

The Redistributive Impact of Taxation in Canada

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PRÉCIS

Cet article mesure l'effet redistributif de l'ensemble des impôts au Canada en 1986. Les résultats démontrent que, dans l'ensemble, le régime fiscal est progressif et qu'il donne lieu à une redistribution considérable des revenus en faveur des classes à revenus faibles. Les structures des impôts du gouvernement fédéral et des gouvernements provinciaux sont progressives. Celle du gouvernement fédéral toutefois est plus redistributive, avant tout parce que l'impôt sur le revenu des particuliers représente une portion plus grande de ses recettes fiscales. Dans l'ensemble, la structure des impôts locaux est proportionnelle.

L'impôt sur le revenu des particuliers est la seule source de revenu qui soit très progressive. Son caractère progressif est plus accentué dans les paliers inférieurs et moyens de l'échelle des revenus. La représentation graphique de tous les autres impôts combinés a la forme d'un U inversé, ce qui signifie que ces impôts redistribuent les revenus de la classe moyenne aux ménages à revenus faibles et à revenus élevés. Un test effectué pour mesurer l'effet d'autres hypothèses de redistribution pour les impôts des sociétés et les impôts fonciers n'entraîna aucun changement important en ce qui concerne l'incidence de l'ensemble du régime fiscal.

Nos résultats diffèrent de ceux de Vermaeten, Gillespie et Vermaeten qui sont également publiés dans cette revue, et ce pour deux raisons importantes. Tout d'abord, ces auteurs avaient utilisé un concept partiel de revenus après-impôt, c'est-à-dire qui comprend le revenu privé plus les transferts gouvernementaux; en ce qui nous concerne nous avons utilisé l'ensemble des revenus après impôt. Deuxièmement, nous avons rajusté le montant de l'impôt dont le fardeau est transféré à la consommation afin de refléter l'indexation des transferts des gouvernements aux personnes selon le taux de l'inflation.

ABSTRACT

This paper estimates the redistributive impact of taxation in Canada for 1986. The results show that the overall tax system is progressive and produces significant redistribution of income in favour of lower income classes. Both federal and provincial governments have progressive tax

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structures. The federal structure, however, is more redistributive, primarily because the personal income tax makes up a larger share of revenue. The local tax structure is roughly proportional.

The personal income tax is the only highly progressive revenue source. Its progressivity is more pronounced at the low and middle range of the income scale. All other taxes combined have an inverted U shape, indicating that they redistribute income from the middle class to both low and high income households. A test for the effect of alternative shifting assumptions for corporate and property taxes did not alter significantly the overall pattern of tax incidence.

Our results differ from those of Vermaeten, Gillespie, and Vermaeten, also presented in this journal, for two major reasons. First, they used a partial concept of post-government income, which includes private income plus government transfers; we used full post-government income. Second, we adjusted the amount of tax shifted to consumption for the indexing of government transfers to persons to the rate of inflation.

INTRODUCTION

The tax structures of the federal, provincial, and local governments and the associated levels of taxation affect the real income of households and its distribution. The redistribution of income induced by taxation is determined by the pattern of the effective tax rates. The extent of such redistribution is an important policy issue.

A number of studies on the incidence of the overall tax system in Canada have been published during the past 30 years. They include Goffman; Gillespie; Maslove; Dodge; Davies, St-Hillaire, and Whalley; Whalley; and Grady.¹ In addition, Johnson² measured tax incidence in Ontario, and Payette and Vaillancourt³ measured tax incidence in Quebec. Except for the Davies et al. study, which measures lifetime tax incidence, all the studies

¹ Irving Jay Goffman, *The Burden of Canadian Taxation: Allocation of Federal, Provincial, and Local Taxes Among Income Classes*, Canadian Tax Paper no. 29 (Toronto: Canadian Tax Foundation, 1962); W. Irwin Gillespie, *The Incidence of Taxes and Public Expenditures in the Canadian Economy*, Studies of the Royal Commission on Taxation no. 2 (Ottawa: Queen's Printer, 1966); W. Irwin Gillespie, *The Redistribution of Income in Canada* (Ottawa: Gage, 1980); Allan M. Maslove, *The Pattern of Taxation in Canada*, a study prepared for the Economic Council of Canada (Ottawa: Information Canada, 1973); David A. Dodge, "Impact of Tax, Transfer, and Expenditure Policies of Government on the Distribution of Personal Income in Canada" (March 1975), 21 *The Review of Income and Wealth* 1-52; James Davies, France St-Hillaire, and John Whalley, "Some Calculations of Lifetime Tax Incidence" (September 1984), 74 *The American Economic Review* 633-49; John Whalley, "Regression or Progression: The Taxing Question of Incidence Analysis" (November 1984), 17 *Canadian Journal of Economics* 655-82; and Patrick Grady, "The Burden of Federal Tax Increases Under the Conservatives" (1992), 1 *Canadian Business Economics* 16-24.

² James A. Johnson, *The Incidence of Government Revenues and Expenditures*, a study prepared for the Ontario Committee on Taxation (Toronto: Queen's Printer, 1968).

³ Micheline Payette and François Vaillancourt, "L'incidence des recettes et dépenses gouvernementales au Québec en 1981" (1986), 62 *L'Actualité Économique* 409-11.

deal with annual tax incidence. Five of these (Dodge, Johnson, Payette and Vaillancourt, and the two Gillespie studies) measure tax incidence as part of overall fiscal incidence. The Goffman, Maslove, and Whalley studies measure tax incidence alone. Grady measures the change in tax incidence from 1984 to 1992.

In this paper we estimate the pattern of tax incidence in Canada, by income class, for each order of government, as part of a study of overall fiscal incidence for the calendar year 1986. We have discussed the results, first, for the incidence of public spending,⁴ and second, for fiscal incidence,⁵ in separate research papers. An important feature of this study is the use of a highly detailed, consistent microdatabase developed by Statistics Canada, the social policy simulation database (SPSD/M).⁶ The same database has been used by Vermaeten, Gillespie, and Vermaeten⁷ to measure tax incidence in Canada for 1988. Since the VGV paper is published in the same issue of this journal, the reader can easily compare the results and the methodology employed in the estimation. The pattern of tax incidence in Canada derived in our study differs from that obtained by VGV, in a manner consistent with the differences in methodology employed. These differences will be explained in the next section. A more detailed discussion of the methodological issues is found in the appendix.

METHODOLOGICAL ISSUES

The Database

The SPSPD/M microdatabase consists of a simulated sample of over 100,000 individuals in their family contexts, with extensive details on demographic composition, income sources, employment status, education, and expenditures. We did not use the actual data in SPSPD/M, but made a number of adjustments before using them in our tax incidence calculations. Each income component was independently adjusted to conform to Statistics Canada's national income accounts (NIA) value. Then the value of total income in the SPSPD/M base was adjusted to include non-money income additions and taxes that are assumed to be shifted backward to factors of production. Since our tax incidence study is part of an overall fiscal incidence study and, therefore, required detailed incidence assumptions for government expenditures as well as taxes, we were unable to use the SPSPD/M

⁴ Giuseppe C. Ruggeri, D. Van Wart, and R. Howard, *The Redistributive Impact of Government Spending in Canada*, Research Paper no. 93-15 (Edmonton: University of Alberta, Department of Economics, 1993).

⁵ Giuseppe C. Ruggeri, D. Van Wart, and R. Howard, *The Redistributive Impact of Government Spending and Taxation in Canada*, Research Paper no. 93-16 (Edmonton: University of Alberta, Department of Economics, 1993).

⁶ For details see Michael Bordt, Grant J. Cameron, Stephen F. Gribble, Brian B. Murphy, Geoff T. Rowe, and Michael C. Wolfson, "The Social Policy Simulation Database and Model: An Integrated Tool for Tax/Transfer Policy Analysis" (1990), vol. 38, no. 1 *Canadian Tax Journal* 48-65.

⁷ Frank Vermaeten, W. Irwin Gillespie, and Arndt Vermaeten, "Tax Incidence in Canada," in this issue of the *Canadian Tax Journal* (herein referred to as "VGV").

base directly. Instead, we divided the total number of households in the microdatabase into 330 distinct groups, composed of 22 income classes and 15 family types. This procedure is equivalent to selecting a sample of 330 taxpayers representing the average taxpayer in each cell.

The adjustments we made to the income data in the SPSD/M differ in relative magnitude from those made by VGV. Our adjustments are 37.6 percent of market income, while VGV's adjustments are 45.6 percent of market income. Two items account for most of the difference: gifts and inheritances, and the treatment of pension income and RRSPs.⁸

We did not include gifts and inheritances in income for the following reasons. First, inter vivos gifts often involve a reciprocal action; the receiver of a gift is also likely to be a giver during a given year. Therefore, only the net gift should be recorded. However, reliable data on gift giving corresponding to gift receiving are not available.

Treating inheritances as income may introduce double counting and create some confusion between stocks and flows by treating wealth as income. Let us consider the case where individual A holds his or her entire wealth in bonds for the first six months of the year and then bequeaths them to individual B, who holds them for the remainder of the year. The interest income earned is recorded, and assigned in equal amounts to individuals A and B. If we add the value of the inheritance to individual B we not only add a stock to a flow, but we also treat the same stock of wealth differently depending on the holder. In the hands of the bequeather it is treated as wealth, but when it is transferred to the inheritor it is treated as income.

With respect to pensions and RRSPs, one could argue that what should be included in income is their accrual value rather than the amounts received. It should be noted, however, that these income sources are subject to personal income taxation (PIT), and the actual revenue data used in incidence calculations include the tax paid on pension income received. To maintain a consistent treatment when accrual values are used, two alternative adjustments can be made. The amount of the accrual can be reduced by the personal income tax payable on the difference between the accrual and the actual value; alternatively, the PIT revenue can be increased by the additional tax liability on the above difference. Since either approach involves a certain degree of arbitrariness in the calculation and allocation of the additional tax liability, we decided to use actual values—that is, actual pension income received and actual tax liability incurred. The need for similar adjustments is much less in the case of accrued capital gains. Capital gains on owner-occupied residential properties, which represent the largest share of the total, are tax-exempt, and the rest escape a large portion of the tax otherwise payable because of the lifetime exemption and the partial inclusion rate (50 percent in 1986).

⁸ The effect of this difference in adjustments to the income base on our results is very small. See *infra* footnote 25.

The Income Concept

As Gillespie has stressed,⁹ there are two consistent income concepts that can be used for the measurement of fiscal or tax incidence: pre-government income and actual post-government income.¹⁰ Pre-government income, one of the concepts used by VGV, is a hypothetical measure of private factor income that can also be interpreted as the special case of post-government income associated with a distributionally neutral budget. Post-government income, the concept we use, is a comprehensive measure of a family's command over resources, measured as income received from all sources, including transfer payments, plus the benefits of government purchases minus taxes assigned to that family.

The choice between the two income bases has little effect on the pattern of overall fiscal incidence, but alters considerably the pattern of incidence of each budget component. Specifically, under the pre-government concept, taxes appear to be less progressive (pro-poor), or more regressive (pro-rich), while expenditures appear to be more progressive or less regressive. This conclusion underscores the desirability of estimating the pattern of tax incidence within the framework of fiscal incidence. This approach, which is also preferred by Gillespie and Vermaeten,¹¹ shows how each component of the budget is affected by changes in definitions and assumptions.

Our study used actual post-government income, not simply because that measure was available to us from our analysis of fiscal incidence, but because in our view it offers a more intuitive interpretation of fiscal and tax incidence results, and it provides a more appropriate counterfactual for tax policy purposes. Actual post-government income provides an estimate of the standard of living of different households in the period under consideration (not taking into account differences in the consumption of leisure). The ratio of the taxes paid to post-government income indicates the degree by which the current standard of living (including the benefits received when the tax revenue is spent) is reduced by the payment of taxes. Moreover, since the value of post-government income is responsive to the

⁹ For example, W. Irwin Gillespie, "Effect of Public Expenditures on the Distribution of Income," in Richard A. Musgrave, ed., *Essays in Fiscal Federalism* (Washington, DC: Brookings Institution, 1965), 122-86; and *The Redistribution of Income in Canada*, supra footnote 1.

¹⁰ Gillespie, "Effect of Public Expenditures on the Distribution of Income," supra footnote 9, at 126-27, states, "the effect of taxation and government expenditures upon the distribution of income must be treated consistently. That is, (1) either the income base must exclude the entire public sector or it must include the entire public sector within its distribution; and, in addition, (2) all government expenditures (expenditures on goods and services and transfer payments to families) must be treated identically in the income base."

¹¹ W. Irwin Gillespie and Frank Vermaeten, "Tax Incidence in Canada," a paper presented to the 27th annual meeting of the Canadian Economics Association, Carleton University, Ottawa, 1993 (mimeograph). They conclude, *ibid.*, at 4, "that for normative and positive [policy making] reasons a tax incidence study ought to be seen as an integral component of a broader fiscal incidence study."

assumptions about the incidence of taxes, changes in those assumptions affect both the numerator and the denominator of the effective tax rates in a consistent manner.

Vermaeten, Gillespie, and Vermaeten also derive the pattern of tax incidence using a partial concept of post-government income, which they call broad income, calculated as pre-government income plus transfer payments to persons. Their results are generally discussed for the estimates based on broad income. Estimating tax incidence by using a partial post-government income concept, however, muddles the interpretation of the results. As pointed out by Gillespie and Vermaeten: "Any other income measures [other than pre- or post-government income] that might be used for measuring fiscal, tax or expenditure incidence are partial at best and misleading in some situations."¹² Such a concept includes only a small portion of government expenditures; for example, in 1988 the \$49.9 billion of transfer payments included by VGV represent less than 25 percent of total government expenditures, excluding interest on the public debt. As we have elsewhere pointed out,¹³ this concept is inconsistent with the framework of differential fiscal incidence, and yields different patterns of tax incidence for identical tax structures and distributions of pre-government income depending on the relative share of transfer payments in total government expenditures. For example, if transfers to post-secondary education institutions were replaced by direct transfers of equal value to post-secondary students, the pattern of tax incidence based on broad income would be altered even if the tax structure remained unchanged.

Selection of Government Revenues

Government revenues, for purposes of calculating tax incidence, include personal income taxes, corporate income and capital taxes, commodity taxes, payroll taxes, property taxes, natural resource revenues, profits from the sales of lottery tickets, and revenue from fees and charges. Total revenue by source in 1986 is shown in table 1 for the three levels of government combined. The principal data source is Statistics Canada's 1992 national income accounts, supplemented by the 1992 financial management system accounts.¹⁴ The budget deficit and the taxes that are paid by non-residents (primarily corporate taxes) are excluded.

¹² Ibid., at 3.

¹³ Giuseppe C. Ruggeri, D. Van Wart, and R. Howard, *Measuring Tax Incidence Within the Framework of Fiscal Incidence*, Research Paper no. 93-4 (Edmonton: University of Alberta, Department of Economics, 1993).

¹⁴ See Statistics Canada, *National Income and Expenditure Accounts, Annual Estimates 1979-1990*, catalogue no. 13-201; Statistics Canada, *Historical Federal Government Expenditure, 1974/75 to 1990/91*, Financial Management System basis data (Ottawa: Statistics Canada, 1992); Statistics Canada, *Historical Federal Government Revenue, 1974/75 to 1990/91*, Financial Management System basis data (Ottawa: Statistics Canada, 1992); Statistics Canada, *Historical Provincial/Territorial Government Revenue and Expenditure, 1974/75 to 1990/91*, Financial Management System basis data (Ottawa: Statistics Canada, 1992); (The footnote is continued on the next page.)

Table 1 Government Revenue from Taxation, 1986

	Federal	Provincial	Local	Total
		<i>millions of dollars</i>		
Personal income tax	39,274	23,828	0	63,102
Corporate income tax	9,865	4,216	0	14,081
Commodity taxes	21,146	22,127	324	43,597
General sales tax	11,362	12,680	27	24,069
Fuel taxes	1,311	3,276	0	4,587
Tobacco taxes and duties	1,660	1,950	0	3,610
Liquor taxes, profits, and duties	1,006	2,149	0	3,155
Other excise taxes and duties	790	0	0	790
Customs import duties	4,169	0	0	4,169
Miscellaneous	848	2,072	297	3,217
Payroll taxes	14,336	8,875	0	23,211
Contributions to UI	9,615	0	0	9,615
Contributions to CPP/QPP	4,721	1,525	0	6,246
Contributions to WCB	0	3,224	0	3,224
Provincial payroll taxes	0	1,897	0	1,897
Health insurance premiums	0	2,229	0	2,229
Natural resource revenue	445	4,420	0	4,865
Forestry	0	360	0	360
Oil and gas revenues	6	3,002	0	3,008
Mineral and potash royalties	2	298	0	300
Sale of crown leases	0	425	0	425
Water and power rentals	0	335	0	335
Petroleum and gas revenue tax	437	0	0	437
Real property tax	0	1,206	16,232	17,438
Other revenue sources	1,905	6,734	446	9,085
Contributions to public pensions	1,869	1,831	0	3,700
Capital tax	0	1,275	0	1,275
Motor vehicle licences and registrations: business	0	496	0	496
Motor vehicle licences and registrations: personal	0	1,105	0	1,105
Fees and charges	0	376	222	598
Lottery revenue	0	1,042	0	1,042
Miscellaneous	36	609	224	869
Total tax revenue	86,971	71,406	17,002	175,379

Sources: Statistics Canada, *National Income and Expenditure Accounts, Annual Estimates 1979-1990*, catalogue no. 13-201; Statistics Canada, *Historical Federal Government Revenue, 1974/75 to 1990/91*, Financial Management System basis data (Ottawa: Statistics Canada, 1992); and Statistics Canada, *Historical Provincial/Territorial Government Revenue and Expenditure, 1974/75 to 1990/91*, Financial Management System basis data (Ottawa: Statistics Canada, 1992).

¹⁴ Continued . . .

and Statistics Canada, *Historical Local Government Revenue and Expenditure, 1974/75 to 1990/91*, Financial Management System basis data (Ottawa: Statistics Canada, 1992). These data sources are referred to herein as NIA and FMS, respectively.

The numbers in the SPSPD/M database were adjusted to agree with the NIA totals. The NIA framework ensures that the taxation and expenditure statistics are consistent with the total income base used for fiscal incidence.

We make a detailed adjustment to tax revenues assumed to be borne by consumers for the effect of the indexing to inflation of government transfers to persons. Following Ruggeri; Ruggeri and Bluck; and Ruggeri, Van Wart, and Howard,¹⁵ the actual indexing amounts benefiting the recipients of government transfers were treated as a negative tax and, therefore, subtracted from the portion of each tax assigned to consumers and from the transfers received by households. The largest adjustment was for the consumption taxes. The rationale for that adjustment is explained in the next section and in the appendix.

Shifting Assumptions

This study uses the small open economy framework as a basis for deriving the tax shifting assumptions.¹⁶ In our view, a small open economy provides a realistic representation of Canada's position in the international marketplace. This framework affects the choice of shifting assumptions for taxes on capital and for sales and excise taxes on intermediate goods. Details on the tax shifting assumptions employed in our study are found in table 2.

In both the VGV study and our study, the burden of commodity taxes is assumed to fall largely on consumers. However, we make an explicit adjustment for the indexing of government transfer payments to persons. We argue that, to the extent that transfer payments are indexed to the consumer price index (CPI), as in the case of old age security benefits, an increase in consumption taxes for the recipients of indexed transfers is offset by the automatic increase in the transfer payments in response to the tax-induced increase in the CPI.

An example may help illustrate this concept, while a more detailed explanation is found in the appendix. Let us consider the case where the government introduces a general sales tax, but exempts seniors from payment of the tax upon presentation of a special card. The seniors do not bear the burden of the sales tax. Instead of the exemption, the government may decide, for administrative purposes, to let seniors pay the tax at the time of purchase, but to compensate them for the tax paid through either a discretionary transfer payment or the automatic indexing of transfer payments. If seniors received all their income from indexed transfers and spent all their income in the period it was received, and if all their purchases

¹⁵ Giuseppe C. Ruggeri, "On the Measurement of Sales Tax Incidence in the Presence of Transfers," *Public Finance* (forthcoming); Giuseppe C. Ruggeri and Kelly A. Bluck, "The Treatment of Transfers in the Measurement of Sales Tax Incidence: The Case of Canada's Manufacturers' Sales Tax" (January 1992), 20 *Public Finance Quarterly* 24-46; and Giuseppe C. Ruggeri, D. Van Wart, and R. Howard, *Indexing of Transfer Payments and Total Tax Incidence*, Research Paper no. 93-2 (Edmonton: University of Alberta, Department of Economics, 1993).

¹⁶ VGV, *supra* footnote 7, also use the small open economy assumption. The specific assumptions employed in the calculations, however, are not identical. For example, we assign 50 percent of corporate income taxes to owners of capital and 50 percent to consumers in our base case, whereas VGV make that allocation in their regressive case.

Table 2 Selected Tax Incidence Assumptions

Tax	Incidence	Allocation series
<i>Direct taxes on persons</i>		
Personal income tax	Those liable for tax	PIT paid per model
Contributions to public pensions	Labour	Wages and salaries (SPSD/M)
Contributions to UI	Labour	UI contributions (SPSD/M)
Contributions to WCB	Labour	WCB contributions (SPSD/M)
Estate taxes	Property owners	House values (SPSD/M)
<i>Direct taxes on corporations</i>		
Corporate income tax	Base case: 50 percent to consumers, remainder less portion exported and less dividend tax credit to owners of capital; Progressive variant: 100 percent less portion exported and less dividend tax credit to capital;	Portion to consumers: total consumption (SPSD/M); Portion to capital: realized capital gains (SPSD/M)
	Regressive variant: 100 percent less dividend tax credit to consumers	
Petroleum and gas revenue tax (PGRT)	50 percent to labour, 50 percent less portion exported to capital	Portion to labour: wages and salaries (SPSD/M); Portion to capital: adjusted dividends per SPSPD/M, money interest per SPSPD/M, accrued capital gains per SPSPD/M (broad capital income)
Mining and logging income taxes	Same as corporate income tax	Same as corporate income tax

(Table 2 is continued on the next page.)

Table 2 Continued

Tax	Incidence	Allocation series
<i>Indirect taxes</i>		
General sales tax	Tax on final purchases: 100 percent less portion exported less compensation on indexed transfers to consumers;	Total consumption (SPSD/M)
	Tax on business purchases: tradable to labour and capital, non-tradable to consumers;	Tradable: adjusted factor income; non-tradable: total consumption (SPSD/M)
	Tax paid by government institutions: families	Total money income
<i>Excise taxes</i>		
Fuel taxes	Tax on final purchases: 100 percent less compensation on indexed transfers to consumers;	Fuel consumption (SPSD/M)
	Tax on business purchases: tradable to labour and capital, non-tradable to consumers	Tradable: adjusted factor income; non-tradable: total consumption (SPSD/M)
	Same as above	Same as above
<i>Other excise taxes and duties</i>		
Customs import duties	Same as above	Same as above
Air transportation tax	Same as above	Consumption of transportation services (SPSD/M) and adjusted factor income
Tobacco taxes and duties	100 percent less compensation on indexed transfers to consumers of taxed goods	Tobacco consumption (SPSD/M)
Liquor taxes and duties	Same as above	Liquor consumption (SPSD/M)
Amusement tax	Same as above	Recreational services consumption (SPSD/M)
Race track tax	Same as above	Same as above
Capital tax	Same as corporate income tax	Portion to consumers: total consumption (SPSD/M); Portion to capital: broad capital income (see PGRT)

(Table 2 is continued on the next page.)

Table 2 Continued

Tax	Incidence	Allocation series
Insurance premium tax		
On life insurance premiums	100 percent less compensation on indexed transfers to consumers of product	Distribution from Alberta Superintendent of Insurance below \$50,000; equal per family above \$50,000
On general insurance	Same as above	Automobile insurance: value of new and used automobiles (SPSD/M); Home insurance: market value of house (SPSD/M); Remaining portion: equal per family
Real property tax	Base case: owner-occupied property: homeowners; residential rental property: land portion to owners, structures portion 50 percent to renters, 50 percent to capital; commercial-industrial property: land portion to owners, structures portion 50 percent to consumers, 50 percent to capital; Progressive variant: rental and commercial structures portion 100 percent to capital; Regressive variant: rental structures 100 percent to renters, commercial structures 100 percent to consumers	To homeowners: market value of house (SPSD/M); To rental property owners: rental income (SPSD/M); Portion to renters: rental payments (SPSD/M); Portion to capital: broad capital income (see PGRT); Portion to consumers: total consumption (SPSD/M)
Miscellaneous	100 percent less compensation on indexed transfers to consumers of product	Total consumption (SPSD/M)
<i>Natural resource revenue</i>		
Oil	Same as above	Consumption of gasoline, grease, and oil (SPSD/M)
Gas	Same as above	Consumption of natural gas (SPSD/M)
Other oil and gas revenues	Same as above	Oil and gas consumption (SPSD/M)

(Table 2 is concluded on the next page.)

Table 2 Concluded

Tax	Incidence	Allocation series
Forestry	Same as above	Market value of house (SPSD/M)
Mineral royalties	Same as above	Total consumption (SPSD/M)
Potash royalties	Same as above	Same as above
Sales of Crown leases	Same as above	Same as above
Water and power rentals	Same as above	Same as above
<i>Other revenue sources</i>		
Provincial payroll taxes	Labour	Wages and salaries (SPSD/M)
Health insurance premiums	Labour and self-employed	Portion to labour: wages and salaries (SPSD/M); Portion to self-employed: net self-employment income, non-farm plus farm (SPSD/M)
Liquor profits	100 percent less compensation on indexed transfers to consumers of product	Liquor consumption (SPSD/M)
Motor vehicle licences and registrations		
Business	Consumers of transported goods (less indexing compensation)	Total consumption less consumption of services (SPSD/M)
Personal	Private vehicle owners	Vehicle ownership (SPSD/M)
Other fees and charges	Consumers (less indexing compensation)	Total consumption (SPSD/M)
Miscellaneous	Same as above	Total consumption (SPSD/M)
<i>Contributions to CPP and QPP</i>	Labour	CPP/QPP contributions (SPSD/M)
<i>Lottery revenue</i>	Consumers of product (less indexing compensation)	Distribution of Vaillancourt and Grignon ^a
<i>Hospital revenue</i>	Same as above	Purchases from hospitals (SPSD/M)

^a François Vaillancourt and Julie Grignon, "Canadian Lotteries as Taxes: Revenues and Incidence", *Canadian Tax Journal* 369-88.

were taxable, the increase in transfer payments due to indexing would exactly offset the tax paid on purchases. Under any of the three approaches, the seniors would not bear the burden of the sales tax, and the indexing of transfers would produce the same effect as the exemption.

In the calculation of the sales tax incidence, this equivalence of results is obtained when indexing is treated as a negative tax. When indexing is ignored, transfers are entered in the denominator of the effective tax rate at their full value, including the indexing component, while the numerator shows a positive amount of tax paid. The net result indicates that seniors bear the burden of a tax that they effectively do not pay.¹⁷

The Measure of Tax Incidence

In this study we measure tax incidence within the framework of full fiscal incidence. Ruggeri et al.¹⁸ have shown that a local index of fiscal incidence (I_i) can be derived as the algebraic sum of the incidence indices for each component of the budget. Under differential fiscal incidence, where the standard of comparison is a balanced budget with a proportional income tax (T), and with government transfers (Tr) and purchases (G) also proportional to income, this index can be written as:

$$I_i = g_i + tr_i - t_i \quad (1)$$

where $g_i = G_i/Y_i$, $tr_i = Tr_i/Y_i$, $t_i = T_i/Y_i$, Y_i is actual post-government income, and the subscript i refers to the i th income class. I_i is the ratio of the class's net fiscal benefit or burden to total income. For taxation only, I_i equals t_i .¹⁹

Ruggeri, Van Wart, and Cassady²⁰ have shown that structural incidence measures, such as those in expression 1, can be transformed into redistributive measures. For taxation, we can derive the following local redistributive measure, introduced by Baum²¹ under the name relative share adjustment (RSA):

$$RSA_i = \frac{1 - t_i}{1 - t} \quad (2)$$

where t is T/Y . The RSA_i measures the local redistributive impact of a given tax compared with a proportional income tax. It can be shown that the rate of change of RSA_i between income classes is a constant propor-

¹⁷ Under our approach, the numerator is corrected by subtracting from tax revenue (T) and from the value of transfers (Tr) the amount of the indexing (D) so that only the net tax revenue is included. In the denominator the adjustment follows automatically from the use of post-government income because $Tr - T = (Tr - D) - (T - D)$.

¹⁸ Supra footnote 13.

¹⁹ This is the structural index of tax incidence used in the VGV study, supra footnote 7.

²⁰ Giuseppe C. Ruggeri, D. Van Wart, and K. Cassady, *Global Progressivity Indices as Aggregates of Local Indices: The Relative Share Adjustment and Suits' Index*, Research Paper no. 92-24 (Edmonton: University of Alberta, Department of Economics, 1992).

²¹ Sandra R. Baum, "On the Measurement of Tax Progressivity: Relative Share Adjustment" (April 1987), 15 *Public Finance Quarterly* 166-87.

tion of the rate of change of t_i ; therefore, when plotted, the slope of this local redistributive index provides the same information about the progressivity of the tax system as the slope of the structural index.

We prefer to use a redistributive measure of tax incidence because it offers a direct indication of the impact of a tax change on the economic position of a taxpayer. For example, a value of $RSA_i = 1.03$ indicates that the i th taxpayer would lose approximately 3 percent ($0.03/1.03$) of total current income if the existing tax system were replaced by a proportional income tax.

The incidence of a tax and the resulting redistribution of income can also be viewed from a global perspective. This global perspective determines whether the overall impact of a tax is progressive (redistribution in favour of low income households), regressive (redistribution in favour of high income households) or neutral (no redistribution) with respect to the given distribution of income. A comparison of the properties of global tax incidence measures is found in Cassady, Ruggeri, and Van Wart.²²

Ruggeri et al.²³ have shown that the RSA_i can be transformed into a global index of redistribution through suitable aggregation. The local RSA_i in equation 2 can be transformed into the following global measure, RSA_G :

$$RSA_G = \sum_{i=1}^n w_i \frac{1-t_i}{1-t}, \quad (3)$$

where

$$w_i = y_i (y_i + 2 \sum_{j=i+1}^n y_j), \quad (4)$$

y_i is the share of post-government income of the i th taxpayer, and the taxpayers are ordered by increasing income.

A value of RSA_G of 1 indicates that a tax does not affect the distribution of income; we call such a tax proportional. A value of RSA_G greater (less) than 1 indicates that the tax redistributes income from the higher (lower) to the lower (higher) income classes. We call such a tax progressive (regressive). RSA_G ranges in value from 0 to 2.

TOTAL TAX INCIDENCE

The Base Case

Our estimates of the redistributive effect of the tax system in 1986, for three alternative sets of shifting assumptions, are summarized in table 3. For the combined tax system of all three orders of government, our base case assumptions yield a value of the global progressivity index (RSA_G) of 1.085. Since the estimated value of RSA_G exceeds 1, we conclude that the

²² Kim Cassady, G.C. Ruggeri, and D. Van Wart, "On the Classification and Interpretation of Progressivity Measures," *Public Finance* (forthcoming).

²³ *Supra* footnote 20.

Table 3 The Redistributive Impact of Government Taxation by Order of Government, Canada, 1986 (Measured by the Global RSA index)

	Base case	Progressive variant	Regressive variant
Federal	1.041	1.042	1.038
Provincial	1.024	1.025	1.022
Local	1.001	1.006	0.996
Total	1.085	1.096	1.073

overall Canadian tax system in 1986 was progressive and produced a redistribution of income in favour of lower income groups.

A different pattern of tax incidence would be obtained if we used a partial post-government income concept, such as VGV's broad income. Ruggeri et al.²⁴ have shown that when broad income is used as the income base, and indexing of transfers is ignored, the pattern of tax incidence in 1986 is only slightly progressive. A similar result is derived by VGV for 1988, thus indicating that the progressivity of the tax system changed little from 1986 to 1988.²⁵

We also re-estimated the redistributive impact of taxation under a variant assumption about the distribution of government expenditures on goods and services (not reported in table 3), where non-specific expenditures are allocated on the basis of total money income. Even under this more pro-rich variant, the tax system continues to be redistributive in favour of lower income groups. The estimated value of RSA_G falls from 1.085 to 1.069.²⁶

Details on the patterns of incidence summarized in table 3, using the base case shifting assumptions, are shown in figure 1. The income classes on the horizontal axis are defined by total money income, the concept used in the SPSPD/M database. Total money income includes pre-tax wages and salaries, self-employment income, realized investment income, and cash transfers. This commonly used income concept facilitates interpretation and comparison of the results. All calculations are performed on

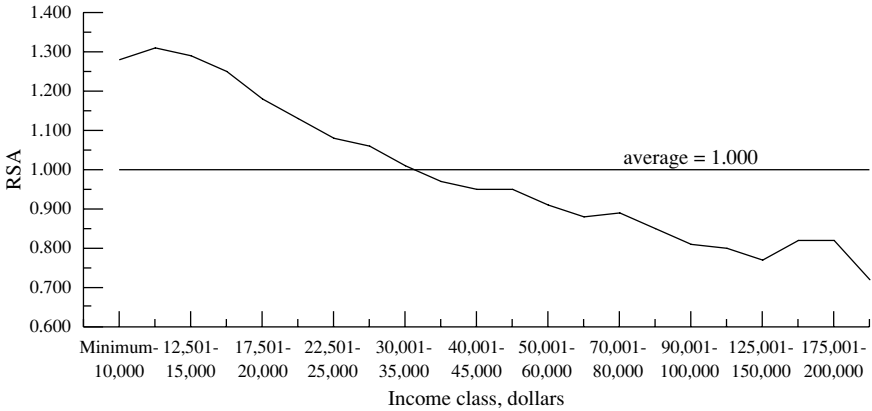
²⁴ Supra footnote 13.

²⁵ When the broad income concept is used and the indexing of transfers is ignored, the RSA_G is 1.011 in 1986 (from our study) and 1.003 in 1988 (from VGV's study, supra footnote 7). The reduction in the redistributive impact of taxation between 1986 and 1988 is consistent with the conclusion in Van Wart and Ruggeri that the 1988 personal income tax reform reduced the progressivity of the personal income tax (see D.C. Van Wart and G.C. Ruggeri, "Tax Reform and the Progressivity of the Personal Income Tax in Canada" (1991), vol. 46, no. 1 *Public Finance* 134-56). An additional reason for this result is the difference in the inclusion of many non-money additions to broad income between VGV and our study. Eliminating these non-money adjustments and holding the level of after-tax income constant reduces the RSA_G in the base case from 1.085 to 1.080.

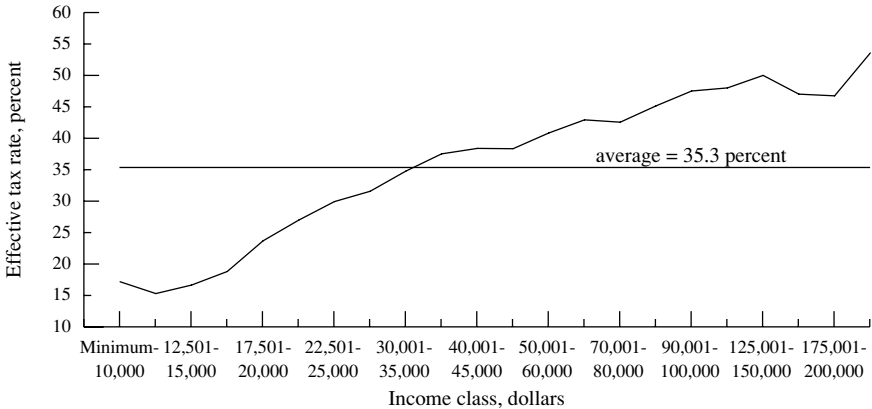
²⁶ See Ruggeri et al., supra footnote 5.

Figure 1 Incidence, Using Base Case Shifting Assumptions, 1986

**Panel A Relative Share Adjustment (RSA) by Income Class:
All Taxes for All Governments**



**Panel B Effective Tax Rate by Income Class:
All Taxes for All Governments**



post-government income. The unit of analysis is the census family, which differs from the economic family in that it does not include married children living in the same dwelling.

Panel B of figure 1 shows the effective tax rates on post-government income by income class. The slope of the effective tax rate curve provides an estimate of the local progressivity of the tax system.²⁷ The total tax revenue, properly adjusted for the indexing of transfers, represents 35.3 percent of post-government income. Taxpayers with incomes below \$36,000 bear

²⁷ R.A. Musgrave and Tun Thin, "Income Tax Progression, 1929-48" (December 1948), 56 *Journal of Political Economy* 498-514.

below-average tax burdens, and those with incomes above \$36,000 bear above-average tax burdens. However, with the exception of the first income class, the slope of the effective tax rate curve is steepest for the lower end of the income scale. This shows that the progressivity of the Canadian tax system is largely confined to the lower end of the income scale.

In the income range \$15,000 to \$40,000, the effective tax rate increases by an average of 0.534 percentage points per \$1,000 of income. For the income classes from \$40,000 to \$150,000, the average increase in the effective tax rate per \$1,000 of income is only 0.114 percentage points. This positive rate of change in the effective tax rate reverses direction in the income range from \$150,000 to \$200,000, declining slightly at a rate of 0.066 percentage points per \$1,000 of income, and then rising again for incomes above \$200,000. The top income class bears an effective tax rate that is 3.6 percentage points higher than that of the income class \$125,000 to \$150,000.

The pattern of effective tax rates is reflected in the redistributive impact of the tax system, shown in panel A of figure 1, because, as shown in Ruggeri et al.,²⁸ the rate of change in RSA_i is proportional to the rate of change in t_i . We notice that, with two minor exceptions, the value of RSA_i falls steadily in the income range \$10,000 to \$150,000, increases slightly over the next two income classes, and then falls again in the above \$200,000 class, indicating that the tax system is progressive overall. Taxpayers with incomes less than approximately \$36,000 are made relatively better off by the tax system, while those with incomes above \$36,000 are made relatively worse off. While the tax system is highly progressive in the middle income range, between \$25,000 and \$50,000, it has little impact on the relative income position of these taxpayers. The largest relative benefit accrues to those at the lower end of the income distribution; individuals with incomes between \$10,000 and \$12,500 are made 30.9 percent better off than under a proportional tax that raises the same revenue. The largest relative cost is paid by the top income class (over \$200,000); its after-tax income is about 28.3 percent less than under a proportional tax system.

Progressive and Regressive Variants

To test the sensitivity of the results to alternative tax shifting assumptions, we re-estimated tax incidence under two variants of the base case. The progressive variant does not assign to consumers any of the revenue from property taxes and corporate taxes; the regressive variant assigns all revenue from property taxes to consumers of housing services, and from corporate taxes to consumers in general. As shown in table 3, the two variants do not alter dramatically the overall redistributive impact of the tax system.²⁹ For all governments combined, the progressive variant

²⁸ Supra footnote 20.

²⁹ A similar pattern is found by VGV, supra footnote 7, although their regressive and progressive variants do not contain identical tax shifting assumptions to our variants.

increases the value of RSA_G by 1.0 percent, while the regressive variant reduces it by 1.1 percent. In all three cases, the value of RSA_G is substantially higher than 1.

The effect of the alternative variants on the pattern of effective tax rates is shown in figure 2. Income classes below \$70,000 are slightly better off under the progressive case than under the base case, while those above \$70,000 are worse off. For income classes between \$12,500 and \$70,000 the degree of structural progressivity is unaffected, and the effective tax rates are reduced by about 1 percentage point. The degree of progressivity rises almost steadily above \$90,000, so that above \$200,000 the effective tax rate is 7.3 percentage points higher than under the base case.

Under the regressive variant, income classes below \$90,000 are made worse off, and those above \$90,000 better off, than in the base case. As with the progressive variant, below \$70,000 the degree of structural progressivity of the tax system is unaffected, and the effective tax rate is increased by about 2 percentage points between \$12,500 and \$70,000. Above \$70,000 the degree of progressivity falls almost steadily, so that above \$200,000 the effective tax rate is reduced by 9.1 percentage points from the base case. In this case, effective tax rates peak at \$90,000 to \$100,000; in the income class above \$200,000 the effective tax rate of 44.5 percent is about the same as that for the \$70,000 to \$80,000 class.

TAX INCIDENCE BY ORDER OF GOVERNMENT

As shown in table 3, in the base case the estimated values of RSA_G exceed 1 for the federal and provincial governments, thus indicating that the tax structure of the two senior orders of government promote a moderately progressive degree of redistribution. The federal tax structure is more progressive than the provincial one mainly because federal tax revenue is dominated to a much larger extent by the personal income tax, the only strongly progressive component of the entire tax system. In the base case, the local tax structure is virtually proportional in its global redistributive impact.³⁰

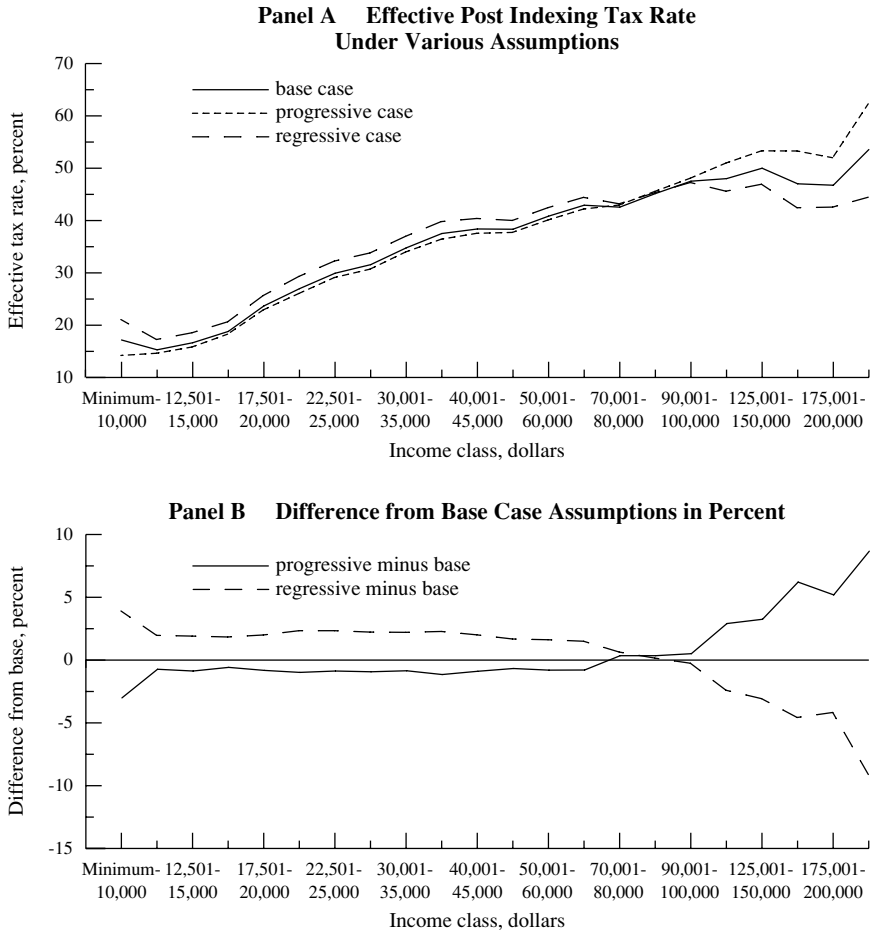
Details on the pattern of tax incidence by order of government are shown in figure 3. It is evident that the federal tax system is progressive, since effective tax rates generally increase throughout the entire income range, except for a drop of 1.6 percentage points between the \$125,000-\$150,000 and the \$150,000-\$175,000 classes. Taxpayers with incomes below \$35,000 pay below-average federal tax rates, while taxpayers with incomes above \$35,000 pay above-average tax rates.

At the provincial level, the tax system is also progressive, but less than at the federal level. Ignoring the anomaly in the lowest class,³¹ the effec-

³⁰ The VGV study, *supra* footnote 7, also finds that both the federal and provincial tax structures are progressive and that the former is more progressive than the latter. It concludes, however, that local taxation is regressive.

³¹ The data for the lowest income class are anomalous in that they contain a disproportionately high number of wealthy individuals whose annual post-government income has
(The footnote is continued on the next page.)

Figure 2 Incidence, Using Alternative Assumptions, 1986

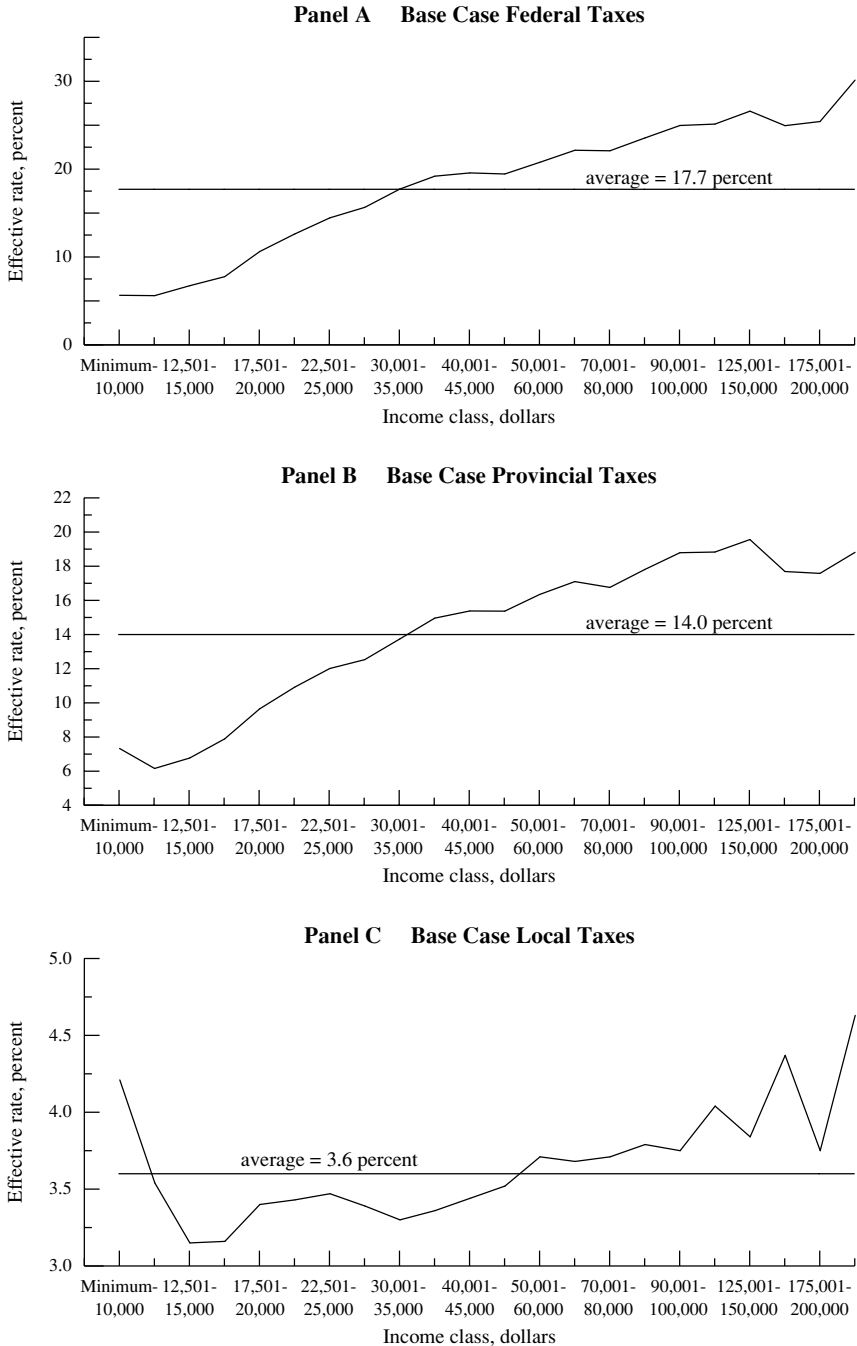


tive tax rate generally rises throughout the entire income range except for a drop of about 2 percentage points between the \$125,000-\$150,000 and the \$150,000-\$175,000 income class. As under the federal system, taxpayers with incomes below \$35,000 pay below-average provincial tax rates, and those with incomes above \$35,000 pay above-average rates.

³¹ Continued . . .

been reduced by business and capital losses. As a result, their effective tax rate is biased upward because these individuals have large consumption expenditures relative to income and, thus, pay high effective consumption and property tax rates. In addition, the SPSPD/M data for high income earners are imputed from aggregate data and do not reflect detailed tax information on income composition and deductions. The results for high income classes, therefore, are less reliable than for middle and low income classes.

**Figure 3 Tax Incidence by Order of Government, 1986:
Effective Rate by Income Class**



For local taxes, the pattern of incidence is uneven and close to proportionality. First, the deviations from the average of effective tax rates are much smaller than for the federal and provincial systems. Second, the line for the average of effective tax rates is crossed over twice, at about \$12,000 and \$55,000. Third, although there is a slight upward trend in the value of effective tax rates, the pattern is marked by several reversals of the trend.

The redistributive impact by income class is shown in figure 4 for federal, provincial, and local governments. With respect to federal and provincial taxes, taxpayers with incomes below \$35,000 are made better off by the tax system relative to those with incomes above \$35,000. The relative gain for the lowest income classes and the relative loss for the highest income classes are substantially higher at the federal level. This result is due primarily to the federal dominance of the personal income tax and the larger federal share of total revenue. The federal system increases the post-government income of the \$10,000-\$12,500 class by 14.7 percent, and reduces that of the over \$200,000 class by 15 percent compared with a proportional tax, while the provincial system increases the post-government income of the \$10,000-\$12,500 class by 9.1 percent and reduces that of the over \$200,000 class by 9.4 percent compared with a proportional tax. At the local level, there are very small relative gains for taxpayers with incomes between \$12,500 and \$50,000, and very small relative losses for those with incomes below \$12,500 and over \$50,000.

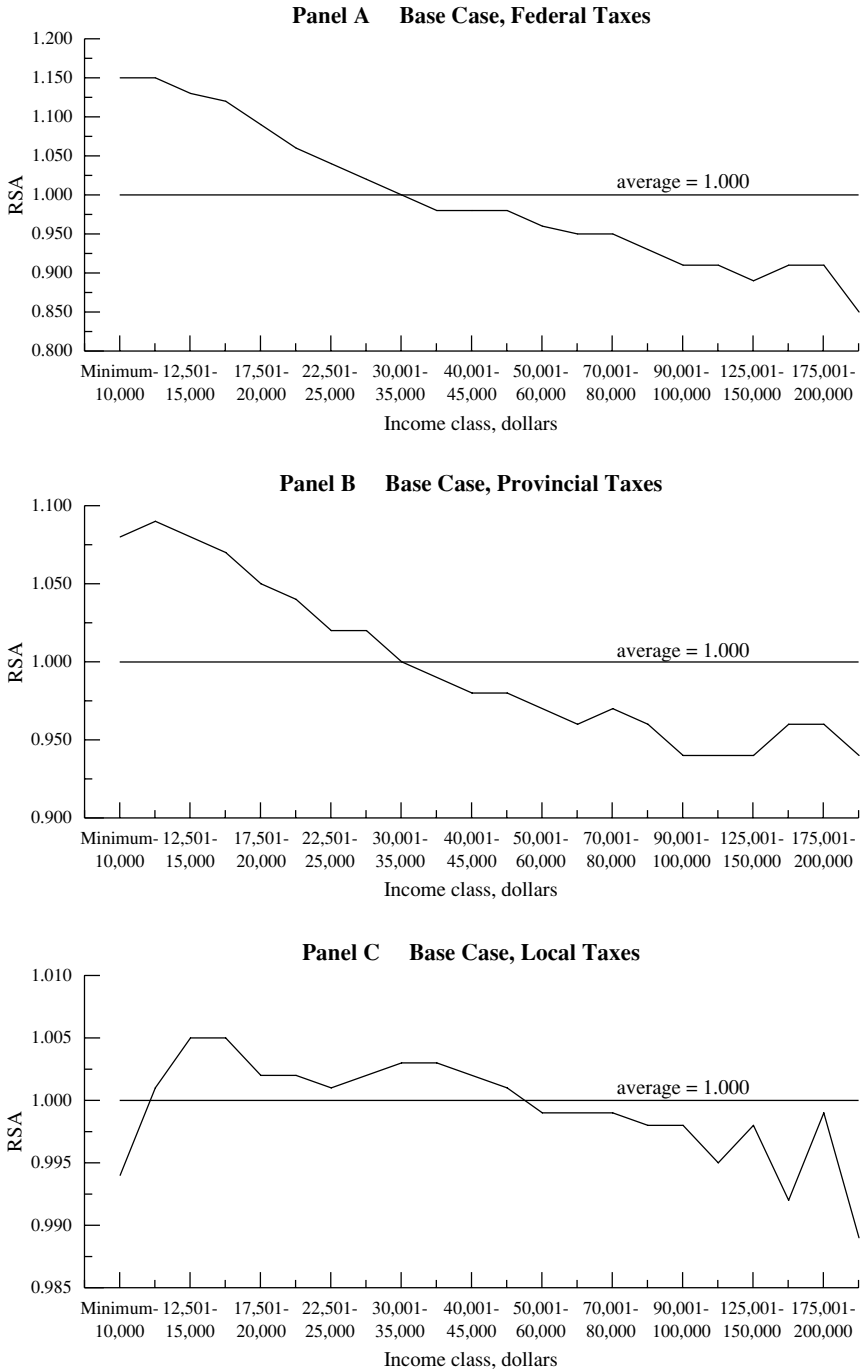
The differences in RSA_G resulting from the variants to the base case between each order of government are also quite modest (see table 3). At the federal level, RSA_G has almost identical values for the base case and the progressive variant, and is slightly lower for the regressive variant. At the provincial level, the three cases yield very similar RSA_G values. These results are not surprising since, for the two senior governments, the main revenue source affected by the different assumptions is corporate tax revenue, which accounts for a relatively small share of total federal and provincial revenue. The main effect of the alternative shifting assumptions is found at the local level because it involves the predominant source of local financing, the property tax. Under the progressive (regressive) variant, the redistributive impact of local taxes is slightly progressive (regressive).

TAX INCIDENCE BY TYPE OF TAX

The Base Case

We now turn to the incidence by type of tax for all orders of government combined. Our estimates of the global redistributive impact of each tax are shown in table 4. It is evident that, in terms of the global redistributive impact, only the personal income tax (PIT) is significantly progressive. This result is caused by the combination of a progressive rate structure and a large share of total revenue, which translates the structural progressivity into a substantial redistributive effect. None of the other tax components individually has a large impact on the overall distribution of income in the base case. Of course, this does not mean that their rate structures are proportional. Details of the incidence of each tax are shown in figure 5.

Figure 4 Relative Share Adjustment (RSA) by Income Class



**Table 4 Global Tax Progressivity Indices for Canada, 1986
(Measured by the Global RSA)**

Selected taxes	Base case	Progressive variant	Regressive variant
Personal income tax	1.0567	1.0576	1.0562
Corporate taxes	1.0019	1.0021	0.9988
Payroll taxes	1.0018	1.0023	1.0013
General sales taxes	1.0018	1.0022	1.0014
Fuel taxes	1.0000	1.0001	1.0000
Liquor and tobacco taxes	0.9985	0.9986	0.9983
Natural resource revenues	1.0001	1.0001	1.0000
Real property tax	1.0009	1.0061	0.9967
Fees and charges	1.0000	1.0001	1.0000
Miscellaneous revenue	1.0017	1.0018	1.0016
Total	1.0853	1.0958	1.0728

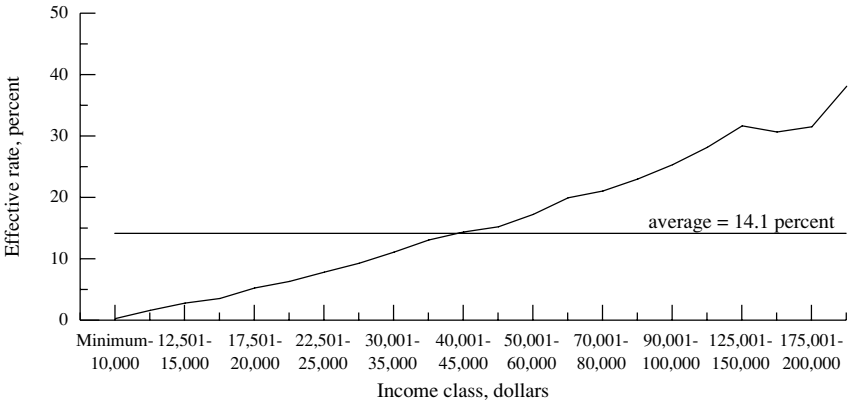
The personal income tax (panel A of figure 5) is progressive throughout most of the income scale. The effective tax rates increase steadily up to an income of \$150,000, dip slightly to an income of \$175,000, and then continue a slow climb to a maximum of 38.1 percent for incomes above \$200,000. Taxpayers with incomes below \$40,000 bear below-average tax rates and, therefore, are made relatively better off by the PIT than those above \$40,000. In the bottom income class, individuals are 16.2 percent better off than under a proportional tax, while those above \$200,000 retain post-government income of just 72.1 percent of what they would retain under a proportional tax.

In the base case, the combination of corporate income and capital taxes (panel B) is mildly regressive at the low end of the income scale, because we have assigned 50 percent of the net revenue to consumption. It is roughly proportional between \$20,000 and \$50,000 and mildly progressive thereafter, with the exception of the income range between \$150,000 and \$200,000. However, the absolute differences from the average of effective tax rates are fairly small throughout most of the income range. Taxpayers with incomes below \$50,000 bear below-average tax rates. The income classes from \$12,500 to \$17,500 have post-government income that is just 0.6 percent higher, and the income class above \$200,000 has post-government income that is 2.1 percent lower, than under a proportional tax that raises the same revenue.

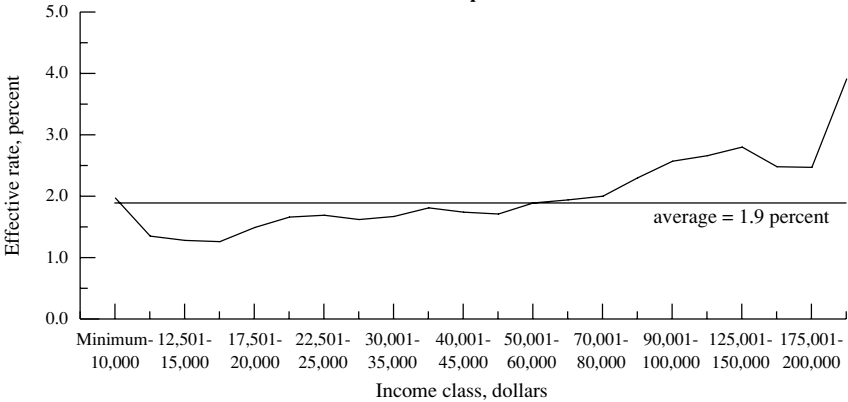
Combined payroll taxes and health care premiums (panel C) exhibit an inverted U pattern of incidence. Effective tax rates increase steadily up to incomes of \$35,000 and decline steadily thereafter. Taxpayers with incomes below \$20,000 and above \$70,000 bear below-average tax rates, while those with incomes between \$20,000 and \$70,000 bear above-average tax rates. Three elements contribute to the progressivity at the low end of the income scale: the ratio of earned to total income, the non-taxable threshold for CPP/QPP contributions, and health care premium adjustments. Provincial payroll taxes and UI and CPP/QPP contributions are progressive because they are assessed against earned income, which increases faster than

Figure 5 Incidence by Type of Tax

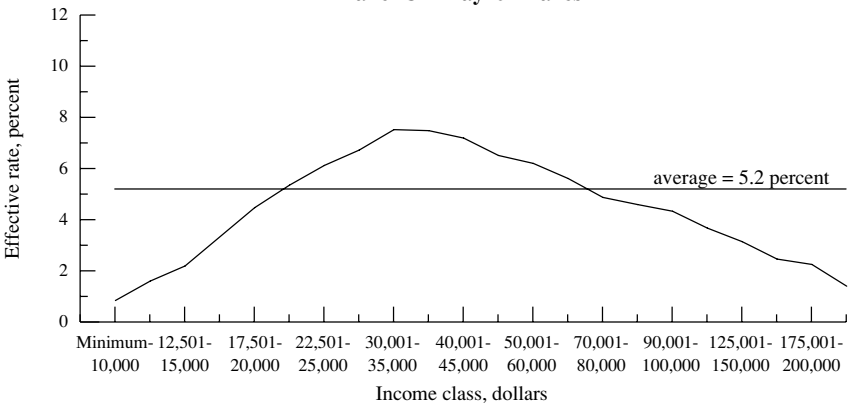
Panel A Personal Income Tax



Panel B Corporate Taxes

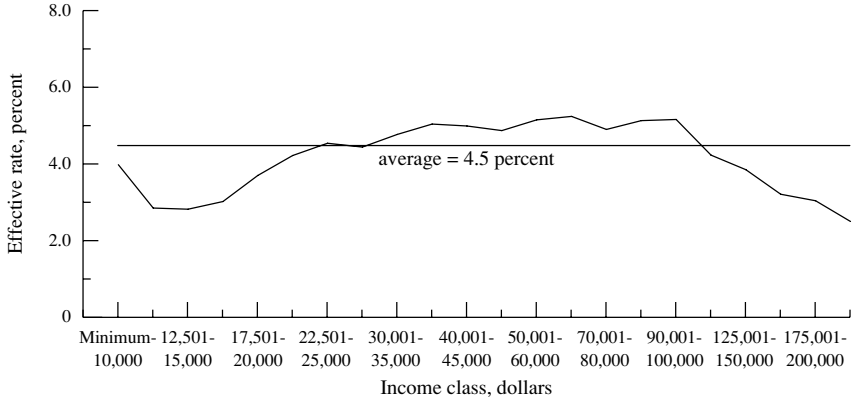


Panel C Payroll Taxes

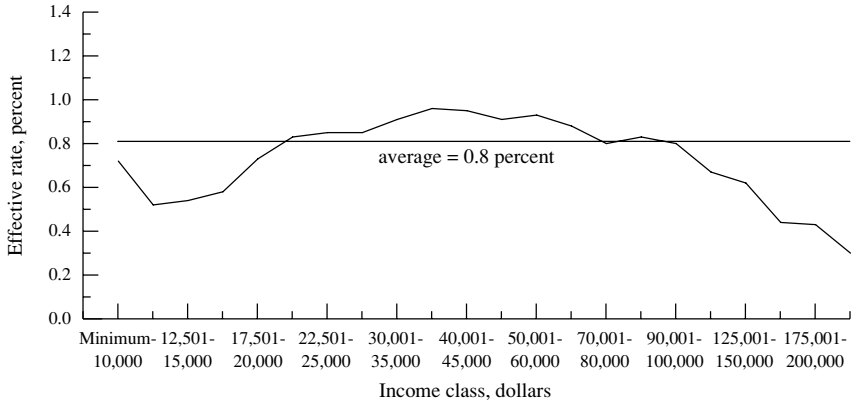


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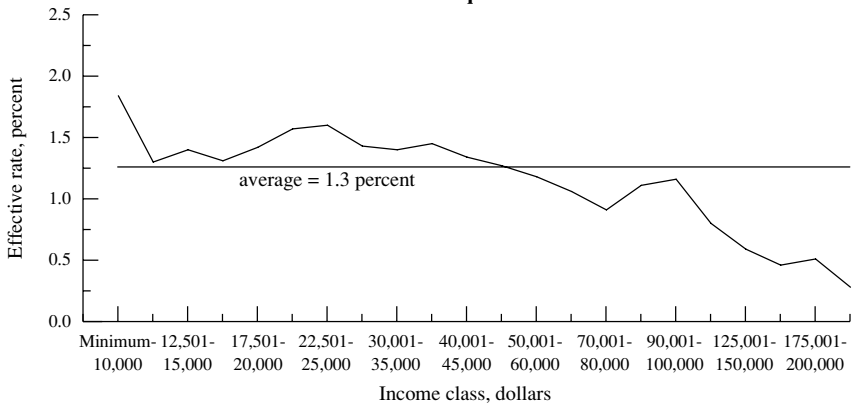
Figure 5 Continued
Panel D General Sales Taxes (MST and PST)



Panel E Fuel Tax

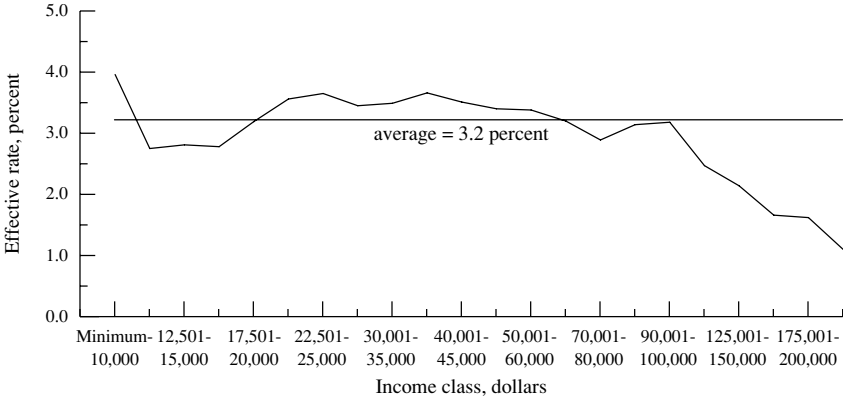


Panel F Combined Liquor and Tobacco Taxes

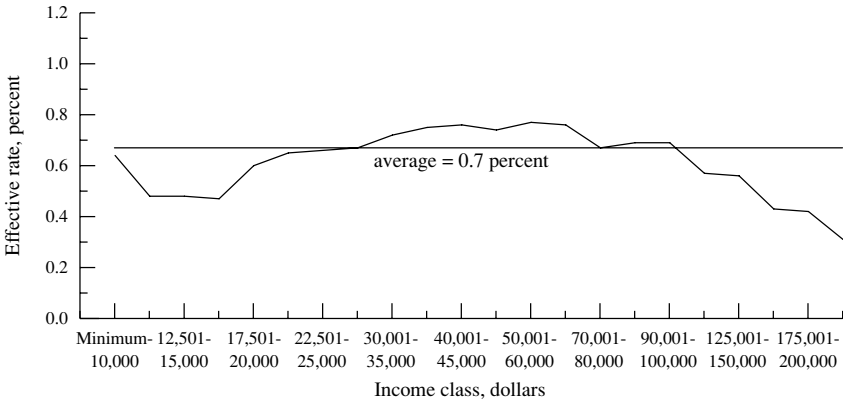


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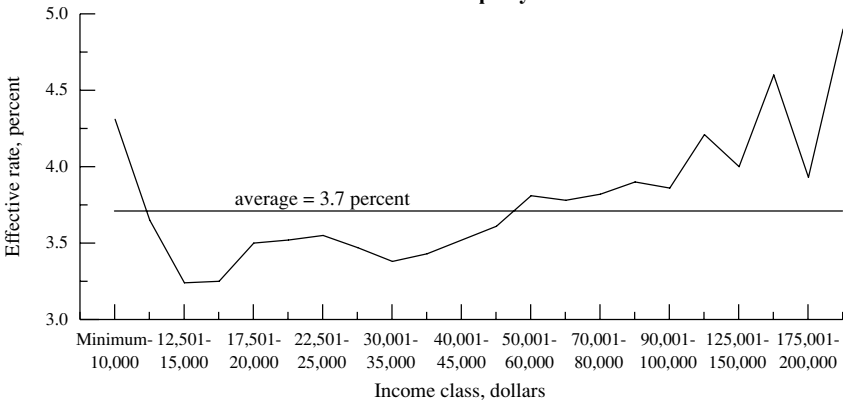
Figure 5 Continued
Panel G All Excise Taxes



Panel H Natural Resource Revenue

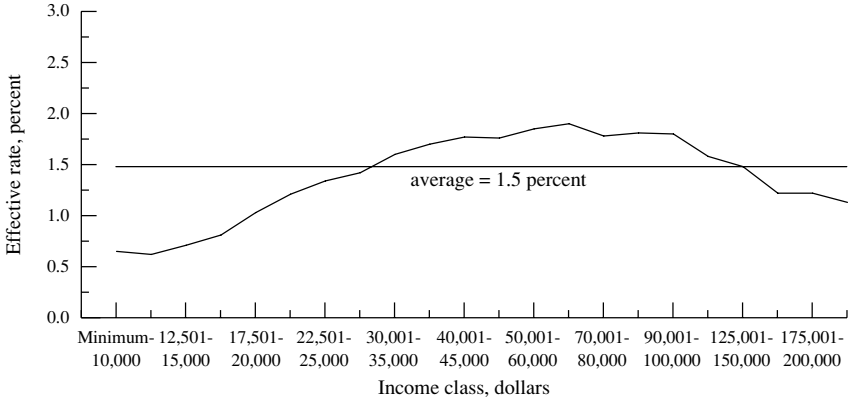


Panel I Property Tax

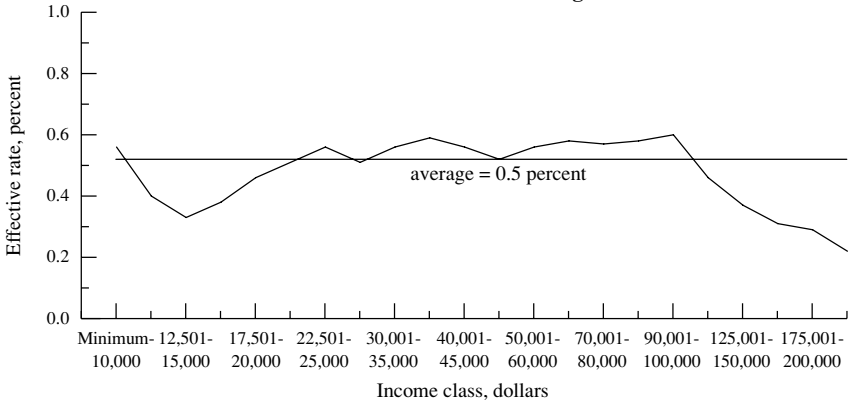


(Figure 5 is concluded on the next page.)

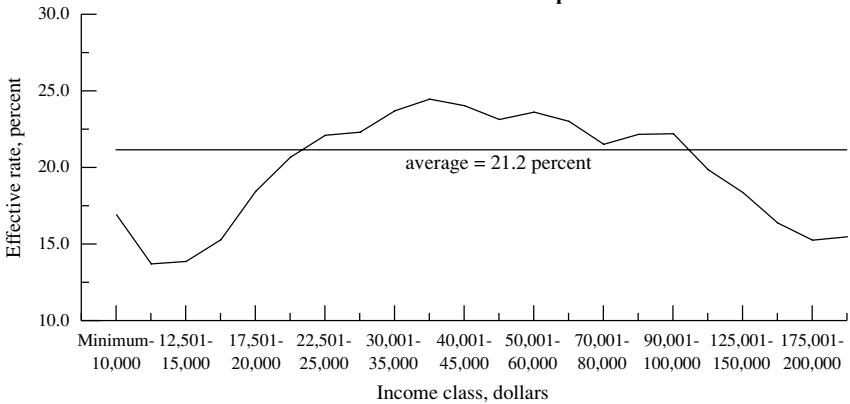
Figure 5 Concluded
Panel J Miscellaneous Taxes



Panel K Fees and Charges



Panel L All Taxes Except PIT



post-government income for low income classes. The tax-free range for CPP/QPP contributions results in increasing effective tax rates as income rises to the maximum contribution level. Seniors and social assistance recipients do not pay health care premiums, and there are graduated premium subsidies for low income earners. These taxes have a significant redistributive impact. The post-government income of the bottom income class is 4.6 percent higher, and that of the top class is 4.0 percent higher, than under the proportional standard, while the \$30,000 to \$40,000 classes (the hardest hit) lose 2.4 percent compared with a proportional tax.

With the exception of the anomaly at the lowest income class, general sales taxes (panel D) have a pattern of incidence similar to that of the combined payroll taxes and health care premiums. The effective tax rate increases, though not as fast or as steadily, up to an income of \$50,000, is roughly proportional for incomes from \$50,000 to \$100,000, and then falls steadily. The low and high income classes bear below-average effective tax rates, while the middle income classes (\$30,000 to \$100,000) bear above-average tax rates. The progressivity at the low end of the income scale is caused by the indexing of transfer payments, which, in our calculation, is properly treated as a negative tax.³² The redistributive impact of the combined general sales taxes is less than that of the payroll taxes. The low income classes between \$10,000 and \$15,000 are made 1.7 percent better off and the highest income class is 2.1 percent better off than under the proportional standard; the \$60,000 to \$70,000 class loses 0.8 percent.

A pattern of incidence very similar to that of general sales taxes is shown by fuel taxes (panel E). Liquor and tobacco taxes (panel F), however, have a largely regressive structure, except for a slight progressive pattern between incomes of \$15,000 and \$22,500 and between \$70,000 and \$100,000. The combined excise taxes (panel G), including fuel, liquor, and tobacco taxes, have an inverted U incidence pattern similar to that of general sales taxes, but the shape of the U is flatter. As in the case of general sales taxes, above-average excise tax rates are paid by taxpayers in the middle of the income scale (between \$20,000 and \$60,000). The redistributive impact of the combined excise taxes increases the post-government incomes of the \$10,000 to \$12,500 class by 0.5 percent, and that of the over \$200,000 class by 2.2 percent, relative to a proportional tax, while it reduces the relative post-government income of those in the \$35,000 to \$40,000 class by 0.5 percent. The same pattern is exhibited by natural resource revenues (panel H), which is not surprising since they were treated as excise taxes. The variation in effective tax rates and the redistributive impact is very slight.

The property tax (panel I) is slightly progressive overall, except at the low end of the income scale (mainly because of the anomaly in the first

³² Commodity taxes are the major revenue item where the pattern of incidence estimated in our study differs markedly from that obtained by VGV, *supra* footnote 7.

income class). It is virtually proportional between \$17,500 and \$45,000. Taxpayers with incomes below \$50,000 bear below-average tax rates (except for the two lowest income classes). The degree of redistribution is slight. Those with incomes between \$12,500 and \$17,500 are 0.5 percent better off than under a proportional tax, and those with incomes between \$150,000 and \$175,000 are 0.9 percent worse off. Miscellaneous taxes (panel J) have a clear inverted U shape, indicating that taxpayers with incomes between \$30,000 and \$125,000 pay above-average tax rates. Fees and charges (panel K) have a pattern similar to the combined excise taxes. Effective tax rates fall slightly up to incomes of \$15,000, rise slightly to incomes of \$25,000, remain roughly constant and slightly above the average in the income range between \$25,000 and \$100,000, and then drop steadily. Their redistributive impact is very slight.

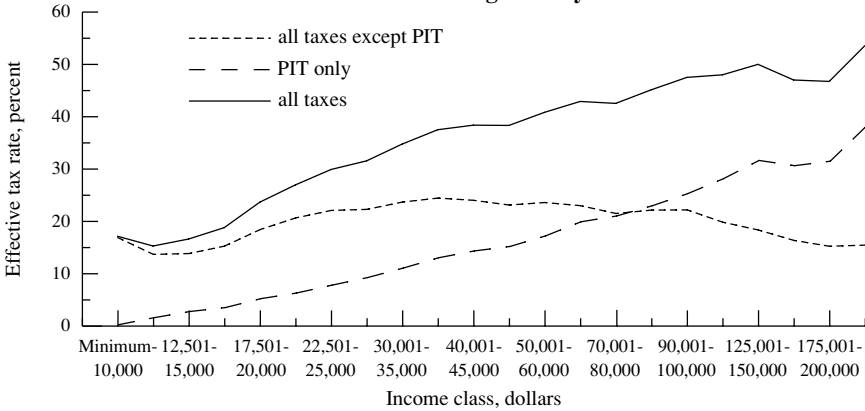
In the base case, the pattern of incidence of all taxes and fees except personal income taxes (panel L) has an overall inverted U shape. Effective rates are below the average in income classes below \$22,500 and over \$100,000, and above the average for incomes between \$22,500 and \$100,000. Therefore, 60 percent of government revenue has a redistributive impact that shifts a share of after-tax income from the middle income classes, very broadly defined, to the poor and the rich. The size of this redistribution is significant for low, high, and middle income classes. The \$10,000 to \$12,500 class is made 9.4 percent better off, and the \$175,000 to \$200,000 class is made 7.5 percent better off, than under a revenue-neutral proportional tax, while the hardest hit, middle income class, \$35,000 to \$40,000, is made 4.2 percent worse off. The redistributive impact of these combined taxes is larger than that of the PIT for the income classes between \$35,000 and \$50,000.

Figure 6 compares the pattern of incidence of the two major components of government revenue, personal income taxes and all other taxes. It is evident that all taxes other than the PIT generate mild redistribution from the middle income households to both low and high income households. The progressivity of the PIT offsets the regressivity of other taxes at the top of the income scale. The net result is an overall progressive pattern of incidence. The degree of progressivity, however, is stronger at the lower end of the income scale, and practically disappears after incomes of about \$100,000. It is evident that for households with incomes up to \$80,000, the PIT is less onerous than the combination of all other taxes. The opposite conclusion holds for households with incomes above \$80,000.

Progressive and Regressive Variants

The alternative shifting assumptions in the two variants to the base case alter the redistributive impact of the property tax to a greater extent than for corporate taxes. In the progressive variant, the value of RSA_G increases from 1.0019 to 1.0021 for corporate taxes and from 1.0009 to 1.0061 for property taxes; in the regressive variant, the value of RSA_G falls to 0.9988 for the former and 0.9967 for the latter. Although the alternative shifting

Figure 6 The Impact of the Personal Income Tax on Overall Progressivity



assumptions do not have a large redistributive impact, they do change substantially the pattern of structural incidence of the affected taxes.

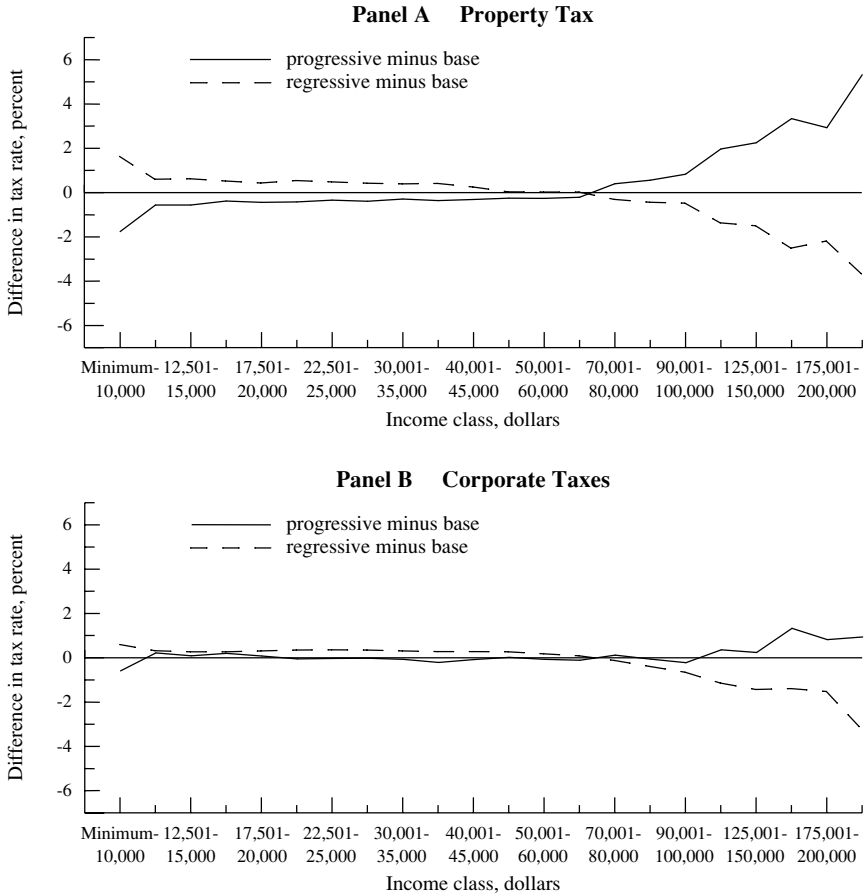
The effects of the two variants on the pattern of incidence of property taxes and corporate taxes are shown in figure 7. We notice that the action is largely concentrated at the top of the income scale, which, for the property tax, starts at incomes of \$70,000 and for corporate taxes at incomes of \$90,000. The effective property tax rate for the over \$200,000 class ranges from 1.2 percent under the regressive variant to 10.8 percent under the progressive variant. The difference in effective corporate tax rates is much smaller, ranging from 1.0 percent to 3.9 percent for the over \$200,000 class. The absence of changes at the lower end of the income scale is due to the effect of transfer indexing. In the progressive variant, low income taxpayers do not bear the burden of corporate and property taxes because they do not own much property or other capital; in the regressive variant, they pay the tax as consumers, but are largely compensated through the indexing of transfers.

CONCLUSION

In this paper we estimated the redistributive impact of taxation in Canada for 1986. Our results show that the overall tax system is progressive and produces a significant degree of redistribution in favour of lower income classes. Both federal and provincial governments have progressive tax structures. The federal tax structure, however, produces a greater degree of redistribution, primarily because it is dominated to a larger extent by the personal income tax. The local tax structure is roughly proportional.

Among the various revenue components, the personal income tax is the only source with a high degree of progressivity. However, its progressivity is more pronounced at the low and middle range of the income scale. All other taxes combined have an inverted U shape, indicating that they generate a redistribution of income from the middle class, broadly defined, to both low and high income households.

Figure 7 Incidence of Property and Corporate Taxes Under Alternative Assumptions: Change in Effective Tax Rate



We tested for the effect of altering the shifting assumptions for corporate and property taxes by estimating the pattern of incidence under a progressive and a regressive variant. Our results show that these alternative assumptions did not alter significantly the overall pattern of tax incidence.

APPENDIX: METHODOLOGICAL ISSUES

Excess Burdens and Tax Evasion

Although we are using actual revenues, it is well known that taxes create burdens in excess of revenues collected. We do not include the distributional impact of excess burdens in our analysis for two reasons: first, as Musgrave et al. noted,³³ we don't know how these burdens are distributed;

³³ Richard A. Musgrave, Karl E. Case, and Herman Leonard, "The Distribution of Fiscal Burdens and Benefits" (July 1974), *2 Public Finance Quarterly* 259-311.

second, we want to maintain consistency with our treatment of expenditures in fiscal incidence. Since we are measuring tax incidence within the framework of fiscal incidence, there may also be excess benefits on the expenditure side. These excess benefits have not been included because of the arbitrariness in the calculation of their values and their distribution.

It is also well known that the amount of tax collected is less than the total legal liability because of tax evasion. We do not include the effect of tax evasion on the distribution of the tax burden because of the lack of reliable data. This approach incorporates the assumption that evaded taxes are distributed in a distributionally neutral manner.

Annual Versus Lifetime Incidence

In recent years, there has been increasing interest in lifetime tax incidence.³⁴ Although lifetime tax incidence provides useful information for the design of tax structures, it does not reduce the usefulness of annual incidence studies, the approach taken in this paper. Lifetime tax incidence depends upon the time profile of income and tax burdens. Its correct measurement requires the separate calculation of annual incidence for each year of an individual's life. Therefore, the measurement of annual incidence is both a foundation for the measurement of lifetime incidence as well as a complementary approach.

Small Open Economy Assumption

In this study, tax incidence is measured by using shifting assumptions derived explicitly within the framework of a small open economy. The small open economy assumption affects the pattern of incidence of various taxes through two basic channels: it prevents deviations between the domestic and the world rate of return on capital, and it constrains the producer price of tradable goods and services.

One of the special characteristics of a small open economy is the perfect mobility of capital, which, in the absence of transaction costs, will generate a perfectly elastic supply of capital to the domestic economy. The net rate of return on capital is determined in the world market, is independent of the level of domestic savings and, therefore, must be treated as a given. However, the world rate of return faced by the domestic economy is net of the burden of the average world tax rate on capital. Therefore, in tax incidence analysis, a distinction must be made between domestic tax rates that are equal to the average world rate and differences from that rate.

With respect to the average world tax rate on capital, the entire world economy can be treated as a closed economy, and capital will bear a tax burden whose magnitude depends on the elasticity of the world supply of capital. In the simplest case of a small open economy, capital mobility does not allow any domestic tax to be borne by capital, since the domestic

³⁴ See Davies, St-Hilaire, and Whalley, *supra* footnote 1; and Don Fullerton and Diane Lim Rogers, "Lifetime Versus Annual Perspectives on Tax Incidence" (September 1991), 44 *National Tax Journal* 277-87.

rate of return cannot be lower than that in the world capital market. However, this conclusion is altered when a foreign tax credit is provided.

A foreign tax credit reduces the domestic tax on capital by the amount of foreign capital taxes incurred on investment income from abroad. Therefore, assuming that the foreign capital tax is fully offset by the amount of domestic capital tax collected, if domestic capital tax rates equal the average world rate, a small open economy can be treated as a closed economy for purposes of tax incidence. In this case, domestic capital will bear a portion of the domestic burden equal to the burden borne by foreign capital in the closed world economy. Any differential between the domestic and average world rates, however, has a different pattern of incidence under the closed and the small open economy assumptions. In the former case, the entire tax revenue is allocated in the same manner, and capital bears the burden in relation to its supply elasticity. In the latter case, capital mobility does not allow the differential domestic tax rate to be borne by capital: this component of the domestic tax is shifted.

The small open economy assumption also affects the allocation of the portion of sales and excise taxes that affect producer prices. Under the small open economy assumption, the producer prices of tradable goods and services are determined in the world market; as a result, domestic producers are price takers. A distinction needs to be made between the direct component of sales taxes, which is levied on final consumer purchases, and the indirect component collected on business inputs, which enters the final retail price to the extent that this can be shifted forward to consumers. Direct taxes on consumers have the same incidence patterns in a closed or small open economy because they do not affect producer prices and are applied at the same rate on domestic and imported goods and services. The incidence of the indirect component collected on business inputs differs between a small open economy and a closed economy.

Since domestic producers in a small open economy are price takers in international markets, any indirect tax on exports cannot be shifted forward to foreign consumers. Similarly, in the case of tradable goods, domestic goods are subject to the domestic indirect tax on inputs, but imported goods are not. Competition from imported goods does not allow the indirect tax on domestic production to be passed on to domestic consumers and, therefore, it must be absorbed by domestic factors of production. This portion will be borne primarily by labour because capital is perfectly mobile. Domestic producers of non-tradable goods and services, however, do not face a world producer price and, therefore, do not have to absorb the indirect component of the tax.

In conclusion, the small open economy affects the incidence of those taxes that would impose a differential burden on capital from average world rates or would affect producer prices. The burden of those tax components under perfect capital mobility and price-taking behaviour cannot be borne by either consumers or owners of capital and must be shifted to the immobile factors, labour and land. These conclusions have been used, where applicable, in our selection of shifting assumptions shown in table 2.

Indexing of Transfers to Persons

As mentioned in the text, the treatment of the indexing of government transfers to persons for tax-induced increases in the price level is one of two major methodological differences between our study and the VGV study. The importance of transfers in the measurement of commodity tax incidence was brought to the fore by Browning, and Browning and Johnson.³⁵ Browning³⁶ initially argued that transfer payments do not bear the burden of sales and excise taxes because they are indexed. Therefore, the burden of sales and excise taxes falls entirely on factor income. In response to criticism that not all transfers are indexed,³⁷ Browning re-stated his argument³⁸ within the framework of a differential tax incidence model where real government expenditures, transfers as well as purchases of goods and services, are kept constant. Since transfers account for a decreasing share of total income as income increases, Browning derives a progressive pattern of incidence for sales and excise taxes by assuming that the savings ratio is constant and that transfers are fully indexed.

A reconciliation between the traditional approach and Browning's alternative has been recently proposed by Ruggeri.³⁹ Ruggeri shows that within the framework of differential tax incidence, where the standard of comparison is a proportional income tax applied to a comprehensive income base, transfers affect the pattern of incidence only to the extent they are indexed. Moreover, the effect of indexing is properly captured by treating the actual degree of indexing as a negative tax. Therefore, in the measurement of sales tax incidence, the amount of tax to be allocated is not the gross revenue but the revenue net of the portion of transfers due to indexing; this net revenue, however, is a burden on consumers and not on factor earnings.

Ruggeri's analysis shows that the traditional approach and Browning's alternative can be treated as polar cases of a general formula. Whatever the actual degree of indexing may be, the former treats transfers as if they are not indexed at all, while the latter assumes that they are fully indexed, even when they are not.

³⁵ Edgar K. Browning, "The Burden of Taxation" (August 1978), 86 *Journal of Political Economy* 649-71; Edgar K. Browning, "Tax Incidence, Indirect Taxes, and Transfers" (December 1985), 38 *National Tax Journal* 525-33; and Edgar K. Browning and William R. Johnson, *The Distribution of the Tax Burden* (Washington, DC: American Enterprise Institute for Public Policy Research, 1979).

³⁶ "The Burden of Taxation," supra footnote 35.

³⁷ Charles E. McLure Jr., "Commentary," in John R. Moroney, ed., *Income Inequality: Trends and International Comparisons* (Lexington, Mass.: Heath, 1979), 111-14; and Timothy M. Smeeding, *Are Sales Taxes Progressive?* Institute for Research on Poverty Discussion Paper no. 545-79 (Madison: University of Wisconsin-Madison, June 1979), 545-79.

³⁸ "Tax Incidence, Indirect Taxes, and Transfers," supra footnote 35.

³⁹ "On the Measurement of Sales Tax Incidence in the Presence of Transfers," supra footnote 15.

Excise taxes produce an additional effect. Since they are levied on selected items, they alter the relative prices of consumer goods. Therefore, their burden, net of the indexing effect, is borne by the consumers of the taxed items rather than consumers in general.⁴⁰

In our calculations we performed a fairly detailed process of allocation of sales and excise taxes. First, we acknowledged that a portion of the revenue from sales and excise taxes originated from business purchases.⁴¹ Under the small open economy assumption, this indirect tax component cannot be shifted forward but must be absorbed by factors of production.⁴² The direct tax component was allocated to consumers. In the case of the federal and provincial general sales taxes, this direct revenue was first allocated to each of 39 categories of consumer spending in accordance with their effective tax rates.⁴³ The amounts assigned to each expenditure component were then allocated to various households on the basis of their consumption of each item according to the SPSD/M microdatabase. This procedure yielded a detailed estimate of the tax payable before the adjustment for indexing.

To adjust for indexing, we reviewed each of the major government transfers to persons and determined the degree to which they are indexed for price level increases. We then evaluated the effect of a rise in the nominal price level on each tax by dividing the amount of revenue assigned to consumers under the various shifting assumptions by total consumer expenditures. This price level adjustment was multiplied by the degree of indexing to determine the increase in transfers caused by a tax-induced increase in the consumer price index. This indexing amount was treated as a negative tax and, therefore, was subtracted both from the tax assigned to consumers and from the transfers received by households.

⁴⁰ For an example of indexing applied to an excise tax, see James M. Poterba, "Is the Gasoline Tax Regressive?" in David Bradford, ed., *Tax Policy and the Economy*, vol. 5 (Cambridge, Mass.: National Bureau of Economic Research and MIT Press, 1991), 145-64.

⁴¹ M.Y. Siddiqi, P.S.K. Murty, and J. Diena, "Highlights of the Provincial Sales Tax Commodity Allocation Project, 1984" (mimeograph, Statistics Canada, Input-Output Division, Ottawa, 1989).

⁴² Details for general sales taxes are found in G.C. Ruggeri and K. Bluck, "On the Incidence of the Manufacturers' Sales Tax and the Goods and Services Tax" (December 1990), 16 *Canadian Public Policy* 359-73; and Ruggeri and Bluck, *supra* footnote 15; details for all taxes are found in G.C. Ruggeri, D. Van Wart, and R. Howard, "The Redistributive Impact of Taxation in Canada (Long Version)" (mimeograph, Alberta Treasury, Edmonton, 1993).

⁴³ Estimated by Chun-Yan Kuo, Thomas C. McGirr, and Satya N. Poddar, "Measuring the Non-Neutralities of Sales and Excise Taxes in Canada" (1988), vol. 36, no. 3 *Canadian Tax Journal* 655-70, adjusted to 1986.