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Consumer Attitudes, Uncertainty, and Consumer Spending

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Table of Contents

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Abstract

This study examines the link between consumer expenditures and the Conference Board's Index of Consumer Attitudes, an index highly regarded for some time as a useful leading indicator of consumer expenditures. However, the theory that identifies why it may be useful in an analysis of consumption is less well established. To explore this question, we investigate the complementary value of including the index in a consumption equation. We also take a closer look at the index to establish what information it captures and why it may be useful in explaining household expenditures.

The results suggest that the consumer attitudes index supplements traditional economic variables such as real income, wealth, interest rates, and the unemployment rate in equations explaining household expenditures. This finding is quite robust. Furthermore, when tested separately in the equation, the individual questions that contribute most to the index's explanatory power are those on current income as well as the "good time to buy" question that likely reflects consumers' assessments of their economic environment. The results suggest that the attitudes index partially captures information about expected income but that its explanatory power may also come from its measurement of the perception of economic prospects, including some assessment of the probability of a negative outcome and the uncertainty of economic prospects.

Résumé

L'étude examine le lien entre les dépenses de consommation et l'indice des attitudes des consommateurs du Conference Board, que l'on considère largement depuis quelques années comme un indicateur avancé utile des dépenses de consommation. Toutefois, l'utilité de cet indice aux fins de l'analyse de la consommation est encore mal étayée du point de vue théorique. Les auteures ont choisi de creuser cet aspect de la question, en cherchant à établir si l'addition de l'indice des attitudes à l'équation de consommation apporte un complément d'information. Elles examinent attentivement l'indice afin de déterminer quelle information il permet de saisir et comment il peut aider à expliquer le comportement des dépenses des ménages.

Les résultats présentés donnent à penser que l'indice des attitudes des consommateurs est un complément utile des variables économiques invoquées traditionnellement pour expliquer l'évolution des dépenses des ménages, comme le revenu réel, la richesse, les taux d'intérêt et le taux de chômage. Cette conclusion est très robuste. En outre, lorsque l'indice est remplacé dans l'équation par chacune de ses composantes, on constate que les questions de l'enquête qui accroissent le plus son pouvoir explicatif sont celles qui portent sur le revenu actuel ainsi que la question concernant l'opportunité d'effectuer (au moment de l'enquête) de gros achats; cette dernière question reflète probablement l'évaluation que font les consommateurs du climat

économique ambiant. D’après les résultats obtenus, l’indice des attitudes saisirait une partie de l’information relative au revenu attendu. Toutefois, son pouvoir explicatif tiendrait aussi au fait qu’il renseigne sur la manière dont les ménages envisagent leur avenir économique et évaluent la probabilité d’une détérioration de la conjoncture et l’incertitude entourant les perspectives économiques.

1. Introduction

This study examines the link between consumer expenditures in Canada and the Conference Board of Canada's Index of Consumer Attitudes, an index highly regarded for some time as a useful leading indicator of consumer expenditures (see, for example, Rayfuse 1982). However, the theory that identifies why it may be useful in an analysis of consumption is less well established. To explore this question, we investigate the complementary value of including the index in a consumption equation. We also take a closer look at the index to establish what information it captures and why it may be useful in an analysis of household expenditures.

This study is motivated in part by the observation that estimated consumption equations that include traditional economic variables such as disposable income, wealth, and real interest rates have tended to overpredict consumption in Canada through much of the 1990s. Given that consumption represents about two-thirds of gross domestic expenditure, estimated reduced-form output equations have also tended to overpredict in the 1990s (see Freedman and Macklem 1997). We explore the possibility that at least some of this overprediction can be explained by shifts in consumer attitudes.

To understand the role of the consumer attitudes index in predicting consumption, the first step is to consider the nature of the questions that make up the index. The survey consists of the following four questions:[1]

1) *Considering everything, would you say that your family is better off financially or worse off than six months ago?*

2) *Again considering everything, do you think that your family will be better off financially, the same, or worse off financially six months from now?*

3) *How do you feel the job situation and overall employment will be in this community six months from now?*

4) *Do you think that right now is a good time or bad time for the average person to make a major outlay for things such as a home or a car or some other major item?*

Since respondents are asked explicitly to evaluate how current conditions differ from past or future conditions in three of the four questions, the *level* of the index is a statistical measure of *changes* in consumer attitudes. But what is the economic information conveyed by this statistical summary of consumers' outlook?

1. The index is constructed by summing the percentage of positive responses to the four questions, next subtracting the percentage of negative responses, adding a scalar equal to 400 and indexing the result to a base year of 1991. The scalar is introduced to force the value of the index to zero if all of the responses are negative. The survey results are then seasonally adjusted. This is a quarterly survey of 1500 households.

As can be seen from the questions, the survey is not asking, “What mood are you in?” as is sometimes surmised based on the title of the index. Instead, the index tracks the consumers’ informed assessment of current and anticipated finances, the local job market, and whether it is a good time to make a major purchase. This assessment is presumably based on economic variables such as recent and expected income growth, net levels of total wealth, inflation, interest rates, employment prospects, other aspects of the business cycle, and the availability of other economic opportunities. Therefore, it is unlikely that consumer attitudes are strongly exogenous to the other variables in the consumption equation. However, if the index remains significant in a well-specified consumption equation that includes these variables, then it must convey additional information over and above that provided by these macroeconomic variables.

We consider two hypotheses concerning the possible sources of explanatory power of the index. The first proposes that any additional explanatory power comes from the possibility that the index captures changing perceptions of income and wealth, and therefore, views of permanent income. Its usefulness may also come from its timeliness, since households have immediate knowledge of large changes that will affect their lives (announced layoffs, for example) well before they appear in the aggregate statistics. The second hypothesis proposes that any additional explanatory power comes from the possibility that individual responses also include some evaluation of economic risk. General and personal economic security would influence spending plans and would also be reflected in the index through the response to the “good time to buy” question as well as through responses to the forward-looking questions. As such, the inverse of the confidence index could be viewed as a proxy for uncertainty.

The use of the consumer attitudes index as a proxy for uncertainty has been suggested by the work of others, including Mishkin (1978), Acemoglu and Scott (1994), and Belessiotis (1996). Conditioning consumption behaviour on a measure of uncertainty is appealing in two respects. First, it is reasonable to suggest that uncertainty belongs theoretically in a consumer optimization framework (Sandmo 1970), though its effects on consumption depend heavily on the form of the utility function (see Carroll and Kimball (1996) and Deaton (1992) for a discussion) and on the source of uncertainty. Secondly, one could argue that a significant rise in the amount of structural adjustment and accompanying uncertainty has characterized the Canadian economy in the 1990s.

Canada has undergone a lengthy period of economic adjustment as businesses have made necessary changes to become more competitive, changes that have affected individuals in the workplace and through the labour market. Restructuring in the private sector, and more recently in the public sector—particularly when announced as forthcoming but without specific changes identified, may affect the individuals working in an organization as well as those doing business with it. The increased possibility of layoff or early retirement for an individual or for other family members may cause households to delay expenditures during the adjustment period as they take into account the possibility that the eventual outcome may be a bad one. This delay in

expenditures is likely to continue until the uncertainty is resolved. In effect, the possibility of a negative outcome suggests an option value to waiting before undertaking large expenditures.

Recent changes in the functioning of labour markets have also increased the uncertainty in individuals' lives, particularly in the lives of young adults as new participants in the labour market. To lower labour costs and improve competitiveness, employers are increasingly tending towards a flexible labour force, outsourcing and using part-time and temporary employees. Self-employment has risen relative to paid employment, with a shift towards self-employed individuals who do not have employees, known as the own-account self-employed (see Ekos Research (1998) for a discussion). Non-standard employment may affect the individual's planning horizon, particularly if unemployment is high and another job or contract may not be readily available at a similar wage rate.

To examine the explanatory power of consumer attitudes for consumer expenditures, we begin by estimating a dynamic aggregate consumption equation based on the consumption equation for Canada developed by Macklem (1994), which adopts an error-correction approach in the spirit of work by Davidson, Hendry, Srba, and Yeo (1978). We then re-estimate the equation including the consumer attitudes index in the specification. We also test the explanatory power of the individual questions that make up the survey to try to identify the source of the index's explanatory power.

We find that the consumer attitudes index supplements traditional economic variables in equations explaining household expenditures. These results are quite robust. Furthermore, when tested separately, the individual questions that contribute most to the index's explanatory power are those on current income as well as the "good time to buy" question that is likely to reflect consumers' assessments of the economic environment. The results suggest that the attitudes index partially captures information about expected income but that its explanatory power may also come from its ability to capture perceptions of economic prospects, including uncertainty.

The remainder of the paper proceeds as follows: Section 2 presents a literature review of past work on confidence indexes and consumption; Section 3 provides a graphical review of the historical link between consumption and the attitudes index; Sections 4 and 5 discuss the empirical work and implications; Section 6 presents some empirical work to identify what information is captured by the index; Section 7 presents a short-term forecasting equation; and the final section summarizes.

2. Literature review

There is a long tradition of empirical work using consumer attitude indexes. In one of the earliest papers, Mishkin (1978) reports empirical evidence that the U.S. Index of Consumer Sentiment measures consumers' perceptions of the probability of financial distress and is largely affected by shifts in the composition of the balance sheets of households. Using a standard stock-

adjustment model of demand for consumer durables, he shows that the level of the index of consumer sentiment has significant explanatory power, though it becomes less useful when balance sheet data are also included in the specification.

Rayfuse (1982) finds that the Canadian Index of Consumer Attitudes tends to lead movements in durables expenditures by one quarter. Much of this paper deals with the leading indicator properties of a large number of questions on buying intentions (many of which are no longer included in the survey). Among his findings, Rayfuse reports that the questions about "expected income" and "good time to buy" have the most explanatory power for the index and these are both questions that have remained in the survey.

Empirical work conducted in the United States also suggests a role for confidence indexes in forecasting equations. Garner's (1991) empirical work suggests that, while consumer confidence is not particularly useful as a forecasting variable in ordinary circumstances, an abrupt decline in confidence after important non-economic events provides potentially useful information to forecasters about the reaction of consumers. Fuhrer (1993) reports that 70 per cent of the variation in consumer sentiment can be explained using traditional macroeconomic variables. In equations explaining total consumption, goods, motor vehicles, or services, the index is statistically significant even though the economic and practical significance of the index is small. The sentiment's predictive power arises primarily from its ability to forecast real income growth. In subsequent work, Carroll, Fuhrer, and Wilcox (1994) find that the consumer sentiment index provides additional explanatory power in a consumption equation over and above the information it contains about income growth. Other lines of research link sentiment indexes and precautionary saving. The work of Acemoglu and Scott (1994) suggests that the additional explanatory value of the confidence index is related to its role as a proxy for uncertainty, and to the need for precautionary savings.

In a recent OECD study on the subject, Santero and Westerlund (1996) use graphical and correlation analysis of cross-country data to determine whether confidence indicators improve forecasts. They generally find that, for most countries, business sentiment measures provide valuable information about the business cycle, while consumer confidence indexes are rarely useful. However, their results demonstrate that consumer confidence indexes vary across countries with respect to both their content and their usefulness. Their results for Canada are much more positive than for most countries. They report a strong correlation between private consumption and the consumer attitudes index, and Granger causality tests provide additional evidence supporting the usefulness of the Canadian attitudes index. However, the Canadian consumer confidence index is not found to be a reliable indicator of turning points.

Belessiotis (1996) conducts an empirical review of consumption in France. He finds that the consumer confidence index forecasts more than changing expectations of income. In particular, it

has additional explanatory power related to insecurity about the economy, especially about employment, income prospects and tightening fiscal policy.

In more recent work, Carroll and Dunn (1997) investigate the interactions between uncertainty, consumer debt, and spending. They use the Michigan confidence survey question on unemployment expectations in their research, as they characterize unemployment as the most important source of uncertainty. This research extends earlier work by Carroll (1992) and others and is based on the notion that consumers have a desired stock of debt or debt-to-income ratio, the level of which is determined in part by the uncertainty that they face. High debt-to-income ratios increase consumer sensitivity to a rise in uncertainty, such that they are more likely to delay durables purchases. They also find that non-durables spending is sensitive to changes in unemployment prospects. Carroll and Dunn use this relationship between debt, consumer spending, and uncertainty to provide evidence supporting a plausible explanation of the weakness in U. S. consumer spending in the early 1990s. Consumers built up a large stock of debt as a result of the financial liberalization of the 1980s. When the risk of unemployment increased in the early 1990s, consumers slowed their durables purchases in an attempt to attain their desired balance sheets.

3. Consumption and consumer attitudes

As shown in Figure 1, the consumer attitudes index is correlated with real per capita consumption growth, with a correlation coefficient of 0.45.[2] While consumption growth has been more volatile than the attitudes index, most large swings in consumption growth have coincided with similar swings in consumer attitudes. Consumer attitudes are also strongly negatively correlated with nominal interest rates, suggesting that the cost of borrowing is one factor affecting consumer confidence.[3]

Figures 2 and 3 illustrate the strong correlation between real per capita consumption growth and real per capita disposable income growth for two important subperiods. However, these graphs also suggest that there may be a role for the consumer attitudes index in forecasting consumption growth since there are important swings in consumption growth that seem to be linked more to movements in the index (e.g., 1974; 1981–1982; and 1996) than to income growth.

This is supported by a simple review of the correlations between these series. The correlation between the attitudes index and real per capita consumption growth has increased in recent years, rising from 0.22 for the 1962Q1 to 1979Q4 period to 0.65 for the 1980Q1 to 1997Q2 period. On the other hand, the correlation between real disposable income growth and real

2. Appendix 1 outlines how the data are defined and constructed.

3. The correlation between the level of the 90-day rate on prime corporate paper and the level of the consumer confidence index is -0.52, with interest rates leading the index by two quarters.

consumption growth, both in per capita terms, fell from 0.35 for the 1962Q1 to 1979Q4 period to 0.28 for the 1980Q1 to 1997Q2 period.

Figure 4 presents historical consumption per capita and income per capita (both in logarithms) and the consumer attitudes index. Throughout the 1960s, the consumer attitudes index (1991=1.0) reflected a relatively high level of optimism on the part of Canadians, averaging a level of 1.2 and never falling below 1.09. At the same time, real consumer expenditures per capita grew fairly steadily at an average rate of 2.2 per cent (seasonally adjusted, quarterly, annual rates). Throughout most of the 1970s, both spending and optimism remained fairly high on average, though much more erratic than in the 1960s, with sharp two-quarter declines in consumption and consumer optimism in 1970, 1974, and 1977. In the late 1970s, consumer spending growth was more sluggish. Consumption fell in early 1979, while consumer attitudes remained strong. However, in the fourth quarter, the consumer attitudes index suddenly fell sharply from 1.17 to 0.99, the first time a value below 1.0 had been reported. This coincided with a sharp increase in nominal interest rates as the 90-day rate on prime corporate paper rose 240 basis points. There was a subsequent pickup in both spending and consumer attitudes at the end of 1980, though it was very short lived. Consumer attitudes plummeted at the same time as expenditures in 1981, and both remained weak until the first quarter of 1983. During the 1981–1982 recession, the index fell to an all-time low of 0.78. Nominal interest rates peaked during this same period, rising to 21 per cent in the third quarter of 1981, and subsequently began to decline. The low point for consumers apparently came later in 1982Q2, when previously declining interest rates suddenly rebounded. From 1983 until 1989, the consumer attitudes index reflected a very high level of optimism, peaking at 1.3 in 1987Q1. Growth in consumer expenditures per capita averaged 3.1 per cent. In the first quarter of 1990, the consumer attitudes index plunged to 1.01, though consumer expenditures growth remained robust at 4.6 per cent in that quarter. In the second quarter of 1990, the index fell further to 0.95 and per capita spending fell 6.6 per cent. Again, this coincided with a recent peak for nominal interest rates at 13.8 per cent. Confidence remained at low levels and spending continued to decline until the second quarter of 1991. The consumer attitudes index has been relatively weak and volatile throughout the 1990s, suggesting more pessimistic perceptions of income and wealth and the economic environment in general. However, optimism is currently on a upswing, rising steadily from a recent low of 0.86 in the fourth quarter of 1995 to 1.17 in the second quarter of 1997. Nominal interest rates declined steadily from the first quarter of 1995 until mid-1997. At the same time, consumer spending has been on the upswing since late 1996.

It is also revealing to look at the relationship between the consumer attitudes index and the Bank of Canada's measure of the output gap (Figure 5).[4] The correlation between the consumer attitudes index and the output gap reaches its maximum at a five-quarter lead of the index; the

4. We refer here to the output gap as discussed in the November 1997 *Monetary Policy Report* . The output gap is measured as the difference between realized output and potential output, where potential output is generated using the extended multivariate filter as outlined in Butler (1996).

correlation is 0.69. If the attitudes index captures consumers' perceptions of their financial and economic prospects, it would also likely be correlated with the business cycle.

The index is also strongly inversely correlated with the unemployment rate (-0.57) as seen in Figure 6. This high correlation derives from the inverse correlation of the "more jobs" and "good time to buy" questions with the unemployment rate.

Figure 1: Consumption growth and consumer attitudes, 1962Q1–1997Q2

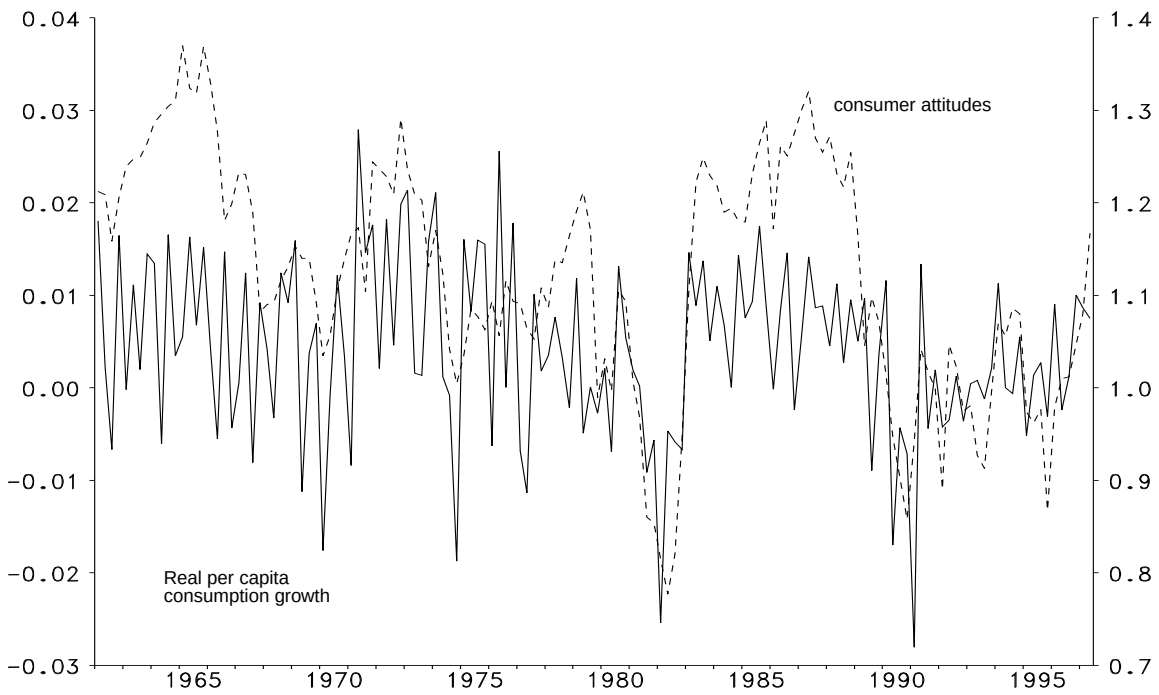


Figure 2: Income growth, consumption growth, and consumer attitudes, 1962Q1–1979Q4

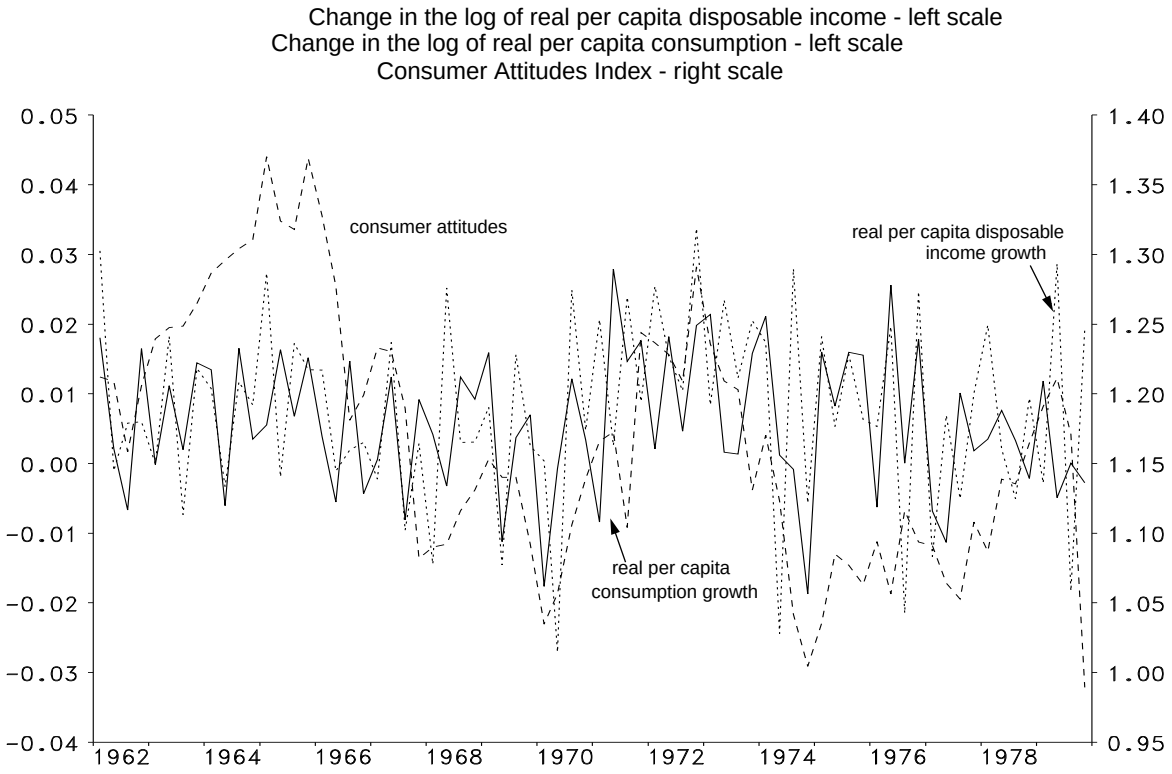


Figure 3: Income growth, consumption growth, and consumer attitudes, 1980Q1–1997Q2

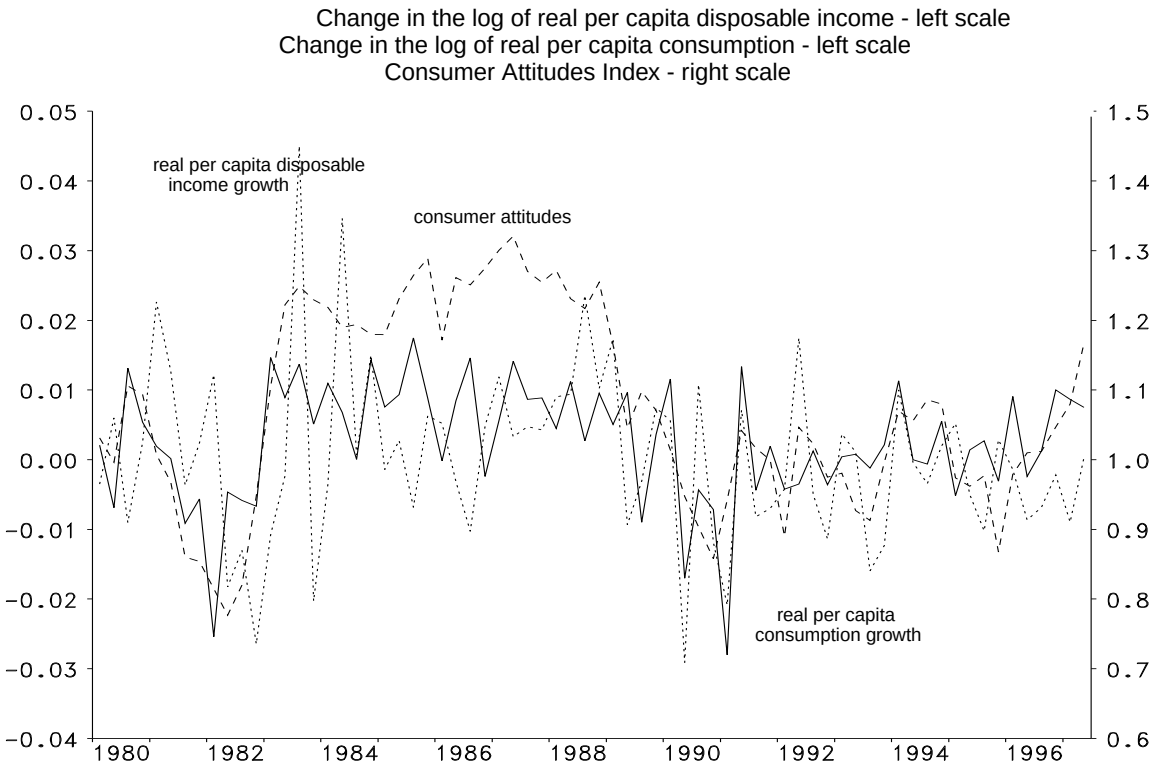


Figure 4: Consumer spending, income and attitudes. 1962Q1–1997Q2

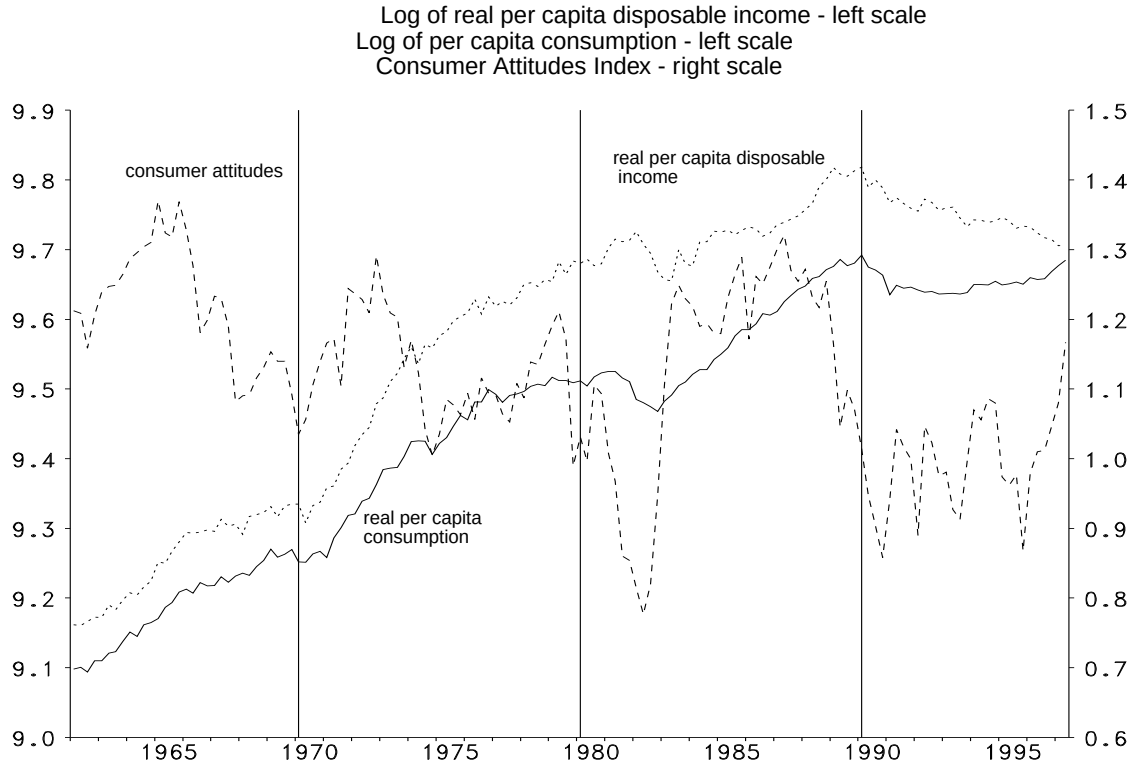


Figure 5: Consumer attitudes index and output gap, 1962Q1–1997Q2

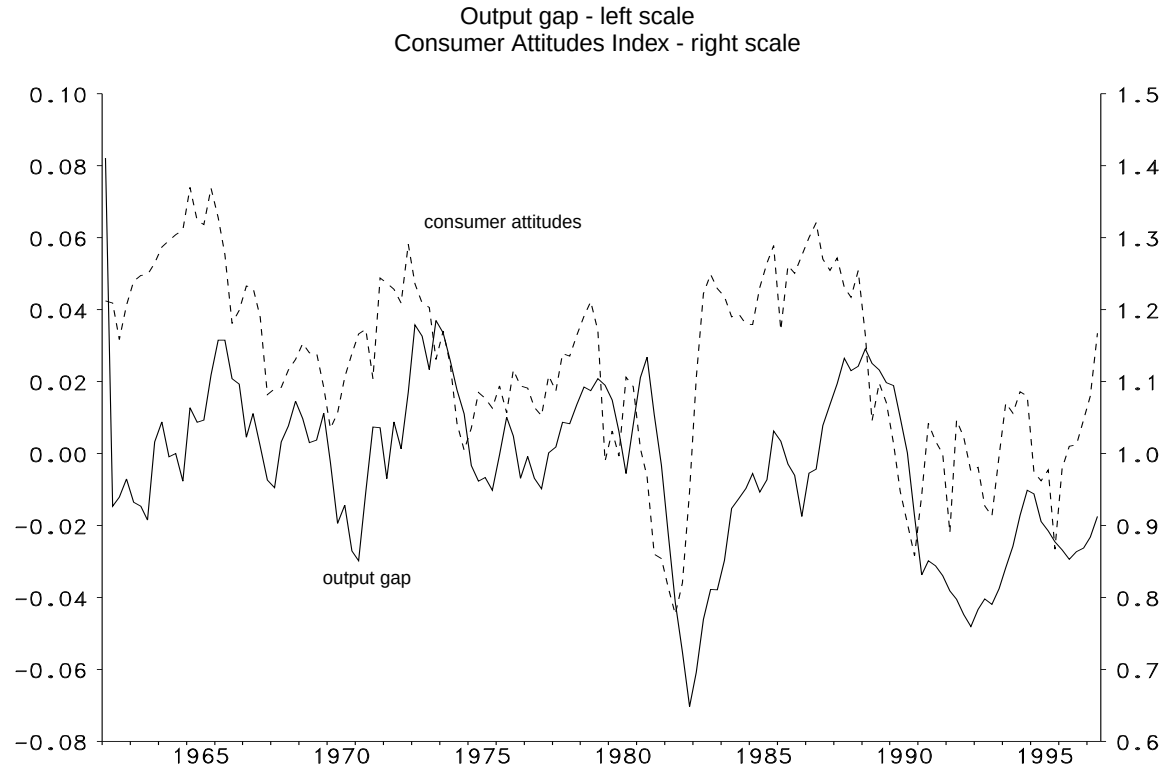
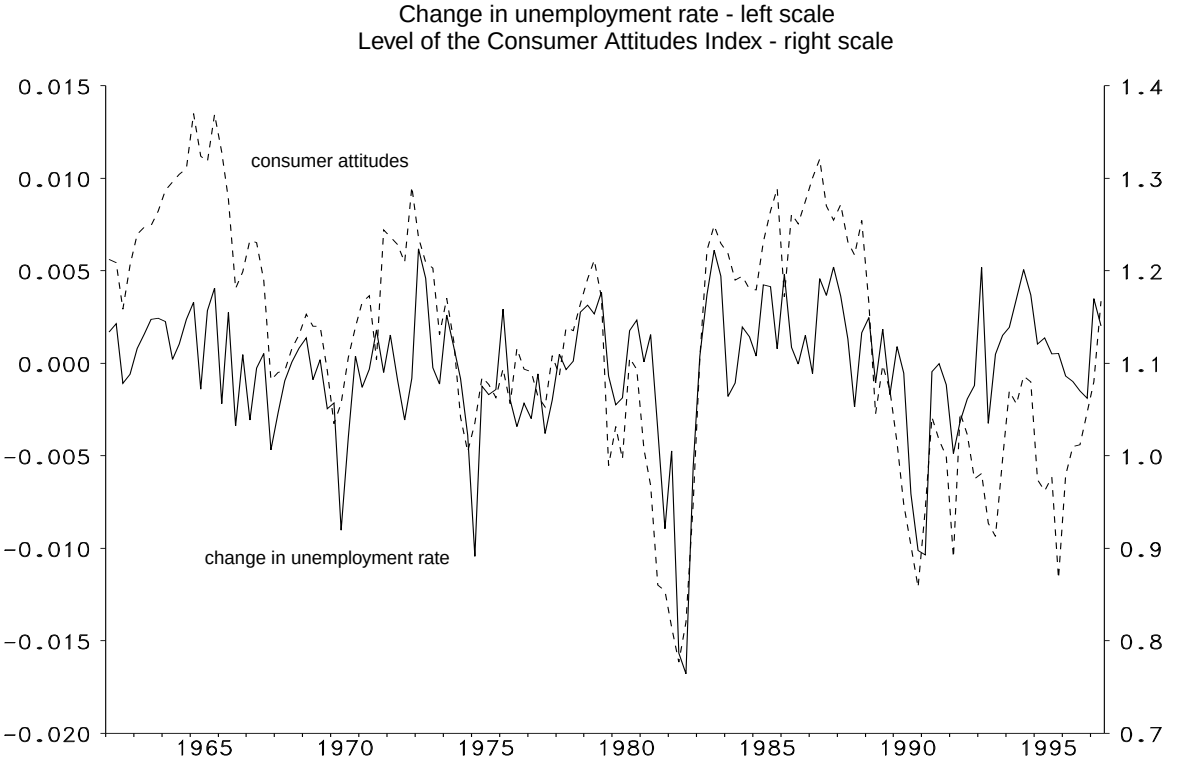


Figure 6: The (negative of) the change in the unemployment rate and the level of the consumer attitudes index



4. Empirical framework

We begin by estimating a conventional aggregate consumption equation. As our base model, we take the consumption equation for Canada estimated by Macklem (1994) which adopts an error-correction approach in the spirit of work by Davidson, Hendry, Srba, and Yeo (1978) and Davidson and Hendry (1981). Following Macklem, we estimate a dynamic consumption equation in two steps. In the first step, we estimate the long-run consumption function:

$$c_t = \alpha_0 + \alpha_1 y_t + \alpha_2 w_t + \upsilon_t \tag{4.1}$$

where c is the log of real per capita total consumption, y is the log of real per capita disposable income, w is the log of real per capita total wealth, and υ is a random error term. Under the hypothesis that c, y, and w are cointegrated, υ_t is I(0). Disposable income includes labour income, investment income, and transfers from government to persons, net of taxes. Wealth is defined to include human, physical, and financial wealth as measured by Macklem (1997). Real variables are calculated using the consumption deflator, and per capita measures using the population aged 15 and over. [5]

In the second step, we estimate a dynamic consumption equation. The dependent variable is the change in consumption. The explanatory variables are the estimated residual $\hat{\upsilon}_t$ from the step-one long-run regression—the so called error correction term—as well as the first difference of the long-run factors, the slope of the yield spread, and the first difference of the unemployment rate. The inclusion of the unemployment rate is generally thought to proxy liquidity effects and/or the effects of uncertainty and its expected sign is therefore negative.

The slope of the yield curve is defined as the 90-day rate on prime corporate paper less the yield to maturity on 10-year-and-over Government of Canada bonds. When the central bank tightens, short-term rates increase relative to long-term rates, causing the spread to rise. Thus, we expect the coefficient on this variable to be negative in our dynamic equation for consumption growth. The yield spread has previously been used in empirical work; see, for example, Cozier and Tkacz (1994). It is convenient since the yield spread is a stationary variable by construction. Furthermore, the use of real interest rates measures are sensitive to the definition of expected inflation, an unobserved variable, and the yield spread allows us to avoid this controversy.[6]

The dynamic consumption function is estimated without the consumer attitudes index and subsequently with it added to determine whether the index improved the fit of the model. The dynamic specification is:

$$\Delta c_t = \beta_0 + \beta_1(L)\hat{\upsilon}_{t-1} + \beta_3(L)\Delta y_t + \beta_4(L)\Delta w_t + \beta_4(L)\Delta u_t + \beta_5(L) r_t + \beta_6(L) A_t + \varepsilon_t \tag{4.2}$$

---

5. See Appendix 1 for more precise descriptions of the data.

6. We also obtain very similar results if we include a measure of the short-run real interest rate in place of the yield spread.

where Δ is the first difference operator, y is real per capita disposable income, w is real per capita wealth, u is the unemployment rate, r is the slope of the yield spread, A is the Index of Consumer Attitudes, ε is a random error term, and $\beta_i(L)$ is a polynomial in the lag operator.

5. Empirical results

5.1 Long-run consumption function

The long-run regressions presented here follow earlier work by Macklem (1994) with two major changes. First, Macklem used consumption of non-durables and services as the dependent variable whereas this paper uses total consumption. Secondly, his measures of real income and wealth are calculated using the GDP deflator. Since theory suggests the price of consumer goods and services as more appropriate information for consumers to use when measuring their income and wealth in real terms, we redefine real income and wealth using the consumption deflator.

The cointegrating vectors presented in Macklem (1994) are robust to the sample, estimation technique, and to the measure of nominal consumption chosen. However, over the full sample period (1962–1997), only the regressions using definitions of real income and wealth based on the GDP deflator suggest a cointegrating relationship between these variables and any measure of consumption. Nevertheless, we prefer a more theoretically appealing construction, with cointegration of real income, real wealth, and real consumption where all three are defined using the consumption deflator. After some investigation, we find that, when the early part of the sample is dropped (the 1960s), measures of real income and real wealth (which are defined using the consumption deflator) generate cointegrating vectors. The sensitivity to the sample period may reflect problems with the measures of income and wealth in the 1960s, particularly investment income.

We estimated several different versions of these cointegrating vectors using the consumption deflator. Table 1 presents the most interesting results where real per capita disposable income is calculated using the consumption deflator and the shorter sample period (1972Q1–1996Q2) is used. In the first row, we present the vector which includes real income and wealth measures based on the consumption deflator. As in Macklem (1994), both real per capita disposable income and real per capita wealth are significant determinants of trend movements in real per capita consumption. It is not surprising that wealth continues to be significant given its recent dynamics (see Figure 7) and its theoretical importance in the permanent income hypothesis. Based on the Augmented Dickey Fuller (ADF) test, we are able to reject the null of no cointegration at about the 8 per cent level.

We considered the possibility that there was something missing in our income measure. If consumers have to take inflation into account when formulating their consumption-saving decisions, perhaps the income measure should include an adjustment for this effect. In a sense,

since individuals must save so that the value of their nominal net financial assets will not be eroded by inflation, then the income available to them for spending is reduced. To correct for this, we create a measure of the net interest-bearing assets of households. In the second row we present an alternative specification where disposable income has first been adjusted to take into account savings by households to offset the loss of value of net interest-bearing financial assets due to inflation. Adjusting disposable income improves our results in the sense that we can now reject the null hypothesis of no cointegration at less than the 1 per cent level. We considered both specifications and found our results were not sensitive to the choice between these two alternatives so we report only the results for the simpler, more conventional measure of real disposable income.[7]

Table 1: Cointegration tests for total consumption
Sample: 1972Q1–1996Q2, 98 observations

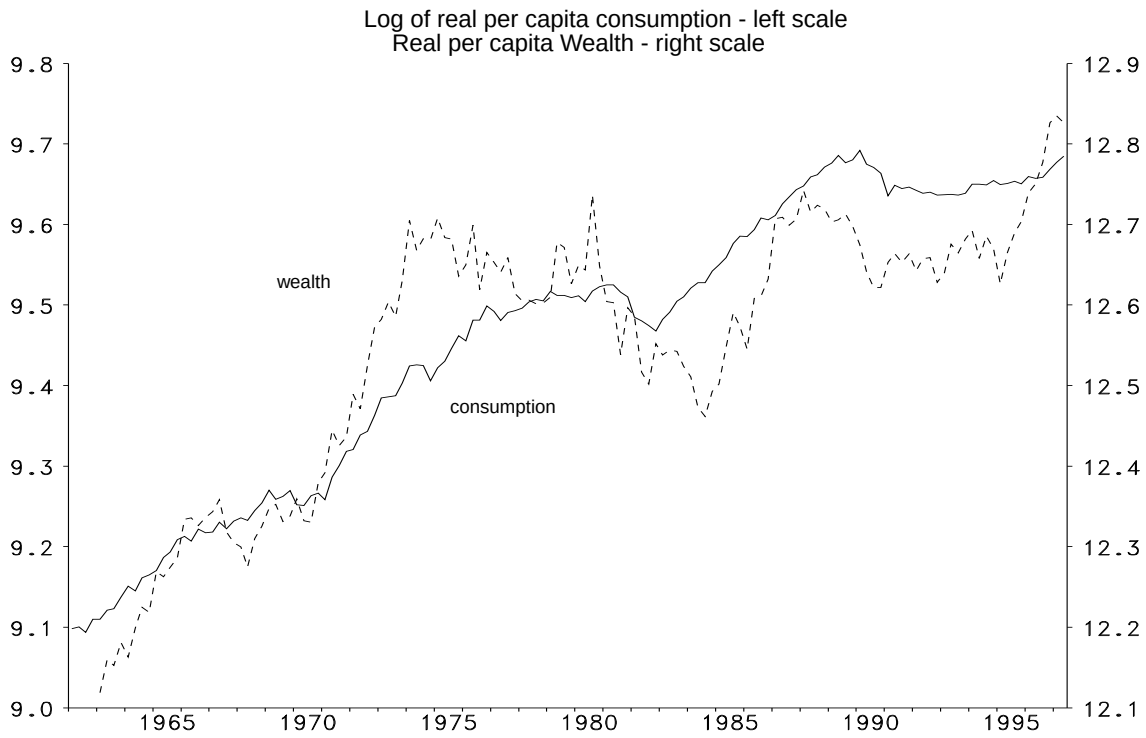
	Estimates of the long-run parameters[a]	***Unit Root Test***[b]	
	αLR_t	***ADF*** $\hat{\tau}_\mu$	***dflags***
Real per capita disposable income	-4.51 + 0.98*y* + .36*w* (0.00) (0.00) (0.00)	-3.63 [.10]	1
Inflation-adjusted real per capita disposable income	-3.13 + 0.89*yadj* + .32*w* (0.00) (0.00) (0.00)	-4.87 [<.01]	1

a. The estimates reported above are obtained using the Stock-Watson (1993) leads-and-lags procedure. Standard errors have been calculated using the Newey-West procedure (4th order). P-values are reported below the parameter estimates.

b. The ADF statistic tests the null hypothesis of *non-cointegration* (i.e., H_0: C_t - αLR_t is I(1)) against the alternative hypothesis of *cointegration* (i.e., H_1: C_t - αLR_t is I(0)). αLR_t are the long-run parameters. Probability values for the ADF t-statistics (reported in square brackets) are obtained from the critical values reported by MacKinnon (1991, Table 1).

7. Results using the alternative cointegrating vector are available on request from the authors.

Figure 7: Log of real per capita consumption and real per capita wealth, 1962Q1–1997Q2



5.2 Dynamic consumption functions

Table 2 summarizes the regression results for the dynamic consumption equations. The base case equation without the consumer confidence variable is presented in the first column. The second column presents an equation with the consumer attitudes index added. Since our main purpose is to compare the specification with and without the attitudes index, we include variables that are not always statistically significant in every version of the equation.[8] We have also included the contemporaneous value of income since this will allow us to determine whether the attitudes index contains any explanatory power over and above the information it contains about income. On the other hand, the change in wealth, and longer lags of the included variables, have been omitted since they were insignificant in virtually all of the specifications.

In both specifications, the error-correction terms are negatively signed and statistically significant providing further evidence of cointegration. The consumer attitudes index adds

8. For example, the first lag of the change in consumption is insignificant in the base case equation; leaving this variable in the equation made very little difference in the equation and made the comparisons more transparent.

considerable explanatory power to the equation. The sum of the coefficients on the index is statistically significant and positively signed, as expected. Each of the individual lags is also significant. Adding the index to the equation also increases the absolute value and statistical significance of the coefficient on the lagged dependent variable. Income growth remains a highly significant determinant of consumption growth in either specification, as does the yield spread. The change in the unemployment rate, however, becomes statistically insignificant when the attitudes index is added to the equation. The residual diagnostics tests presented at the bottom of each column suggest that either equation is a reasonable specification based on the properties of the error term. The RESET test, in particular, suggests that the addition of the attitudes index improves the specification.

Table 2: Error-correction models for total consumption

Dependent variable: Δc_t ***Estimation sample: 72:02 -96:02***		
	base case	***index added***
$constant$	0.001 (0.330)	**-0.021** **(0.009)**
ec_{t-1}	**-0.089** **(0.008)**	**-0.061** **(0.036)**
$\sum_{s=0}^{3} \Delta y_{t-s}$	**0.534** **(0.003)**	**0.535** **(0.000)**
$\sum_{s=0}^{2} r_{t-s}$	**-0.002** **(0.000)**	**-0.002** **(0.003)**
Δu_{t-1}	**-0.474** **(0.020)**	-0.393 (0.062)
Δc_{t-1}	-0.073 (0.463)	**-0.242** **(0.000)**
$\sum_{s=0}^{2} A_{t-s}$	-	**0.021** **(0.005)**
RBAR**2	0.29	0.47
DW	1.83	2.09
Q(24-0)	0.26	0.66
LM(4)	0.13	0.15
ARCH(1)	0.97	0.76
ARCH(4)	0.27	0.33
RESET	0.05	0.98
Jarque-Bera	0.30	0.51
RMSE	0.008	0.008
Theil's U	1.00	0.82
MAE	0.006	0.006

Probability values are reported in parentheses. Standard errors have been corrected using the Newey-West procedure. Q(24) is the Box-Ljung Q-test for autocorrelations using 24 lagged residuals. The LM(4) test is the Lagrange Multiplier test for fourth order serial correlation, ARCH(1) and ARCH(4) are Engle's test for autoregressive conditional heteroskedasticity of orders 1 and 4, RESET is Ramsey's RESET specification test for powers 2-4, Jarque-Bera is a test for normality. P-values are reported for the residual diagnostics tests.

We also present a statistical evaluation of the out-of-sample forecast errors in the last three rows of Table 2. The post-estimation sample period of 1996Q3–1997Q2 did not provide enough data points to compute Theil's *U*-statistic so the following procedure is used to evaluate the model.[9] The model (only the short-run dynamic equation) is estimated over the 1972Q1 to 1980Q1 period and the estimated equation is then used to conduct a one-step-ahead forecast for the period 1980Q2 to 1997Q2. The sample size is then extended by one period and the entire process is repeated. The forecast error from each subsequent one-step-ahead out-of-sample forecast is saved as a time series. Finally, the root mean squared error (RMSE), the mean absolute error (MAE), and Theil's (1971) *U*-statistic are calculated for each model. The results suggest that the forecast errors for the specification with consumer confidence added as an explanatory variable are somewhat better than the base case, though Theil's *U*-statistic is still relatively large. In particular, the base case model performs as well as a random walk model.

Figure 8 presents dynamic simulations of both the models presented in Table 2. These simulations demonstrate the usefulness of adding the consumer attitudes index to the consumption equation. The equation with the consumer attitudes index performs well in the 1980–1981 recession and subsequent recovery and it also picks up on the period of slow growth in the early 1990s.

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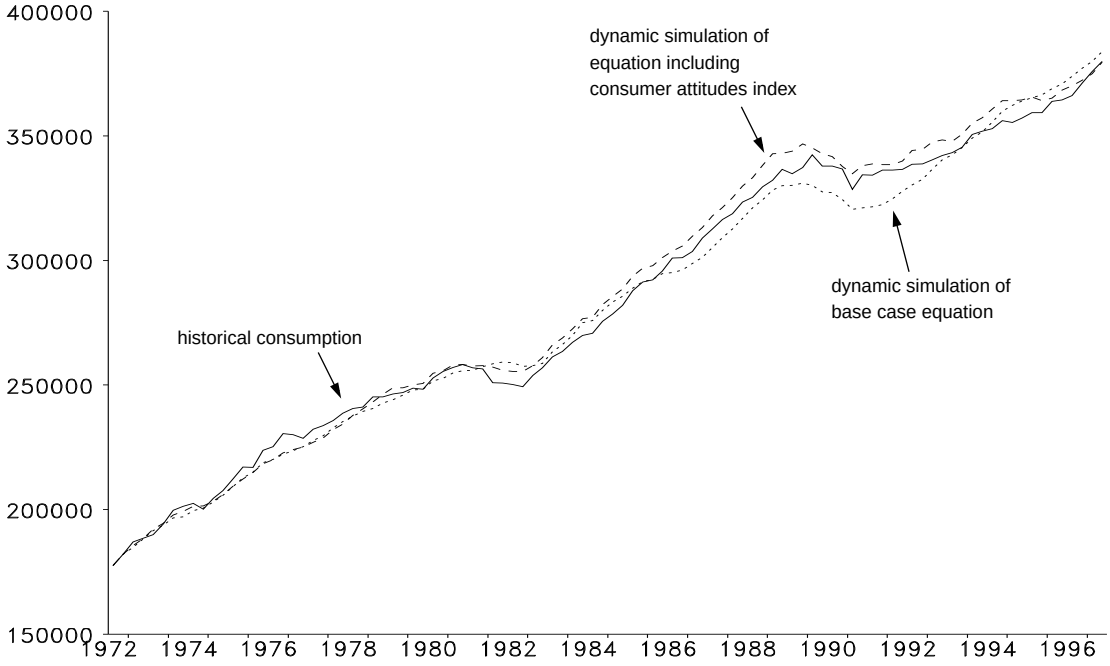
9. The *U*-statistic is defined as: $U = \left(\left(\frac{1}{n^0}\sum_i (y_i - \hat{y}_i)^2\right) \Big/ \left(\frac{1}{n^0}\sum_i y_i^2\right)\right)^{\frac{1}{2}}$ where n^0 is the number of forecasting periods being forecasted, y_i and $\hat{y}_i$ are actual and predicted values of total consumption. Note that the numerator can be defined as the RMSE. Then if *U*=0 then this implies that $y_i = \hat{y}_i$ for all i. The larger the *U*, the worse the forecasting performance of the model. Also if $U > 1$ then the forecasting performance of the model is inferior to a random walk model.

Figure 8: Dynamic simulations of the consumption equations in Table 2, 1972Q3–1997Q2



6. What information is embodied in the attitudes index?

While the index as a whole contains predictive power for consumption growth, an analysis of the components of the index—the individual questions—might provide some insight into the source of that predictive power. Table 3 presents the results of a set of regressions where each column presents the same base case equation from Table 2, modified by the replacement of the index itself with each of the separate individual *questions* from the survey. The following questions contain the most explanatory power: the backward-looking question "is better off," which is likely to capture the information on the current income of households, and the "good time to buy" question, which is likely to reflect economic uncertainty.

These results are confirmed when all four questions were included in the regression at the same time. One odd result that arises is the change in the sign of the coefficient on the "will be better off" question when all four questions are included. This is likely due to the high correlation between the "will be better off" and "is better off" questions (the correlation coefficient is 0.86). Therefore, in the final column, we report a regression with only the two most significant questions, that is, the "is better off" and "good time to buy" questions. The coefficients on both questions remain significant. Notably, the $\bar{R}^2$ of this regression is higher than when the attitudes

index itself is used in the regression (see Table 2), suggesting that it is the information captured by the “is better off” and “good time to buy” questions that provide the index with its explanatory information for consumption.

Two interesting results can be highlighted. First, when the “is better off” question is included in the equation, the sum of the coefficients on income growth and their significance level falls. This supports our prior intuition that this question captures recent changes in income. Second, the explanatory power of the index relative to the change in the unemployment rate is particularly interesting. We have proposed that the index may provide information about economic insecurity. For instance, the index may proxy households’ employment prospects (Carroll 1997) or liquidity constraints of consumers (Flavin 1985). While the change in the unemployment rate was significant in the base case specification, it was no longer significant when either the consumer attitudes index (see Table 2) or the two individual questions, which do not directly relate to income (Table 3), were added to the explanatory variables. This implies that the consumer attitudes index contains more information about uncertain economic prospects, particularly employment prospects, than is typically proxied by the unemployment rate.

Table 3: Error-correction models for total consumption

Dependent variable: Δc *Estimation sample: 72:02 -96:02*						
	"is better off" question	***"will be better off" question***	***"more jobs" question***	***"good time" question***	***all questions***	***two most significant questions***
$constant$	**-0.009** **(0.044)**	-0.012 (0.093)	-0.009 (0.089)	-0.006 (0.068)	**-0.010** **(0.043)**	**-0.012** **(0.001)**
ec_{t-1}	**-0.080** **(0.012)**	**-0.079** **(0.029)**	**-0.072** **(0.053)**	**-0.070** **(0.022)**	**-0.081** **(0.020)**	**-0.068** **(0.026)**
$\sum_{s=0}^{3} \Delta y_{t-s}$	0.251 (0.202)	**0.490** **(0.008)**	**0.410** **(0.028)**	**0.697** **(0.000)**	**0.391** **(0.031)**	**0.472** **(0.009)**
$\sum_{s=0}^{2} r_{t-s}$	**-0.003** **(0.000)**	**-0.003** **(0.000)**	**-0.003** **(0.000)**	**-0.002** **(0.004)**	**-0.002** **(0.001)**	**-0.002** **(0.004)**
Δu_{t-1}	**-0.417** **(0.022)**	**-0.508** **(0.011)**	-0.337 (0.118)	-0.326 (0.161)	-0.206 (0.356)	-0.283 (0.179)
Δc_{t-1}	**-0.234** **(0.016)**	**-0.208** **(0.011)**	-0.151 (0.072)	**-0.165** **(0.023)**	**-0.302** **(0.000)**	**-0.277** **(0.001)**
$\sum_{s=0}^{2} isbet_{t-s}$	**0.046** **(0.013)**	-	-	-	**0.063** **(0.002)**	**0.031** **(0.040)**
$\sum_{s=0}^{2} wibet_{t-s}$	-	0.046 (0.060)	-	-	**-0.070** **(0.049)**	-
$\sum_{s=0}^{2} mjobs_{t-s}$	-	-	0.052 (0.058)		0.036 (0.088)	-
$\sum_{s=0}^{2} goodt_{t-s}$	-	-		**0.020** **(0.030)**	**0.026** **(0.027)**	**0.016** **(0.049)**
$\bar{R}^2$	0.40	0.36	0.31	0.43	0.48	0.49
DW	2.04	1.95	1.88	2.01	2.16	2.12
Q(24-0)	0.28	0.42	0.49	0.23	0.25	0.38
LM(4)	0.31	0.28	0.12	0.18	0.05	0.23
ARCH(1)	0.90	0.78	0.70	0.64	0.62	0.73
ARCH(4)	0.55	0.15	0.61	0.63	0.73	0.40
RESET	0.90	0.89	0.14	0.50	0.09	0.52
Jarque-Bera	0.21	0.36	0.34	0.16	0.48	0.47

In order to test more directly whether the index proxies expected income or whether it provides additional information, we try to control for the effect of expected future income in the index. We use leads of actual future income to proxy expected income on the basis that, if people are forming rational expectations (with full information) then, $\Delta y_{t+i} = E_t(\Delta y_{t+i}) + \varepsilon_{t+i}$ where ε_{t+i} is white noise.

We regressed the confidence index on a constant and four leads of the change in income:

$$A_t = const + \sum_{i=1}^{4} \beta_i \Delta y_{t+i} + v_t$$

where Δ is the first difference operator, A is the Index of Consumer Attitudes, and y is the log of real per capita disposable income. The error term v_t includes errors in estimating the expected future income growth, ε_{t+i}, suggesting the use of instrumental variables. Our instruments include both the contemporaneous value and three lags of each of the following: the change in U.S. per capita real disposable income, the change in real interest rates, the change in the real exchange rate, and the change in a measure of the fiscal stance.[10]

The estimation results are presented in Table 4. The regression suggests that about a third of the movement in the attitudes index can be explained by its correlation with changes in the proxy for expected income. The residuals from this initial regression, v_t, can then be interpreted as the information in the index that cannot be directly attributed to changes in expected income. Next, we include this non-income information in the dynamic equation in place of the full attitudes index to determine whether any explanatory power remains for consumption growth even after excluding the information on expected income.

Table 4: Does the attitudes index mainly reflect expected income?[a]

IV: Dependent variable: A_t - Sample: 71:03 - 96:02	
constant	1.06 (0.00)
Δy_{t+1}	3.93 (0.01)
Δy_{t+2}	3.33 (0.05)
Δy_{t+3}	4.23 (0.03)
$\bar{R}^2$	0.34

a. Probability values are reported in parentheses.

10. Real interest rates, the real exchange rate, and the change in the fiscal stance are all measures as defined in Duguay (1996).

Table 5 reports the estimation results when these residuals, v_t , are included in the consumption equation. The first column shows the base case equation from Table 2, except that the residuals from the previous regression, v_t (interpreted as the non-income information in the index), have replaced the attitudes index. This measure of non-income information in the index is significant.

These regressions are subject to the criticism that v_t is a generated regressor. However, the analysis of Pagan (1984) suggests that, in this instance, the OLS regression of the estimated coefficient and standard errors on v_t is correct, though the standard errors on the other coefficients are incorrect and should be estimated using 2SLS.[11] Therefore, these OLS regressions can identify the explanatory power of these residuals. The significance of v_t suggests that the explanatory power of the index comes from more than just its information about changes in expected income—from the other information it contains that we interpret to include consumers' perceptions of the uncertainty of economic prospects.

11. Pagan discusses several models; this experiment corresponds most closely to the analysis of Model 4, page 233.

Table 5: Determining the importance of the index as a proxy for expected income [a]

Dependent variable: Δc_t Sample: 72:02 - 96:02	
$constant$	0.001 (0.00)
ec_{t-1}	-0.08 (0.03)
$\sum_{s=0}^{3} \Delta y_{t-s}$	0.54 (0.01)
$\sum_{s=0}^{2} r_{t-s}$	-0.003 (0.00)
Δu_{t-1}	-0.36 (0.10)
Δc_{t-1}	-0.11 (0.27)
$\sum_{s=0}^{2} v_{t-s}$	0.03 (0.00)
$\bar{R}^2$	0.31
DW	1.91

a. *P*-values are reported in parentheses.

7. A forecasting equation

Since the equation might be useful for forecasting consumption over upcoming quarters, we re-specify the equation, this time limiting the variables to lags of the data that would be available at the time of the forecast. This allows the forecast of consumption to be independent of assumptions about the contemporaneous level of consumer attitudes or income. In order to choose the optimal lag, we ran all possible combinations of lag structure, using a general-to-specific methodology. The optimal regression chosen was the regression with the highest $\bar{R}^2$, where the longest lag of each variable was significant at least at the 5 per cent level. Table 6 presents the model. Figure 9 presents a dynamic simulation of this suggested equation compared with the original equation in Table 2.

This specification has an $\bar{R}^2$ of 41 per cent, somewhat less than the consumer attitudes index model in Table 2. The deterioration in performance relative to the base case model reflects the fact that the equation for forecasting does not rely on the contemporaneous consumer attitudes index or current income. These results also highlight the robustness of the results. The finding that the consumer attitudes index adds explanatory power is not dependent upon the inclusion of particular variables or lags of income. The change in the unemployment rate does not appear in this equation as it is not significant when the attitudes index was included in the specification. Again, we choose to omit the change in wealth from the final specification as it is not significant.

Figure 9: Dynamic simulation of consumption equations (1972Q3–1997Q2)

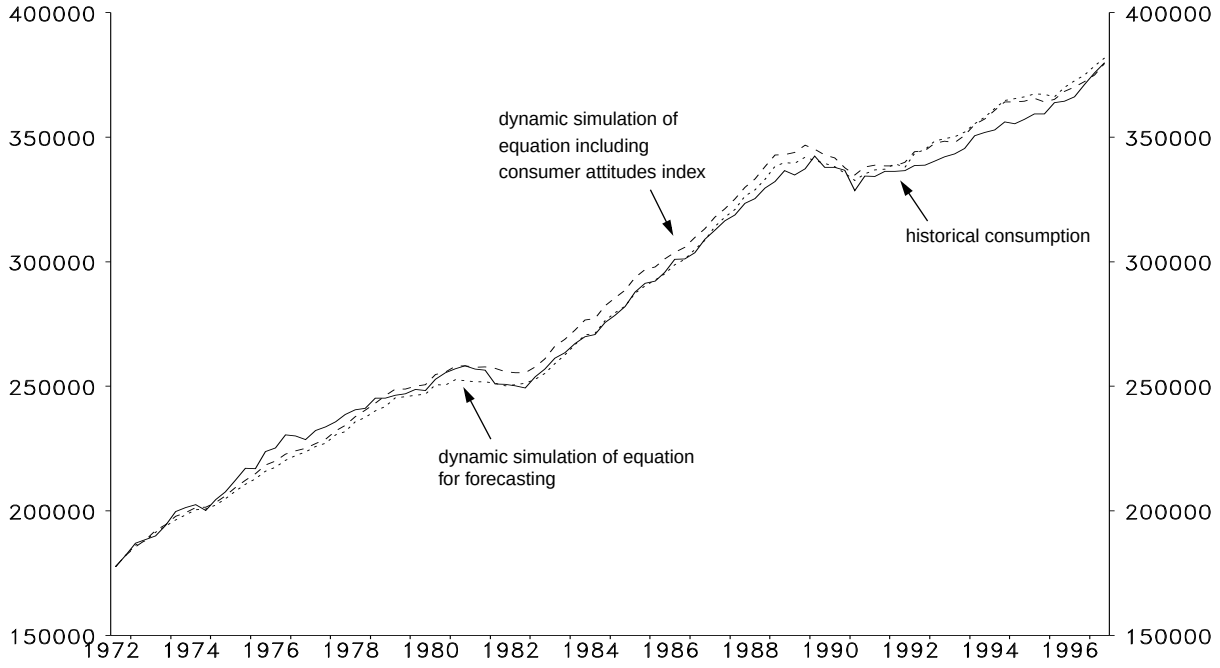


Table 6: Forecasting version	
$constant$	**-0.034** **(0.000)**
ec_{t-1}	-0.061 (0.051)
$\sum_{s=1}^{3} \Delta y_{t-s}$	**0.318** **(0.018)**
$\sum_{s=0}^{2} r_{t-s}$	**-0.002** **(0.000)**
Δc_{t-1}	**-0.239** **(0.002)**
$\sum_{s=1}^{2} A_{t-s}$	**0.033** **(0.000)**
$\bar{R}^2$	0.41
DW	2.10
Q(24-0)	0.76
LM(4)	0.15
ARCH(1)	0.48
ARCH(4)	0.10
RESET	0.73
Jarque-Bera	0.75
RMSE	0.007
Theil's U	0.87
MAE	0.006

8. Conclusion

Estimated consumption functions have tended to overpredict growth in consumer spending though much of the 1990s. In this paper, we examine whether the consumer attitudes index improves the fit of a consumption equation that also takes account of the effects of macroeconomic variables such as income and wealth. Not surprisingly, real per capita disposable income and real per capita wealth are the most important determinants of real per capita consumption. However, the index is statistically significant when included in the short-run dynamic equation, and its inclusion increases the explained variation in consumption by 18 percentage points. Both full-sample dynamic simulations and Theil tests using one-period-ahead out-of-sample simulations indicate that including the index reduces the forecast errors of the equation.

This brings us to consider why it works so well. Generally, the index provides timely information about consumers' changing outlook on their current and expected future finances, and therefore it may be an indicator concerning changes in perceptions of permanent income. However, it seems to have additional explanatory power over and above expectations of changes in income and wealth.

When the survey questions are tested individually in the consumption equation, the income-related questions are generally significant, confirming the view that the survey contains information about current and expected future income. However, the "good time to buy" question is also significant. This question most likely captures the consumer's economic outlook, including some assessment of risk. This is further supported by our results when we attempt to isolate and remove the information in the index that reflects expectations of changes in income. The non-income information that remains in the index still improves the fit of consumption equation. We have also noted that the level of optimism or pessimism is highly correlated with the stage of the business cycle and that the index appears to capture similar information to that typically proxied in consumption equations by the change in the unemployment rate. This suggests that the index's additional explanatory power over and above the information it contains about perceptions of income may lie in its ability to convey the consumer's assessment of the general economic environment, including views regarding economic uncertainty. This assessment will influence consumer spending plans, particularly the timing of major purchases.

Our results suggest that including the consumer attitudes index in our consumption equation provides a good start towards improving our understanding of the weaker-than-expected growth in consumer spending in the early 1990s. However, there are still several interesting avenues of research to be explored. While the consumer attitudes index does seem to be capturing more than expectations of changing future income, we have not proven definitively that it provides a measures of consumers' perceptions of uncertainty. It would be interesting to generate other empirical measures of uncertainty to compare these to the consumer attitudes index and to explore

their ability to explain consumption. This research could focus on specific sources of uncertainty. For example, statistical measures of income uncertainty such as the autoregressive conditional heteroskedastic (ARCH) and linear moment (LM) measures constucted by Flacco and Parker (1990; 1992) for the United States could be used to evaluate the importance of income uncertainty on consumption in Canada. Measures of job instability based on changes in job tenure as in Neumark, Polsky, and Hansen (1997) could provide insights into the extent and importance of changes in the labour market. Alternatively, research could take a broader approach and investigate the extent of aggregate uncertainty. Working along these lines, Smith (1996) constructs a statistical measure of cyclical uncertainty for several OECD countries including Canada. We leave this to future work.

Appendix 1: Description of the data

The remaining data series used in this study are seasonally adjusted and are all drawn from CANSIM, except per capita U.S. personal disposable income that is provided through DRI. All data series include information available up to the end of August 1997 (including the August 1997 National Accounts).

con$ = national accounts nominal consumption. d20113

con = national accounts real total consumption. d20488

c = log of real per capita consumption: log(con/npop)

npop = working age population (15 years and over) quarterly average of the monthly series d980000./1000. The series prior to 1976 have been linked at the Bank of Canada in the Research Department.

p = the log of the GDP deflator (D20011/D20463).

pcon = the log of the implicit consumption deflator (con$/con)

u = the percentage of the labour force that is unemployed defined as: the number of unemployed/total labour force, D980745 or (D980712/D980562) (beginning in 1976). The series prior to 1976 have been linked at the Bank of Canada.

r$ = 90-day rate on prime corporate paper, B14017

r40$ = 10-year-and-over government bonds, B14013

r = yield spread (r$-r40$)*100

w = log(wealth/pcon/npop). Wealth is constructed as per Macklem (1997).

y = log of real per capita disposable income defined as log(d20111/pcon/npop)

A = Conference Board Quarterly consumer attitudes index

isbet = Conference Board question (see page 2, question #1)

wibet = Conference Board question (see page 2, question #2)

mjobs = Conference Board question (see page 2, question #3)

goodt = Conference Board question (see page 2, question #4)

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