rates applied to taxable income. Adjusted gross income is a better approximation of labour earnings than taxable labour income.

[11] Chun-Yan Kuo, Thomas C. McGirr, and Satya N. Poddar, "Measuring the Non-Neutralities of Sales and Excise Taxes in Canada" (1988), vol. 38, no. 3 *Canadian Tax Journal* 655-70.

Table 1 Effective Marginal Tax Rates, 1987

Range of labour income, $	Range of taxable labour income, $	Income by class, $ million	Effective marginal tax rates, %
5,000-7,162	1-1,319	7,247.1	27.2
7,163-8,330	1,320-2,074	4,828.3	36.6
8,331-9,204	2,075-2,639	4,017.3	39.6
9,205-12,551	2,640-5,278	17,613.7	40.9
12,552-15,517	5,279-7,917	17,941.5	43.4
15,518-21,479	7,918-13,196	42,156.3	44.8
21,480-28,084	13,197-18,475	49,355.6	45.7
28,085-34,394	18,476-23,754	45,223.2	44.5
34,395-50,885	23,755-36,951	83,804.0	47.1
50,886-87,162	36,952-63,347	44,873.7	53.5
87,163-99,999	63,348-79,999	30,521.6	58.8
		Total: 347,582.3	

for the rate brackets in table 1 from Revenue Canada's *Taxation Statistics*.[12] In order to convert the data for wage and salary income by income class from this source into taxable income by tax bracket, we divided total taxable income in each class by the number of taxfilers. We repeated this exercise until average taxable income increased to a threshold value at which the statutory marginal tax rate also increased.

ESTIMATES OF THE MARGINAL WELFARE COSTS OF LABOUR TAXES

Given the distributive data in table 1, one needs two additional parameters to implement empirically the marginal welfare cost expression shown in equations 7 and 7.1. They are the value of the compensated labour supply elasticity, u, and the degree of progressivity contained in the new structure of labour taxes, dm/dt. Unfortunately, neither parameter can be ascertained with complete certainty. We therefore used a range of plausible values to determine the sensitivity of the results to a particular parameter regime. As we indicated earlier, the plausible range for the labour supply elasticity is 0.2 to 0.4. In order to err on the conservative side, we chose values of 0.2 and 0.3 for our calculations of marginal welfare cost.

The appropriate choice for the progressivity parameter depends on the manner in which the structure of labour taxes is altered. One attractive assumption is that all labour taxes are adjusted proportionately, in which case m/t equals dm/dt. Under this assumption, as table 2 shows, the weighted average effective marginal tax rate, m, is 47.3 per cent and t is 28.3 percent, so dm/dt equals 1.66. Alternatively, one might suppose that only the income tax component of labour taxes is altered proportionally. In this case, the weighted average marginal income tax rate is more than twice the average income tax rate, so the value for dm/dt in this case is 2.46. Finally,

[12] Revenue Canada, Taxation, *Taxation Statistics, 1989 Edition* (Ottawa: Supply and Services, 1989).

Table 2 Estimation of the Progressivity Parameter, dm/dt

	Effective tax rate		Progressivity parameter,
	Marginal, m	Average, t	$m/t = dm/dt$
	percent		
Proportional expansion of			
All labour taxes[a]	47.3	28.3	1.66
Income taxes only [b]	37.9	15.4	2.46

[a]In calculating both the marginal and average tax rates for a proportional expansion of all labour taxes, the commodity tax rate is assumed to impose a burden on both current and future consumption at the same effective rate. That is, the term CT(1 − PIT) in our expression in the text for the effective marginal tax rate takes disposable income (consumption plus saving) as the commodity base base, given the assumption that the present value of the future consumption base is the value of current savings. Thus t from our data is calculated as 68,140.4/347,582.3 + 0.108 (1 − 68,140.4/347,582.3) = 28.3 percent, where $68,140.4 million is the sum of personal income taxes paid plus CPP and UI contributions. [b]In the case where only income taxes increase, t is the ratio of total personal income taxes to total taxable income. The weighted average marginal income tax rate is obtained by setting CT, UI, and CPP equal to zero in our expression in the text for the effective marginal tax rate.

one might assume that a new proportional tax has been layered onto the existing tax structure, in which case dm/dt is one by definition.

Table 3 presents our estimates of marginal welfare cost for different combinations of the parameter values and the alternatives of no change in the actual labour supply and a decrease in the labour supply. The marginal welfare cost is least when all labour taxes are raised proportionately, the actual labour supply is fixed, and the compensated labour supply elasticity is at its lower bound of 0.2. In this case, society sacrifices 18 cents for every additional dollar of revenue raised. The social cost rises as the values of the supply elasticity and the progressivity parameter increase, reaching a maximum of 66 cents when the supply elasticity is 0.3 and the progressivity parameter is 2.46.

Table 3 The Marginal Welfare Cost of Labour Taxes, 1987

	Parameter regime		Marginal welfare cost, ¢/$
	Labour supply elasticity, u	Progressivity, dm/dt	
No labour supply response (equation 7)	0.2	1.00	18.0
	0.2	1.66	29.8
	0.2	2.46	44.2
	0.3	1.00	26.9
	0.3	1.66	44.7
	0.3	2.46	66.3
Reduced labour supply (equation 7.1)	0.2	1.00	22.0
	0.2	1.66	42.5
	0.2	2.46	79.2
	0.3	1.00	36.8
	0.3	1.66	80.8
	0.3	2.46	196.7

In general, the marginal welfare costs are higher under the assumption that the supply of labour decreases in response to the increase in tax and expenditure. When the value of the compensated labour supply elasticity is 0.2, the marginal welfare cost varies, with the progressivity of the tax change, from 22 to 79 cents per dollar of additional revenue. At the higher value of 0.3 for the labour supply elasticity, the range is much wider—37 to 197 cents per dollar of extra tax revenue. Overall, it is apparent that the marginal welfare cost of labour income taxation is quite sensitive to the type of labour income tax that is imposed, the magnitude of the resulting expenditure benefits, and the value of the labour supply elasticity. If one uses the median value of the progressivity parameter and the lower bound of the supply elasticity, a conservative range of estimates for the marginal welfare cost of labour taxes is 30 to 43 cents per dollar of extra tax revenue, a range that is close to the preferred range of 32 to 47 cents that Browning established for the United States. For comparable values of the parameters, however, marginal welfare cost is somewhat greater in Canada—a consequence of the fact that in Canada tax progressivity is greater and marginal tax rates on wage and salary income are higher. For instance, when all labour taxes are raised proportionately and the labour supply elasticity is 0.3, marginal welfare costs in Canada vary between 45 and 81 cents per dollar of revenue, whereas Browning's range is 32 to 47 cents. For a given value of the supply elasticity, our range of estimates also encompasses the point estimate of marginal welfare cost obtained for Quebec by Fortin et al.,[13] who used a computable general equilibrium model of the Quebec economy in estimating that it would cost $1.56 to increase lump sum transfers to Quebec households by one dollar.

Evaluations of the merits of expenditure policies often compare the benefits of the policies with their budgetary costs alone. This procedure improperly ignores the economic costs of financing expenditure policies, in particular the welfare losses that arise when taxes are used to transfer resources from the private sector to the public sector. Our estimates for 1987 indicate that the marginal welfare cost of raising another dollar of revenue may be as high as $1.97. In this case, a program financed by the additional dollar must have a marginal benefit to society of nearly $3.00 if it is to make a positive contribution to Canada's collective welfare. This test is much more stringent than the requirement that a project with a cost of one dollar yield at least one dollar's worth of benefit. Given the hidden costs of taxation, it may well be that the public sector is overextended in several directions. We have no way of demonstrating that this is the case, however, since the calculation of the marginal benefits from government spending is a separate, and normally a difficult, exercise.

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[13] Bernard Fortin and Henri-Paul Rousseau with the collaboration of Pierre Fortin, *Economic Evaluation of the Options in the White Paper on the Personal Tax and Transfer System: A General Equilibrium Approach*, a report submitted to the ministère des Finances du Québec (Quebec: the ministry, 1984).

We would conclude, nonetheless, by emphasizing that there are costs of taxation in addition to those we have considered here. Income taxes distort capital market decisions as well as labour market decisions and thus create an additional source of welfare loss when they are used to raise revenue. A complete reckoning of the marginal costs of labour taxation would also take into account the compliance costs of higher tax rates and the costs of tax evasion. Higher marginal tax rates encourage taxpayers to use resources in an effort to conceal their income from the tax authorities, and the cost of these resources should be included in a comprehensive assessment of the marginal costs of labour taxation. Vaillancourt[14] has examined the average, but not the marginal, costs of complying with different taxes in Canada, and Usher[15] has shown that researchers should include the marginal costs of tax evasion in measuring the social costs of taxation. The inclusion of these additional elements in the calculation of the social costs of public expenditure would subject the performance of the public sector to an even more rigorous quantitative test than the one we have outlined here.

[14] François Vaillancourt, "The Compliance Costs of Taxes on Businesses and Individuals: A Review of the Evidence" (1987), vol. 42, no. 3 *Public Finance* 395-414, and *The Administrative and Compliance Costs of the Personal Income Tax and Payroll Tax System in Canada, 1986*, Canadian Tax Paper no. 86 (Toronto: Canadian Tax Foundation, 1989).

[15] D. Usher, "Tax Evasion and the Marginal Cost of Public Funds" (October 1986), 24 *Economic Inquiry* 563-86.