

**Fiscal Illusion and the Perceived Price
of Provincial Government Output in Canada**

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Abstract: This paper examines if how governments finance themselves can influence the perceived price of and hence demand for government output. Using a standard model for government output and a panel data set of ten Canadian provinces for the period 1961 to 1992, we find that tax revenues are perceived more acutely than other major revenues (borrowing, federal transfers, investment income) and some taxes are recognized more than others. We also find learning by taxpayers (declining fiscal illusion) during the period and that lower increases in perceived tax prices lead to more seats for incumbent politicians.

Keywords: Fiscal illusion, the perceived price of government output, regression analysis.

J. E. L. Classification: H19, C23, D72

1. Introduction

According to the fiscal illusion hypothesis, how governments finance spending can influence the demand for public sector output. The argument is that more complicated, less visible and fragmented revenue sources make it harder for voter-taxpayers to accurately assess the cost of the public sector. Therefore, less than transparent taxation can cause the voter to underestimate the tax price of public services and thereby increase quantity demanded. To complete the argument there must be some gain to elected officials from choosing opaque revenue sources. One obvious benefit is an increase in expected votes since the lower perceived tax price increases the median voter's perceived utility.

There is a substantial empirical literature that has addressed this issue from a variety of perspectives. For example, beginning with Wagner's (1976) study of 50 large US cities, the Herfindahl (H) index often has been used to measure revenue complexity where $H = \sum r_i^2$ and r_i is the fraction of revenue from revenue source i . Higher values for H indicate simpler revenue structures and therefore a more accurately perceived fiscal burden and lower public sector spending, *ceteris paribus*. Wagner found support for the fiscal illusion hypothesis as did Pommerechene and Schneider (1978) for Swiss municipalities, Baker (1983) for US state and local spending and Breeden and Hunter (1985) for 37 US cities. However other authors, Clotfelter (1976) for higher education, Munley and Greene (1978) for US cities, Misiolek and Elder (1988) for US states, do not find support for fiscal illusion. More recently Wei-Te Hsieh (1995) in a time series study of Canadian federal spending finds that while levels of H do not influence public sector size, changes

in H , the degree of fiscal complexity, do.¹

Another approach focuses on the income elasticity of revenue systems, the idea being that higher income-elastic revenue systems lead to more spending through a fiscal illusion effect. The reason is that revenues automatically increase more than income without attracting taxpayer scrutiny in the same way as new taxes or changes in tax rates. As reported in Oates (1988) empirical support for this argument, where the elasticity of revenue systems is proxied by the proportion of revenues from income taxation, has been mixed.²

Still another approach is represented by Winer (1983) who looks at the issue for a federal state where federal grants to provincial governments drive a wedge between the provincial government that spends and the government that taxes. This wedge lowers the perceived price of provincial government output thereby increasing the demand for this output. In regression estimates of a demand for provincial government output, Winer concluded that federal grants increased provincial spending for a panel data set of the Canadian provinces.

Finally, and most relevant for our purposes, another prominent strand has looked at the impact of deficit financing on perceived tax prices and government spending. In particular Niskanen (1978) introduces into a demand function for government output a perceived tax price variable R/G where R is tax revenue and G is government spending. In the presence of deficit financing R/G is less than one, and therefore so is the perceived tax price of a dollar of government spending since voters, it

1 In a review of the fiscal illusion literature, Oates (1988) argues studies using H are suspect since large budgets may require diverse revenue sources making H endogenous. Only Wei-Te Hsieh directly takes into account this concern though he finds no support for endogeneity.

2 The only study (Feenberg and Rosen (1987)) that uses actual income elasticity estimates finds no support for the illusion hypothesis.

is hypothesized, do not internalize the future tax burdens caused by borrowing. Niskanen found in a time series regression of a demand model that decreases in R/G (increases in deficit financing) were associated with increases in US federal spending. Subsequently, other authors using essentially the same approach, have made similar conclusions for other national governments.³

On balance there seems to be some evidence in support of various kinds of fiscal illusion but not all results are supportive and there are misgivings about how fiscal illusion is represented empirically. To illustrate, for the H index one can have qualms about the index as an adequate measure of revenue complexity and about revenue complexity as a reliable proxy for taxpayer misperceptions. For example some direct taxes may be more visible than some indirect taxes. For the income elasticity literature there are acknowledged difficulties in measuring income elasticities and, in any event, the fiscal illusion hypothesis is more general than an income elastic point. The perceived price approach, although promising, makes a distinction between only two revenue sources, taxes and deficit financing, and imposes an assumption that allows no middle ground, i.e., taxpayers fully recognize taxation costs and fully ignore deficit financing costs.

In light of these issues, our plan is to test the fiscal illusion hypothesis with a regression model in which the demand for public sector spending depends on the perceived price of public sector output and other relevant demand variables. The perceived price will depend on the structure of the revenue system, decomposed into nine revenue sources, and the extent to which taxpayers recognize the cost associated with each revenue source. The perceived price will then be a weighted average of how fully taxpayers recognize the cost of each revenue source as represented by each revenue

3 See for example Provopoulos (1982) for Greece, Craigwell (1991) for the Barbados, Diamond (1989) for the G-7 nations and Ashworth (1995) for the UK.

source's regression coefficient. This approach avoids the problems in using complexity measures (H) to represent voter perceptiveness and does not impose, a priori, different perceptions based on revenue source. The empirical work will be carried out for a panel data set of the ten Canadian provinces for the years 1961 to 1992.

To briefly review the regression results, we find that fiscal illusion effects exist since how revenues are raised can influence the perceived tax price and therefore the demand for public sector output. Specifically we find that provincial tax revenues are perceived by residents more acutely than the other major revenue sources (borrowing, federal transfers to the provinces and net investment income). We also find that some taxes are more fully recognized than others with gasoline taxes being the most recognized. In addition the results suggest some learning by taxpayers since the fiscal effects of revenue sources are more fully recognized towards the end of the sample period, i.e., the perceived price is higher. Finally we use our perceived price results in a second stage regression to see if there is an electoral pay-off in legislature seats from manipulating revenues to create lower perceived prices. In particular we introduce the proportion of seats won by incumbents in elections as a dependent variable and relate this to the change in perceived prices since the last election and other variables. We find that the lower is the increase in perceived prices between elections the greater is the proportion of seats won by incumbents.

In the following sections we present the model, the data, the regression results and discussion.

2. The perceived price of provincial public output

We consider a standard demand for government output model:⁴

$$\text{GOVC} = \beta_0 + \beta_1 Y + \beta_2 \text{POP} + \beta_3 \text{OLD} + \beta_4 \text{YOUNG} + \beta_5 \text{UN} + \beta_6 \text{PP} \quad (1)$$

In the above GOVC is real provincial government spending per adult, Y is real GDP per adult, POP is adult population, OLD and YOUNG identify the percentage of the population greater than 65 years and less than 19 years respectively, UN is a provincial unemployment measure and PP is the *perceived* relative price of public sector output. The income and population variables test for income and congestion effects while the age variables explore demographic effects. The unemployment variable tests to see if the representative voter values spending that tries to moderate the business cycle. Finally with respect to the variable of most interest, the perceived price of government, we note that since GOVC measures expenditures per person, a negative coefficient for PP indicates price elastic demand, while a positive coefficient indicates inelastic demand.

To investigate the influence of revenue structure on public sector demand we need to look more closely at the perceived price variable. Accordingly we define the perceived price as:

$$\text{PP} = (P_G / P) (R^* / G) \quad (2)$$

⁴ See for example Borchering and Deacon (1972). In these models the demand relation is derived by positing elected officials who maximize the utility of the median voter subject to a budget constraint.

In the above P_G/P is the relative price of government output, measured by the price index for this output divided by the price index for provincial GDP, while R^* are payments to the provincial government that voters perceive they make to finance government expenditures, G . With complete information, the median voter's perceived revenue payments would be identical to actual payments ($R^* = R$) and the actual and perceived "tax" price for public sector services would be identical and equal to one, i.e., $R^*/G = R/G = 1$. Fiscal illusion arises when rational voters perceive a tax price less than one because budgetary environments are complicated and information is costly to obtain.

To incorporate this into the demand model, we introduce perception parameters θ_i , $i=1, 9$ which measure the degree to which the cost of one of our nine revenue sources i is recognized by the voter. If $\theta_i = 1$, the cost of revenue source i is fully internalized, while if $\theta_i = 0$, the cost is disregarded. This allows us to write the perceived tax price, R^*/G , as $\sum \theta_i (R_i/G)$, where R_i is revenue from source i , and the perceived relative price as $(P_G/P) \sum \theta_i (R_i/G)$.⁵ Substituting this perceived price back into the demand model gives:

$$GOVC = \beta_0 + \beta_1 Y + \beta_2 POP + \beta_3 OLD + \beta_4 YOUNG + \beta_5 UN + \sum \beta_6 \theta_i (P_G/P) (R_i/G) \quad (3)$$

PauseKey (Key: Enter!)

In a regression of (3), for each revenue source i there is a regression coefficient $\beta_6 \theta_i$ that can be recovered where β_6 provides information about the demand elasticity and θ_i indexes the taxpayer

5 In the Niskanen deficit finance literature, government revenues are divided into a tax source and a borrowing source and the perception parameter is implicitly set equal to one for the tax source and zero for the borrowing source.

perception of revenue source i . The presence of the structural coefficient β_6 means that individual perception parameters θ_i cannot be recovered from a regression. However since β_6 is present for every revenue source, what can be inferred is how acutely taxpayers perceive the cost of one revenue source relative to another. In addition we can also recover from a regression of (3) the term $\sum \beta_6 \theta_i (P_G/P) (R_i/G)$ which is a multiple, by a factor equal to β_6 , of the true perceived relative price $\sum \theta_i (P_G/P) (R_i/G)$. We also note that since the perception parameters θ_i are hypothesized to be non-negative, if the estimated regression coefficient $\beta_6 \theta_i$ is negative this implies $\beta_6 < 0$, i.e., the demand for government expenditures is price elastic.

We close this section by introducing two other issues, one dealing directly with the demand model in (3), the other indirectly with the model. First it may be that as government spending grows, voters will invest greater time and resources in learning about the price of government services. Learning by voters means that the perception parameters may be affected. In particular since the 1960's and 1970's were a time of rapid expansion by provincial governments, we shall test for structural breaks in the nine perception parameters using 1980 as the break point. The hypothesis is that after 1980 the perception parameters on average will be higher because of learning by voters.

Finally, on a somewhat different track, we examine the implications for the welfare of elected officials of adjusting the revenue structure to influence the perceived price of government output. In the model politicians manipulate the revenue structure to reduce the perceived price and increase votes.⁶ Accordingly incumbent electoral success should be negatively related to changes in the

⁶ Following West and Winer (1980), a way to see how politicians benefit is to look at the median voter's perceived private income which is total income minus perceived payments, $\sum \theta_i R_i$, to government. If some θ_i are

perceived price. To test for this we shall consider a simple regression that uses as a dependent variable the percentage of legislature seats won by incumbents and relates this to the average annual change in the perceived price multiple since the last election, together with other control variables. The regression will cover the 73 elections held in the provinces during the sample period.

3. The data

In this section we introduce the variables needed for estimation of equation (3) and explain variable construction and data sources.

The dependent variable (GOVC) is annual provincial government spending per adult (population over 19) from 1961 to 1992 for each of the ten provinces. This spending includes total current expenditure on goods and services, expenditures on fixed investment and transfers to persons. To convert to real terms, we deflate government spending by a constructed implicit price index for government services. The index is constructed as a weighted average of the implicit price index for government goods and services, the implicit price index for government fixed investment and the implicit consumer price index. The weights are respectively the three categories of spending as a proportion of total spending.⁷

Turning to the independent variables, real gross provincial product per adult is used to measure income (Y) and is obtained by deflating by the price index for final provincial domestic demand.

less than one voters believe their private income is higher than it is.

⁷ Price index data for individual provinces are available only for 1971 onwards. For the years 1962 to 1970 we use national indices. Therefore for these early years prices change from year to year but not across provinces.

The relative price of government output (P_G/P) is just our constructed government price index divided by the price index for final domestic demand. By their definitions, the measurement of the two age related demographic variables and the adult provincial population is self-explanatory. However the measure of cyclical unemployment (UN) does need some explanation. In Canada, unemployment rates have been drifting upward over the sample period, probably because of various supply-side phenomena. This underlying drift means that unadjusted unemployment rates are an unreliable measure of cyclical unemployment. Examination of the data revealed that the unemployment rates could be represented as a random walk with drift. Therefore we decided to measure cyclical unemployment as the residuals from a difference stationary process.

The key independent variables in equation (3) are the revenue sources as proportions of total spending (G). The taxation sources are provincial sales taxes (PST), gasoline taxes (GAS), personal direct taxes (PDT), business taxes (BT), personal licenses and fees (LF) and remaining indirect taxes (RIT). The non-taxation revenue sources are transfers from the federal government (TRAN), net investment income (NII) and provincial borrowing or budget deficits (BD). These variables with sample means are summarized in Table 1. The revenue sources contain the five largest individual tax categories with remaining taxes being lumped into the remaining indirect tax category. The smallest revenue source on average are personal licenses and fees while the largest are transfers from the federal government.

Turning to data sources, data for provincial government spending, for gross provincial product and for the revenue source variables are all from Statistic Canada's *Provincial Economic Accounts*. All price indices are from issues of Statistic Canada's *National Income and Expenditure Accounts*. The unemployment rate data for provinces are from issues of Statistics Canada's *Historical Labour*

Force Statistics, and provincial population and the age-related demographic variables are from the Minister of Supply and Services, Ottawa, *Post-Censal Annual Estimates of Population by Marital Status, Age, Sex and Components of Growth*.⁸

TABLE 1
Provincial government revenue sources (as proportions in total spending)

Revenue source variables	Description	Mean
PST/G	provincial sales taxes	0.133
GAS/G	provincial gasoline taxes	0.060
PDT/G	personal direct taxes (includes social security and government pension plan contributions)	0.191
BT/G	corporation taxes	0.046
LF/G	licenses and fees including motor vehicle licenses, hospital and medicare premiums and miscellaneous licenses	0.030
RIT/G	remaining indirect taxes	0.098
TRAN/G	transfers from federal government	0.330
NII/G	positive net investment income measured as investment income minus interest paid on debt	0.060
BD/G	budget deficit or revenue from borrowing	0.052

8 The Statistics Canada data are available on its Cansim data base. In putting the data together a couple of problems did arise. As already mentioned there is only individual provincial price index data after 1970. In addition there are no unemployment data for the four Atlantic and three Prairie provinces before 1966, so regional unemployment rates were used in these years.

4. Empirical results

For the panel data set of 310 observations covering 10 provinces and 31 years we report two regressions. The first regression applies the demand model to the entire time period while the second looks for a structural break in how the revenue sources are perceived with 1980 as the break point. In the next section we will also report on a voting regression that builds an independent variable based on a perceived price for government output extracted from the spending regressions.

Concerning the regression techniques for the spending equations, since this is a panel data set we expect certain estimation problems. In particular groupwise heteroscedasticity across the provinces is likely, especially given the relatively large variation in size of provinces. In addition the error term may be correlated across provinces since it is likely that the diverse economic, social and political forces that effect province will effect all of them to some extent. Accordingly, as indicated by likelihood ratio tests (for cross-group correlation and groupwise heteroscedasticity) and chi-square tests for within province autocorrelation, all three regressions were corrected for groupwise heteroscedasticity and cross group correlation but not for within province autocorrelation.⁹ We also incorporate two classes of control variables. The first is a trend for unmeasured secular changes in the economy. The second is a set of dummy variables identifying the provinces. These are included to account for cross-sectional differences among the provinces not captured by the other independent variables. Finally since equation (3) refers to the long run equilibrium demand for government output, we allow for the existence of inertia and lags in how elected officials adjust spending. We

⁹ Due to space limitation we report only the likelihood ratio tests for groupwise heteroscedasticity and cross sectional correlation.

do this in the standard partial adjustment fashion by including the dependent variable lagged one period as a regressor. The regressions and test statistics were done using the panel regression procedures set out in the software package LIMDEP (Greene, 1995).

The results for the government spending equation are given in Tables 2 and 3. Before concentrating on the perceived price variables, we briefly review the results for the other variables. The results are broadly consistent across the two specifications. The per capita income variable has a positive and, at the one percent level, significant coefficient indicating public sector output is a normal good.¹⁰ In contrast the population variable has a negative and, at the one percent level, significant coefficient. This could imply either economies of scale in the provision of services or that these government services have a significant public good component. Demographics play a role with older populations demanding fewer services. However there is one anomalous result with respect to the youth variable which is insignificant in the first specification but surprisingly negative and significant, at the five percent level, in the second specification. The unemployment variable has positive and, at the five percent level, significant coefficients indicating provincial government spending offsets cyclical movements in unemployment. We can not say how much of this effect, if any, is discretionary and how much is mandated by statutory programs. The trend variable is, as expected, positive and significant. The coefficient for the lagged dependent variable is positive, significant, within the zero to one range mandated by the partial adjustment process, and therefore

10 To interpret the quantitative importance of the coefficients, we note that YOUNG, OLD and UN are measured as proportions, while GOVC and Y are measured in thousands of dollars with means respectively of 4.36 and 20.57 thousand. POP is measured in thousands with mean of 1553.

indicates inertia in the spending process.¹¹ Finally the provincial dummy variables, not shown in the tables, indicate that approximately half the provinces have significant, at the five per cent level, and negative coefficients indicating they spend less per capita than Ontario, the reference province.¹²

TABLE 2
Regression results from the demand model applied to the entire sample

Independent variables	Coefficients	t-statistics	p-value
Constant	3.0762	4.929	0.00000
POP (population)	-0.0002	-5.795	0.00000
Y (real GDP per adult)	0.0508	4.542	0.00001
OLD (population >65)	-9.9006	-4.327	0.00002
YOUNG(population <19)	0.4031	0.458	0.64721
UN (unemployment)	0.0180	2.297	0.02163
Trend	0.0457	5.453	0.00000
Lagged dependent variable	0.50952	14.24	0.00000
Provincial revenue variables			
PST/G (sales taxes)	-2.3297	-3.779	0.00016
GAS/G (gasoline taxes)	-7.0374	-5.968	0.00000
PDT/G (personal direct taxes)	-0.0630	-1.093	0.27444
BT/G (corporation taxes)	-3.7612	-3.880	0.00010
LF/G (licenses and fees)	-1.8516	-2.363	0.01813
RIT/G(remaining indirect taxes)	-1.5496	-2.542	0.01103
TRAN/G(transfers from federal)	-0.0538	-0.116	0.90740
NII/G (net investment income)	0.1745	0.280	0.77949
BD/G (budget deficit)	0.52945	1.133	0.25722
Diagnostics			
LR(df=9) ^a	83.69		0.00000
LR(df=45) ^b	72.70		0.00554
Log likelihood value	112.43		

Notes: ^aLikelihood ratio test for groupwise heteroscedasticity. ^bTest for cross-sectional correlation.

11 The coefficient of adjustment in spending is one minus the estimated coefficient on the lagged dependent variable.

12 For the significant provincial dummies the range is between approximately 200 and 900 dollars per capita.

We turn now to the perceived price variables. Looking first at Table 2, the coefficients on all six of the taxation revenue sources are negative and, except for PDT/G, significant at the five percent level. What do these results imply? Recall that each is the product of β_6 , the elasticity parameter, and θ_i , the perception parameter which should be non-negative. This implies first that $\beta_6 < 0$ and hence demand for government output is price elastic. This also implies that the larger the negative value for the regression coefficient the more acutely the revenue source is perceived by the voter. On this account the most fully recognized, by a considerable amount, is gasoline taxes, followed by business taxes, provincial sales taxes, licences and fees, remaining indirect taxes and personal direct taxes.¹³ In contrast, the non-taxation sources are faintly or perceived not at all as costs. For example the coefficient for federal transfers is negative and not significantly different from zero, while the coefficient for net investment income and borrowing are positive and insignificant. A quantitative assessment of the effects is provided by the size of the coefficients. For example an increase of one percentage point in the gas tax variable (GAS/G) would reduce spending per capita by \$70 compare to only a \$23 reduction for an equivalent increase in the provincial sales tax variable (PST/G).¹⁴ On balance the results imply that revenue sources that are taxation sources reduce spending, the precise

13 The gasoline tax results are quite striking, they are the most acutely perceived provincial taxes. Because of this we would expect that the marginal political cost to politicians from increasing this tax would be high. Interestingly there is support for this view in an article by Landon and Ryan (1997). They investigate voting behaviour in the Canadian provinces from 1960 to 1990 wherein the probability of incumbent defeat depends on a vector of desegregated taxes and government expenditures. Among the tax variables, they find that three (gasoline taxes, sales taxes and personal taxes) contribute significantly, at the ten percent level, to the probability of defeat and of these, the gasoline tax is quantitatively the most important. In fact in the authors' Table 3 a \$1 per capita increase in the gas tax increases the probability of incumbent defeat by .0127 compared to .0052 for sales taxes and .0042 for personal direct taxes.

14 These numbers apply to 1986 which is the base year for the price indices and therefore the relative price variable is conveniently equal to one. Since revenues equal spending, we should point out that an increase in financing from one revenue source must imply a decrease from another. In reporting the numbers in the text we assume no offsetting effect, i.e., the perceived price for the other revenue source is zero.

effect depending on the type of tax, but that non-taxation revenue sources have no dampening effect on spending.

TABLE 3
Regression results from the demand model testing for structural break

Independent variables	Coefficients	t-statistics	p-value
Constant	5.6743	6.376	0.00000
POP (population)	-0.0002	-3.925	0.00009
Y (real GDP per adult)	0.03478	2.818	0.00483
OLD (population >65)	-10.505	-4.255	0.00002
YOUNG (population <19)	-3.1889	-2.663	0.00775
UN (unemployment)	0.01877	2.299	0.02151
Trend	0.05798	6.033	0.00000
Lagged dependent variable	0.40589	9.984	0.00000
Provincial revenue variables			
EPST/G (sales taxes)	-2.6219	-3.904	0.00009
LPST/G	-5.1496	-5.263	0.00000
EGAS/G (gasoline taxes)	-6.8789	-5.015	0.00000
LGAS/G	-8.2924	-3.351	0.00081
EPDT/G (personal direct taxes)	-1.2562	-1.988	0.04686
LPDT/G	-1.4717	-2.202	0.02769
EBT/G (corporation taxes)	-5.7594	-5.014	0.00000
LBT/G	-0.66116	-0.498	0.61860
ELF/G (licenses and fees)	-2.4995	-2.626	0.00863
LLF/G	-3.8569	-2.925	0.00345
ERIT/G (remaining indirect taxes)	-3.4362	-3.652	0.00026
LRIT/G	-1.0864	-1.481	0.13864
ETRAN/G (transfers from federal)	-0.93325	-1.776	0.07570
LTRAN/G	-1.0275	-1.606	0.10827
ENII/G (net investment income)	-0.10955	-0.148	0.88215
LNII/G	-0.78798	-1.129	0.25909
EBD/G (budget deficit)	-0.02994	-0.049	0.96065
LBD/G	-0.26442	-0.474	0.63541
Diagnostics			
LR(df=9) ^a	79.60		0.00000
LR(df=45) ^b	82.19		0.00059
Log likelihood value	125.28		

Notes: 1. ^aLikelihood ratio test for groupwise heteroscedasticity. ^bTest for cross-sectional correlation.

2. Revenue variables beginning with E denote early period coefficients while those with L represent late period coefficients.

The purpose of the second regression reported in Table 3 is to see if voters have become more discerning over the sample period. To address this issue we split the sample with 1980 as the breakpoint. Our hypothesis is that on average the late period regression coefficients may imply higher perception parameters because, in a time of increasing government scale, voters devote more effort to understanding their fiscal environment.

The results from Table 3 support increased voter discernment. First, as evidenced by the log likelihood ratio tests, the late period coefficients are significantly different from the early period coefficients at the one percent level of significance.¹⁵ Furthermore inspection of the revenue source coefficients, all of which are negative, shows that seven of the nine revenue sources have coefficients that imply higher perception parameters in the late period, i.e., seven of the nine revenue sources have coefficients that are higher in absolute value in the late period.¹⁶

Perhaps a more concise way to summarize how voters assessments have changed is to build estimates of the total perceived relative price, $\sum \theta_i (P_G/P) (R_i/G)$, based first on the early period regression coefficients and then on the late period coefficients. Unfortunately, since the parameter β_6 cannot be identified, we cannot retrieve the perceived relative price from our regressions. But what we can recover is the multiple of this, $\beta_6 \sum \theta_i (P_G/P) (R_i/G)$. Accordingly we report the average for this multiple over all 310 observations for the case when the early revenue source coefficients in regression 2 are assumed to apply for the entire 31 years and then for the case when late period coefficients in regression 2 are assumed to apply for the whole time period. The average and

15 The likelihood ratio statistic is 25.7 while the associated chi-square for nine degrees of freedom and significance level of one percent is 21.67.

16 We assume that the elasticity of expenditures, as measured by g , has not changed over the period.

standard deviation (in brackets) for the perceived price multiple using the early coefficients is, after multiplying by -1 because β_6 is negative, 1.82 (.28) while for the later period the numbers are 1.93 (.32). The perceived price multiple constructed with the late period coefficients is higher than the multiple constructed with the early period coefficients. Moreover the difference is significant at the one percent level. These numbers are consistent with the hypothesis that the voters' vision about the cost of government has improved.

In summary, the two regressions suggest that revenue structures influence spending, that taxes are perceived more acutely than other revenue sources, that some taxes are perceived more clearly than others and , finally, that voters' understanding of their fiscal environment has improved.

5. A voting regression

The preceding results indicate that the perceived relative price of provincial government output is a function of how this output is financed. A natural consequence of this finding is to suppose that the electoral success of incumbents depends in part on voters assessment of what has happened to the perceived price during the incumbent's time in office. More specifically if voters discern lower prices for public sector output, then they also observe that the budget constraint summarizing obtainable bundles of public and private sector output is less stringent, and therefore voters perceive themselves better off, i.e., on higher indifference curves.¹⁷ This perceived higher welfare predisposes voters toward incumbents, *ceteris paribus*.

¹⁷ See West and Winer for a full development of the model incorporating this argument.

To test this hypothesis, and hence also to provide additional support to the conclusion that the preceding regression results reveal information about perceived prices, we estimate the following simple model:

$$\text{INCUMB} = \alpha_0 + \alpha_1 \text{PPC} + \alpha_2 \text{UNC} + \alpha_3 \text{YC} + \alpha_4 \text{LE} + \alpha_5 \text{SAME} + \alpha_6 \text{YIP} + \alpha_7 \text{YIPSQ} + \alpha_8 \text{INCUMBL}$$

In the above INCUMB is the proportion of seats won by the incumbent provincial party in an election. PPC is the average annual proportional change between elections in the relative perceived price multiple, $\sum \beta_i \theta_i (P_G/P) (R_i/G)$. UNC and YC are the average annual proportional change in provincial unemployment rates and provincial per capita GDP between elections (Elections were matched with annual economic data by assigning elections before June 30 to the previous year and elections after June 30 to the current year). LE and SAME are dummy variables. The first equals one when elections are held in the final (fifth) year of a mandate and the second equals one when federal and provincial governments are of the same party. YIP and YIPSQ measures years in power for the government and the square of this. Finally INCUMBL is the incumbent party's proportion of seats in the preceding election.

The model implicit in the above equation is one where voters settle up with incumbents by assessing their change in welfare since the last election. The larger the increase in welfare the more likely it is that voters will choose incumbents instead of opposition parties.¹⁸ In this light, the larger are annual increases in PPC and UNC the worse will be incumbent's electoral prospects, while larger

18 For examples of voting models on which our approach is based see Peltzman (1992) and Landon and Ryan.

increases in YC improve the electoral prospects of the government. SAME is included because voters may believe their well-being is advanced by federal-provincial cooperation which is facilitated when parties match. YIP and YIPSQ are included to see if the longevity of a government affects how voters perceive incumbents compared to the opposition. The late election dummy is included to control for unspecified factors which affect the popularity of the government. Governments that wait to the last year are usually governments that are in trouble. Finally the lagged dependent variable measures inertia in voting due to non-marginal voters who are committed to a political party even in the face of large perceived reductions in welfare.

Before reporting the regression result, we note that the sample size covers 73 elections held in the provinces between 1961 and 1992.¹⁹ The data sources for UNC and YC (based on UN and Y from the perceived price regressions) are as identified in our data section. INCUMB, SAME, LE, YIP and its square are taken from Fox (1982, 1991) and different issues of the *Canadian Parliamentary Guide (Globe and Mail Publishing)*. The perceived price multiple is constructed from regression 2.²⁰ The results of a least squares regression with t-statistics in brackets are:

$$\text{INCUMB} = .19 - .83 \text{ PPC} - .09 \text{ UNC} + 1.81 \text{ YC} - .15 \text{ LE} - .03 \text{ SAME}$$

$$(1.79) \quad (2.50) \quad (.48) \quad (1.95) \quad (2.34) \quad (.60)$$

19 The 1972 election in Newfoundland occurred five months after the preceding election and was excluded. Differencing of the data to create average annual changes means that the first elections in the 1960's in the provinces are not in the sample.

20 We use regression 1 rather than 2 to build the perceived price because the structural break in (2) complicates the interpretation of the average annual change between elections in the price when the time interval covers elections on either side of the 1980 break. In fact the results for PPC built using regression 2 are similar but slightly weaker (the coefficient is -1.13 with t-statistic of 1.67).

$$+ .04 \text{ YIP} - .001 \text{ YIPSQ} + .25 \text{ INCUMBL}, \text{ adjusted R-squared}=.54$$

$$(6.39) \quad (5.63) \quad (1.64)$$

Our main interest is in the coefficient for PPC and, as expected, it is negative and statistically significant at the one percent level. If voters perceive that the price of government services has increased since the last election then the proportion of seats won by the government falls.²¹ The results implicitly add credibility to our first stage regressions and our conclusion that they provide information about the perceived price of provincial government product. The remaining variables are largely self-explanatory. At the five per cent level of significance, increases in income per capita increase electoral success, late elections harm electoral prospects and years in power help but eventually hurt electoral performance.

6. Conclusion

The purpose of this paper has been to examine how provincial governments finance themselves can influence the perceived price of and therefore demand for government output. Using a standard model for government output and a panel data set of ten Canadian provinces for the period 1961 to 1992, we found that how much the median voter underestimates the real tax price depends on

21 To establish the quantitative meaning of the coefficient, consider, for example, a one percentage point increase in the most acutely perceived tax, GAS/G for each year between elections balanced by a one percentage point reduction in a non-tax revenue source whose perception parameter, θ , can taken to be effectively zero. From regression 1 the perceived price multiple will increase by 7.03 times .01 or .07 and the effect on the proportion of seats won by the incumbent will be -.83 times .07 or-.058.

revenue structures. In particular greater reliance on non-taxation revenue sources reduces the perceived price relative to taxation revenue sources. In addition, among taxation sources, some are recognized more fully than others with gasoline taxes being the most acutely felt. In fact the perception parameter rankings implied by the regressions have, for the most part, intuitive appeal. For example, by comparison to other taxes, the highly recognized gasoline taxes are frequently encountered user fees that are a significant part of the purchase price. (According to Natural Resources Canada, in 1992 gasoline taxes averaged 47 percent of the retail price in 10 major city markets across Canada.) On the other hand the faintly perceived person direct taxes (income taxes) are collected by the federal government with automatic payroll deduction and the part of the tax that is for the provinces is not identified. In a similar vein the low perception parameters for the non-taxation sources is consistent with the more indirect linkage between these sources and costs to the taxpayer.

We also found evidence of voter learning during the sample period which we interpret as consistent with the hypothesis that voters invest more in understanding their fiscal environment as the cost and size of the public sector expands. Voter learning is significant because it explains what limits manipulation of revenue structures by elected officials. For example, given the low perception parameters for borrowing and federal transfers, what limits movement by provincial politicians into these funding categories? One answer is some sources are beyond the control of the provincial government. For example federal transfers must be negotiated with a federal government which may not be enthusiastic about raising federal taxes to finance provincial spending. But another answer is that voters learn and, as emphasized by Oates, there is a natural limit to the range over which fiscal illusion effects can operate. For instance with respect to increased borrowing we might eventually

expect one kind of limiting pressure from credit rating agencies but we should also expect another kind from a more alert public.

Finally, in an regression exploring voting behaviour, we found a relationship between changes in the perceived price and electoral success. Those jurisdictions with lower increases in the perceived price of public output had greater electoral success, *ceteris paribus*. These results support our interpretation of the regression coefficients in Table 2 as perception parameters and at the same time provide a reason for politicians to manipulate revenue structures.

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