

# **COMPOSITE INDICES OF QUALITY OF LIFE IN CANADA: ESTIMATING WEIGHTS FROM VOTERS' DECISIONS**

Michael R. Hagerty  
Graduate School of Management  
University of California, Davis  
Davis, CA 95616  
(510)522-7505  
mrhagerty@ucdavis.edu

October 1998

## **Abstract**

This paper studies Canadian citizens' behavioral response to changes in Quality Of Life (QOL). Specifically, we examine whether changes in QOL, as measured by the Centre for Study of Living Standards (CSLS) indicators of well-being, affect the outcome of Canadian federal elections. We test the hypothesis that voters hold the governing party responsible for declines or improvements in QOL, which reduces or increases their share of votes in the next election. Objective measures of QOL included all indicators proposed by the CSLS model, such as personal consumption, government expenditures, unpaid work, unemployment, poverty, and inequality. We also tested additional indicators of QOL, including crime rates, divorce rate, and air pollution. For each election since 1960, we compute change in objective measures of QOL since the previous year to estimate the voting consequences. The estimated "voting function" is the best predictor of voters' behavior as a function of the changes in QOL

The results show that changes in the CSLS indicators do influence national elections in the predicted way, with changes in personal consumption, unpaid work, wealth, and violent crime being most important. The results are fairly robust to changes in specification, and retain the same signs when used to "backcast" election results from the 1960s.

## 1. INTRODUCTION

An important goal of this conference is to develop broader measures of Quality of Life (QOL) for a country's citizens. Developing measures of QOL entails first, computing *indices* to reflect changes in each of the individual QOL domains (such as wealth, personal consumption, crime, etc.), and second, forming *composites* of the various indices to reflect how citizens combine the domains. Many of the papers in this conference deal with the first task (e.g., Osberg and Sharpe 1998) by selecting broader measures of QOL and developing indices for each. However, they devote little attention to selecting appropriate weights to form composites. This paper deals with this second task – identifying the weights that reflect how citizens combine domains into perceived QOL.

Such weights have been assigned in the past by several methods. First, moral philosophers such as Plato and Kant have assigned a-priori weights to define the “good life”. Second, many sociologists have asked people directly how important each domain is to them (Bradburn 1969). Third, economists have preferred to *infer* importances from behavior using hedonic pricing studies, or revealed preference studies. In this case, the importance that consumers attach to a domain would be reflected by price consumers pay (conditional on costs and supply). These inferential techniques have been successful *only when* all domains are freely traded in competitive markets. However, many domains in QOL studies are *not* freely traded (clear air, safety from crime, safety from unemployment). Therefore other methods are required to provide weights. This paper explores the information provided from *national elections* to estimate weights for domains of QOL, using the method of revealed preferences. The basic idea is that voters

must tradeoff the various domains of QOL to come to an overall decision on how to vote. By observing their votes contingent on objective circumstances for each domain of QOL, we can infer the weights used by voters themselves.

Figure 1 shows a block diagram of this framework. We use the QOL indices of Osberg and Sharpe (1998), hereafter called the CSLS model (Centre for the Study of Living Standards) to demonstrate. The first column of Fig. 1 represents various objective indicators (rectangles), such as personal consumption and poverty rates, which may affect QOL. The second column shows clusters of these objective indicators, gathered together to form perceived domains (Bradburn 1969; Andrews and Withey 1976, p. 127). The four domains included in the CSLS model are termed consumption flows, wealth stocks, inequality, and insecurity. These domains are then integrated in the third column into overall QOL. Finally, the last column shows how overall QOL leads to the behavioral consequences. In Figure 1, we identify two behavioral consequences of QOL: voting and emigration. Citizens experiencing a low QOL in a country might try to influence the country's policies, by writing letters or organizing political groups, with the goal of voting the incumbent government out of office and electing a new government that will improve their QOL. Alternatively, they might immigrate to another country that can provide a higher QOL to them.

-----  
 Insert Figure 1 about here  
 -----

This paper focuses on the voting behavior of Canadian citizens since 1971 as a function of the changes in QOL. Section 2 describes a theory of how voting behavior depends on national QOL. Section 3 outlines the data used, and Section 4 describes the results for the voting function.

## 2. VOTING BEHAVIOR

We employ the model of voting commonly used in political science (see Paldam, 1991; Beck, 1991). It assumes that voters hold the current government (or the incumbent party) responsible for their “general welfare.” Indeed, the preamble of the US Constitution, says that its purpose is to “promote the general welfare” of its citizens. To ensure this, citizens can follow a deceptively simple decision rule: *if the quality of life declines during an incumbent’s administration, then the incumbent should be voted out.* This decision rule follows from either of two arguments. The first is put forward by Kramer (1971) and by Fair (1978), who assume that voters try to predict how each party will affect their QOL, then vote for the party that will most improve their QOL. The model assumes that the best prediction of a party’s future performance is the party’s past performance while in office. Hence the party with the best recent record is voted in.

At first glance this model appears far too simplistic, since voters could potentially take into account additional information such as the party platforms, or unexpected events beyond the incumbent’s control (such as an oil embargo caused by external circumstances). But Downs and Rocke (1995) argue that voters are better off by ignoring this other information, and by focusing exclusively on the changes in QOL provided by the last government. They model a voter as a player (principal) in a strategic game, who must determine the optimal compensation policy for the government (agent). They show that the rational voter would distrust party platforms and promises because the elected party often ignores party platforms and cannot be compelled to keep promises afterwards. Hence, the electorate trusts only *prior actions* of the incumbent, and punishes with only one action: voting the incumbent out. If the electorate were to give “the benefit of the

doubt” and re-elect a party after QOL declines, then this action would serve as a signal to later incumbents that they need not strive for promoting the general welfare.

All of this implies that voters implicitly ask a simple question, “Are we better off since the last election?” This simple model of voters’ behavior is testable, and evidence from several countries (Paldam, 1991; Fair, 1978) confirms that voters do seem to follow this model, at least for economic indicators: as objective economic circumstances improve, voters are more likely to vote for the incumbent party.

However, previous literature has considered only a few indicators of QOL – primarily growth in GDP and inflation. In this paper, we test for the effects of more and broader indicators of QOL, such as crime rate, divorce, and air quality, on national election outcomes.

We model the percentage of votes received by the incumbent party,  $V$ , as a function of changes in the four domains specified by the CSLS model of Fig. 1, and then add other indicators as well. Specifically, our model is expressed as

$$(1) \quad V = f(\Delta\text{Consumption}, \Delta\text{Wealth}, \Delta\text{Inequality}, \Delta\text{Insecurity}, \Delta\text{Other QOL}, \varepsilon),$$

where  $f(\cdot)$  is a linear function,  $\Delta$  denotes the *percentage change* during the last government, and  $\varepsilon$  is the normal error term.

### 3. DATA

Voting data for federal elections were taken from Feigert (1989), updated by Elections Canada (1998). Percent of votes received for the party forming the federal government prior to each election was recorded for each province for each election. This resulted in 7 elections since 1971, by 10 provinces. In addition the 4 elections from

1960-1971 were collected as validation data. The two territories Yukon and Northwest Territory were not included because of missing data.

Per capita real consumption, unemployment and crime rates were originally obtained from Statistics Canada (1998). Fixed non-residential capital stock, residential capital stock, LICO (percent below low-income cutoff), and GINI were collected by Osberg and Sharpe (1998). Air pollution data were obtained from Environment Canada's National Air Pollution Surveillance Database (1998), which contains measurements of air quality from all provinces and territories using 373 monitoring sites (usually located in large cities). Measures of particulates suspended in the air (smoke, soot and dust) go furthest back, and were used for this study. Provinces with few sites (Newfoundland, PEI) sometimes had missing data. In these cases, air quality was interpolated from nearest years with complete data.

Some data was missing. Inflation was not included because Statistics Canada did not estimate separate price indices for the provinces until 1979. Unemployment, LICO, and GINI were not collected for the separate provinces until 1971. Air pollution was not collected prior to 1975. Therefore some analyses could be done only on elections since 1971. Because of this limited sample size, care was taken to ensure reliability of results by validation.

#### **4. RESULTS**

Table 1 presents the simple correlations between the incumbent's vote share and percent change in QOL indicators from one year prior to the election. The correlations are computed on all elections available since 1960. The middle column shows that simple correlations were significant and in the expected direction (positive for

consumption and wealth, negative for inequality and insecurity). Personal consumption, government consumption, non-residential capital, and housing stock per capita were all positive and significant. In contrast, correlations with raw QOL variables (not shown) were all negative. Simple correlations with percent change in LICO, duration of unemployment, and crime rates were negative and significant, consistent with theory. Correlations for other indicators were not significant.

Table 1: Simple correlations between the incumbent's vote share and percent change in QOL indicators from previous year.

<b>Percent change in QOL indicators from previous year</b>	<b>Correlation with incumbent's vote share</b>	<b>Number of Observations</b>
<b>Consumption</b>		
Personal per cap.	.303***	110
Government per cap.	.226*	70
Unpaid Labor per cap.	-.068	110
<b>Wealth</b>		
Non-residential capital per cap.	.417***	99
Housing stock per cap.	.336***	99
<b>Inequality</b>		
LICO	-.281**	70
GINI	-.014	70
<b>Insecurity</b>		
Unemployment rate	.073	80
Duration of unemployment	-.466***	70
<b>Additional QOL</b>		
Property crime rate	-.474***	110
Violent crime rate	-.490***	110
Air pollution: total particulates	.036	50
Divorce rate per 1,000 pop.	.266**	70

\*\*\*p<.01

\*\* p<.05

\* p<.1

Table 1 gives some encouragement because the zero-order correlations are in predicted direction. But many models are still consistent with Table 1. For example, a single factor may be causing all of the observed correlations. If the economic business

cycle causes all consumption and wealth to increase in that year, and causes all inequality and insecurity to decrease, then only one factor could explain all of the correlations in Table 1.

Table 2 presents tests of some of these models by examining joint effects of the indicators. In the first column, all nine indices of the CSL model are entered into multiple regression. Seven of the nine coefficients retain the expected sign. However, only 5 of the 9 coefficients attain significance, and one of these (unemployment rate) has an incorrect sign. To explore the pattern of collinearity, backward-elimination regression was used to delete the most redundant variables. The second column presents a backward-stepwise regression on these same 9 indicators. The deleted variables were: Government expenditures, Housing stock, and GINI, which together degraded variance explained by only .9%. The remaining coefficients now suffer less from collinearity, and all but one are significant. All have expected sign, except for unemployment rate.

Table 2: Multiple regressions predicting voter support from various QOL indicators. (Standard errors of coefficients are in parentheses).

<b>Percent change in QOL indicator from previous year</b>	<b>CSLS Model</b>	<b>Backward Stepwise Regression on CSLS Model</b>	<b>Backward Stepwise Regression On All Indicators</b>
<b>Consumption</b>			
Personal per cap.	103 (48.6)**	115 (40.8)***	240 (69.5)***
Government per cap.	31.6 (33.5)	---	---
Unpaid Labor per cap.	26. (144)*	285 (135)**	466 (154)**
<b>Wealth</b>			
Non-residential capital per cap.	188 (63.1)***	173 (57.6)***	175 (70.9)**
Housing stock per cap.	8.7 (86.8)	---	---
<b>Inequality</b>			
LICO	-11.4 (12.9)	-18.1 (11.0)	-18.6 (10.7)*
GINI	-34.9 (70.9)	---	---
<b>Insecurity</b>			
Unemployment rate	35.0 (13.0)***	32.8 (11.7)***	---
Duration of unemployment	-68.9 (20.3)***	-71.7 (18.5)***	-28.5 (19.3)*
<b>Additional QOL</b>	----	---	
Property crime rate			---
Violent crime rate			-1105 (475)**
Air pollution: total particulates			---
Divorce rate per 1,000 pop.			---
$R^2$	51.4%	50.5%	61.4%

\*  $p < .1$

\*\*  $p < .05$

\*\*\*  $p < .01$

The last column of Table 2 presents the final backward-stepwise regression, in which all indicators (including crime rates, air pollution, and divorce rates, as well as the CSLS indicators) were entered to find the best overall predictors of voting behavior. Only one of the additional variables attained significance (violent crime rate), whereas all but one (unemployment rate) of the CSLS indicators retained the same signs and significance levels as in the previous column. It appears that adding violent crime rate both increases  $R^2$  to 61.4%, and forces unemployment rate (which had the wrong sign) to

drop out of the equation. Both of these facts suggest that violent crime rate should be added to the CSLS model to better predict perceived QOL.

Further, examining the signs and significance levels of the coefficients across all columns reveals considerable stability – regardless of which variables are entered, all indicators show stable relationships with voting behavior. To examine the reliability of the coefficients further, we attempt to validate the coefficients against earlier elections – those of the 1960's.

**Validation:**

The above analysis uses only elections since 1971 because data on some QOL measures were not collected prior to that time. Nevertheless, we can fit a reduced model to all elections since 1960, using only indicators that were available then, to test whether parameters change prior to 1971. The indicators available since 1960 are personal consumption, unpaid work, capital stock, and violent crime rate. Table 3 presents this validation test. It shows that all variables retain the correct sign. However, unpaid labor is now not significant. Three of the four interactions are not significant, implying that coefficients were stable (given the power limitations of the data) between the validation period of 1960-1970 and the calibration period of 1971- 1995. Only one interaction (wealth) attained significance. Since it is negative, it implies that the coefficient of wealth was smaller during the 1960's when predicting voter support.

Table 3: Validation of reduced model for 1960-1996.

<b>Percent change in QOL indicator from previous year</b>	<b>Coefficient (S.E.)</b>
<b>Consumption</b>	
Personal per cap.	82.4 (43.4)*
Interaction prior to 1971	7.3 (102)
Unpaid Labor per cap.	66.0 (139)
Interaction prior to 1971	-139 (347)
<b>Wealth</b>	
Non-residential capital per cap.	182 (57.8)***
Interaction prior to 1971	-189 (77.7)
<b>Additional QOL</b>	
Violent crime rate	-1745 (394)***
Interaction prior to 1971	550 (923)
R <sup>2</sup>	36.9%

## 5. DISCUSSION

We have proposed a general method for estimating weights for composite indices of QOL. It uses a “revealed preference” approach applied to citizens’ voting behavior. Voting support for the governing party can be interpreted as a referendum on how much the government has increased perceived QOL. We applied this model to Canadian federal elections since 1971, and found supportive and interpretable results. Using the CSLS indicators, 51% of the variance in voting support for the governing party was explained. A further 10% of the variance was explained by adding violent crime rate to the CSLS indicators. Validation to elections between 1960 and 1970 was successful, with signs of most coefficients stable across the two time periods.

Table 4 contains our best estimate of the influence of QOL indicators on voting support for the governing party. They are drawn from the standardized regression coefficients in the backwards regression on all indicators from Table 2. These can be interpreted as importance weights for the indicators, given the actual variances and

covariances in elections since 1971. It shows that increases in personal consumption per capita are most important in determining voting support, followed by unpaid labor and non-residential capital, while decreases in violent crime rate, duration of unemployment, and LICO are of descending importance. Of course, one should use caution in applying these results to future elections – these coefficients are based only on the last 7 elections in Canada. However, the estimates are fairly robust to deleting or adding some variables, and show some validity when extended to earlier elections.

Table 4: Importance of QOL indicators in predicting voter support, measured by standardized beta coefficients.

<b>QOL Indicators</b>	<b>Standardized <math>\beta</math></b>
Personal Consumption per capita	.401
Unpaid Labor per capita	.313
Non-residential capital per capita	.290
LICO	-.171
Duration of unemployment	-.187
Violent crime rate	-.250

*Relations to previous results:*

These results agree fairly well with a growing body of research in other countries. In analysis of U.S. elections, Peltzman (1990) and Fair (1978) both concluded that disposable income had the largest effect on voter support for the incumbent party. In analysis of 13 developed countries, Hagerty, Naik and Tsai (1998) also concluded that economic effects were most influential, followed by homicide rate.

In the future, more elections can be added to the database, or the existing data might be analyzed at a disaggregated level (voting results are available at the level of individual ridings). Further, important local issues might be included in the model. The best example of these is the separatist issue in Quebec, which might explain even more of the variance in voting behavior.

## REFERENCES

- Archer, Keith and Marquis Johnson (1988) Inflation, Unemployment and Canadian Federal Voting Behavior, Canadian Journal of Political Science, 21, 3 (Sept.), 569-584.
- Andrews, Frank M. and Stephen B. Withey : 1976, 'Social Indicators of Well-Being: Americans' Perceptions of Life Quality', New York: Plenum Press.
- Beck, Nathaniel (1991) "The Economy and Presidential Approval: An Information Theoretic Perspective," in Economics and Politics: The Calculus of Support, (eds. H. Norpoth, M. Lewis-Beck, J. Lafay) Ann Arbor: University of Michigan Press.
- Bradburn, Norman M. : 1969, 'The Structure of Psychological Well-Being', Chicago: Aldine.
- Diener, Ed (1984) Subjective Well-Being, Psychological Bulletin, 95, 3, 542-575.
- Downs, George W. and David M. Rocke (1995) Optimal Imperfection? Domestic Uncertainty and Institutions in International Relations, Princeton, N.J.: Princeton University Press.
- Environment Canada (1998) National Air Pollution Surveillance Database.
- Fair, Ray C. : 1978, 'The Effect of Economic Events on Votes for President', The Review of Economics and Statistics, 60,2, 159-173.
- Feigert, Frank (1989) Canada Votes 1935-1988, Durham,NC: Duke University Press.
- Hagerty, Michael R., Prasad Naik, Chih-Ling Tsai (1998) The Effect of QOL on National Elections: A Multi-country Analysis. Working paper, University of California, Davis.
- Kramer, Gerald H. : 1971, 'Short-Term Fluctuations in US Voting Behavior, 1896-1964', The American Political Science Review, 65 , March, p.131-143.
- Osberg, Lars and Andrew Sharpe (1998) An Index of Economic Well-being for Canada, Ottawa: Centre for Study of Living Standards (CSLS).
- Paldam, Martin (1991) "How Robust is the Vote Function? A Study of Seventeen Nations over Four Decades," in Economics and Politics: The Calculus of Support, (eds. H. Norpoth, M. Lewis-Beck, J. Lafay) Ann Arbor: University of Michigan Press.
- Peltzman, Sam (1990) "How Efficient is the Voting Market?" Journal of Law and Economics, 33,(April) 27-63.

Powell, G. Bingham Jr. and Guy D. Whitten :1993, A Cross-National Analysis of Economic Voting: Taking Account of Political Context, *American Journal of Political Science*, Vol. 37, No. 2, p. 391-414.

Statistics Canada (1998) The Canadian Socio-Economic Information Management System (CANSIM). Web Site.

Veenhoven, R.: 1993, Happiness in Nations: Subjective Appreciation of Life in 55 Nations 1946-1990, (RISBO, Erasmus University, Rotterdam. Available by FTP).

Veenhoven, Ruut with the assistance of Joop Ehrhart (1995) "The Cross-National Pattern of Happiness: Test of Predictions Implied in Three Theories of Happiness", *Social Indicators Research*, 34, 33-68.

Wilson, John (1998) Centre for Election Studies Web Site, University of Waterloo.

Figure 1: Effects of Quality of Life on voting and emigration.

