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An Index of Economic Well-being for Canada

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Acknowledgements

Abstract

This objective of this paper is to develop an index of economic well-being for Canada for the period 1971 to 1997 using a framework originally laid out by Osberg (1985). Although the economic well-being of a society depends on the level of average consumption flows, aggregate accumulation of productive stocks, inequality in the distribution of individual incomes and insecurity in the anticipation of future incomes, the weights attached to each component will vary, depending on the values of different observers. It is argued that public debate would be improved if there is explicit consideration of the aspects of economic well-being obscured by average income trends and if the weights attached to these aspects were explicitly open for discussion.

The four components of economic well-being are: (1) effective per capita consumption flows, which includes consumption of marketed goods and services, and effective per capita flows of household production and other unmarketed goods and services; (2) net societal accumulation of stocks of productive resources, including net accumulation of tangible capital and housing stocks, net accumulation of human capital and R&D investment, net changes in the value of natural resources stocks; environmental costs, and net change in level of foreign indebtedness; (3) poverty and inequality, as indicated by the Gini index of inequality, and depth and incidence of poverty; and (4) indicators of insecurity, particularly economic security from unemployment, ill health, single parent poverty and poverty in old age. Estimates of the overall index and the subcomponents will be presented for the 1971-1997 for Canada and the index compared with other measures of economic welfare such as GDP per capita.

An Index of Economic Well-being for Canada[1]

1. Introduction

Has the economic well-being of Canadians increased or decreased in recent years? How would one know and why might it be useful to know?

In modern democracies, national systems of social and economic statistics have become a crucial part of the informational feedback loop of public policy. By providing measures of social and economic outcomes, statistical agencies provide decision makers and voters with the information that often defines the success or failure of public policies. Evidence on such successes or failures can be used to reallocate resources, or to replace governments, hence the calculation of measures of economic well-being is an important issue.

However, the core problem of statistical agencies is that of deciding what information to record and how to present it. Knowing that all statistics summarize a complex reality, and that there are wide variations among the public in which aspects of social reality are considered to be of greatest importance, statistical agencies still have to decide what to count, and what not to count, as part of a measure of economic well being.

For many years, the System of National Accounts (SNA) has been the accounting framework within which most discussions of trends in economic well- being have been conducted, and Gross Domestic Product (GDP) per capita has been an often used summary measure of economic trends.[2] The compilers of the national accounts have often protested that their attempt to measure the aggregate value of marketed economic output was never intended as a full measure of economic well-being. Nevertheless, it has often been used as such, and the GDP accounting exercise has attracted a great deal of criticism as being a misleading indicator of economic well-being (e.g. Waring, 1988). Dissatisfaction with the GDP as a measure has led to a number of proposals for substitute measures (e.g. the Genuine Progress Indicator).

However, summarizing the economic well-being of a complex society inevitably requires a series of ethical and statistical judgements. There are many different dimensions to well-being, which are valued to different degrees by different observers. The problem with any single index number is that it is often difficult to disentangle the relative importance of value judgements in the construction of the index. Furthermore, in thinking about the appropriate public policy response, it is not particularly useful to know only that well-being has gone "up" or "down", without also knowing which aspect of well-being has improved or deteriorated.

The construction of measures of economic well-being can be seen as a problem in the optimal aggregation of information. If the objective is to improve the quality of public decision making and political debate, excess aggregation is not helpful, because it does not enable value judgements and statistical judgements to be separated. Furthermore, excess

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[1] The Centre for the Study of Living Standards would like to thank Sebastian Gerlich and Dmitry Kabrelyan for their excellent work in compiling the data series used to construct the index.

[2] Keunig (forthcoming) reviews the contributions of Dawson (1996) and Kendrick (1996) and the most recent (U.N. 1993) revisions to the SNA

aggregation offers no guide to policy priorities.

Osberg (1985) therefore proposed that an index of economic well-being should be based on indices of consumption, accumulation, inequality and insecurity, with the explicit recognition that the weights attached to each component will vary, depending on the values of different observers.[3] The underlying hypothesis is that public debate is likely to be improved if issues of fact, analysis and values are as clearly separated as possible. Measurement of the current level, or trend, of economic well-being can be seen as the first stage of a three stage discussion in which a society asks: (1) where are we? (2) do we want to go somewhere else? (3) how do we get there? Issues of measurement, of values and of analysis may be conceptually distinct, but in a single index of economic well-being, they often become hopelessly entangled. If the democratic debate on economic policy is to be fruitful, it would seem desirable to separate issues of measurement from the debate on values.

If the discussion is organized in this way, those people who fundamentally care most about a particular aspect of well being can discuss the facts about that aspect of well being and the most desirable way of improving it, without confusing the discussion with other issues. (For example, those who are concerned most with. the bequest that this generation will leave for the future can discuss whether the best way to safeguard sustainability is to emphasize environmental regulation, or capital accumulation, without simultaneously concerning distributional issues.) Such discussions of measurement issues are of a fundamentally different nature from discussions of values – which aspect of economic well being *should* receive greatest weight.

This basic framework - that a society's well-being depends on societal consumption and accumulation and on the individual inequality and insecurity that surround the distribution of macro economic aggregates - is consistent with a variety of theoretical perspectives. We therefore avoid a specific, formal model.[4]

As part of a larger project on the state of living of standards and the quality of life in Canada, the Centre for the Study of Living Standards (CSLS) has constructed the index of economic well-being proposed by Osberg over a decade ago for Canada and for all provinces and for the United States. This paper provides estimates for Canada of the index.

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[3] By specifying additive sub-indices, we are implicitly assuming that preferences for social outcomes are separable in their components (e.g. that the weight placed on consumption does not depend on the weight placed on inequality). We do not explicitly constrain the weights to be assigned to each component of well being, since we think of them as the preferences of different observers. However, some observers may, if they are consistent, have linked preferences – for example, if attitudes to insecurity are driven solely by risk aversion (but see Osberg (1998)), then the weight an individual places on inequality, and the weight they place on insecurity, will both depend on the second derivative of their utility function.

[4] However, a sufficient (but not necessary) set of conditions for the index of economic wellbeing we propose would be that societal economic wellbeing can be represented as the wellbeing of a "representative agent", assuming that (1) such an agent has a risk-averse utility function (i.e. diminishing marginal utility); (2) from behind a "veil of ignorance" as to his/her own characteristics, each person draws an individual income stream (and prospects of future income) from the actual distribution of income streams; (3) each person has a utility function in which both personal consumption and bequest to future generations are valued; (4) individual income streams are exposed to unpredictable future shocks; (5) capital markets and public policies do not always automatically produce a socially optimal aggregate savings rate.

The paper is divided into two main parts. Part one discusses estimates of the four key components or dimensions of the index-consumption flows, stocks of wealth, inequality, and insecurity. Part two presents exploratory or preliminary estimates of the overall index.

2. The Components of Economic Well-Being

GDP is a measure of the aggregate marketed income of a society and most of its proposed substitutes (such as the GPI) are also primarily measures of adjusted average annual "income" flows [where the adjustments are meant to capture issues (such as environmental degradation) that GDP now ignores]. However, "income" is a flow variable which does not directly consider the aggregate value of the bequest which this generation will leave to its descendants. Although those Canadians now alive clearly care about the level of their own consumption, they also care (in varying degrees) about the well-being of future generations. Furthermore, although trends in average income are important, individual Canadians are justifiably concerned about the degree to which they personally will share in the prosperity of the average, and the degree to which their personal economic future is secure. The four components or dimensions of economic well-being in the proposed index of economic well-being are, therefore:

· 2.1 effective per capita consumption flows

- includes consumption of marketed goods and services, and effective per capita flows of household production, leisure and other unmarketed goods and services;

· 2.2 net societal accumulation of stocks of productive resources

- includes at this stage net accumulation of tangible capital, housing stocks and consumer durables, net accumulation of human capital, social capital and R&D investment, net changes in the value of natural resources stocks; environmental costs, and net change in level of foreign indebtedness;

- to be included at a later stage of development stocks of consumer durables;

· 2.3 poverty and inequality,

- includes the intensity of poverty (incidence and depth) and the inequality of income;

· 2.4 insecurity,

- economic security from job loss and unemployment, illness, family breakup, poverty in old age;

- to be included at a later stage of development includes personal security from crime and ill health (including workplace injury) and the impact of unanticipated inflation.

Table 1: Canada, Components of Personal Consumption

Year	Personal Consumption per capita (1992 $)	% of Underground Consumption	Index of Life Expectancy 1971=1.00	Index of Equivalent Income 1971=1.00	Adjusted Personal Consumption per capita including regrettables (1992$)	Total Regrettable Cost Per Cap. (1992 $)	Adjusted Personal Consumption Per Cap. (1992 $)	Index of Adjusted Personal Consumption 1971=1.00
	A	B	C	D	E=A*(1+B/100)*C*D	F	G=E-F	G'
1971	9,657	2.595	1.000	1.000	9,907	1,164	8,743	1.0000
1972	10,103	2.647	1.006	0.995	10,377	1,329	9,047	1.0348
1973	10,676	2.700	1.011	0.990	10,978	1,364	9,613	1.0995
1974	11,072	2.754	1.017	0.985	11,397	1,312	10,085	1.1535
1975	11,368	2.809	1.023	0.980	11,715	1,354	10,361	1.1851
1976	11,821	2.865	1.014	0.975	12,029	1,440	10,590	1.2112
1977	12,031	2.978	1.020	0.970	12,264	1,514	10,749	1.2295
1978	12,312	3.060	1.026	0.966	12,568	1,568	11,000	1.2582
1979	12,533	3.070	1.032	0.961	12,802	1,563	11,239	1.2855
1980	12,626	3.063	1.037	0.956	12,904	1,497	11,407	1.3047
1981	12,657	3.099	1.035	0.951	12,844	1,473	11,371	1.3006
1982	12,196	3.234	1.041	0.946	12,399	1,425	10,974	1.2552
1983	12,417	3.333	1.047	0.942	12,643	1,476	11,168	1.2773
1984	12,852	3.316	1.052	0.937	13,092	1,566	11,526	1.3183
1985	13,390	3.316	1.058	0.932	13,648	1,636	12,013	1.3740
1986	13,784	3.228	1.047	0.928	13,822	1,629	12,193	1.3946
1987	14,175	3.263	1.053	0.923	14,228	1,618	12,610	1.4423
1988	14,600	3.298	1.059	0.918	14,668	1,659	13,009	1.4879
1989	14,863	3.209	1.065	0.914	14,929	1,655	13,274	1.5183
1990	14,832	3.332	1.071	0.909	14,924	1,708	13,216	1.5116
1991	14,448	3.451	1.066	0.905	14,411	1,655	12,756	1.4590
1992	14,499	3.500	1.068	0.900	14,423	1,695	12,728	1.4558
1993	14,574	3.668	1.070	0.896	14,477	1,735	12,743	1.4575
1994	14,847	3.688	1.072	0.891	14,705	1,775	12,930	1.4789
1995	14,921	3.671	1.074	0.887	14,731	1,783	12,948	1.4809
1996	15,098	3.848	1.077	0.882	14,903	1,810	13,093	1.4976
1997	15,548	4.143	1.079	0.878	15,340	1,839	13,501	1.5442

Sources: Appendix Tables A1, A2, A5, A26

A fuller discussion of the rationale for this framework of average consumption flows, aggregate bequest, inequality and insecurity can be found in Osberg (1985). The reason for focussing on these four main dimensions of economic well-being is to enable persons with differing value judgements (e.g. a greater or less preference for intergenerational bequest, or for the reduction of poverty, compared to increases in average consumption) to account explicitly for those values. Each dimension of economic well-being is itself an aggregation of many underlying trends, on which the existing literature is sometimes spotty.[5] However, it is surely a bad approximation to implicitly set the weight of a variable to zero, by ignoring entirely its influence.

2.1 Average Consumption Flows

2.1.1. marketed personal consumption

The starting point for this component of the index is aggregate real personal consumption per capita,[6] readily available from the national accounts. This measure rose from $9,657 (1992 dollars) in 1971 to $15,548 in 1997, a 61.0 per cent increase (Table 1). (All dollar values in this paper are expressed in terms of 1992 constant dollars)

This estimate is of course sensitive to the price series used to deflate nominal consumption. In the national accounts, the consumer expenditure deflator is used, which differs slightly from the Consumer Price Index. Bias in price series obviously bias estimates of average real consumption flows. The recent debate on CPI bias is thus directly relevant to the estimation of real consumption flows. The Boskin Commission (Boskin et al., 1996) estimated that the US CPI had an upward bias of 1.1 per cent, largely due to the failure of prices indexes to capture the welfare effects of new goods and the quality improvements in existing products (Nordhaus, 1996). The Bank of Canada estimates that CPI bias in Canada is less than 0.5 per cent. In this paper, we do not make an adjustment for this bias.

adjustments to marketed personal consumption flows

The System of National Accounts provides a strong basis for estimating the consumption of marketed goods and the cost of providing government services, and there have been enough studies of the value of household production to enable some confidence as to the range of reasonable values. Estimates are more imprecise when one considers the value of a number of other factors which also influence consumption flows, such as leisure, regrettables, the underground economy and life expectancy. These factors are discussed below, with approximate estimates of their value, in some cases. At this stage in the development of the index of economic well-being, our inclination is to include, rather than exclude, imprecise measures on the principle that an imprecise measure is likely to embody a smaller error than omitting a variable, which would implicitly set its value to zero. However, subsequent versions of this paper will undoubtedly revise these estimates somewhat.

the underground economy

There has been much discussion in recent years about the growth of the underground economy. However, estimates of the value of goods and services produced, but not captured in official statistics,

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[5] Since a great deal of work has been done on the valuation of household production, there is at least a clearly defined range of estimates. However, economists have paid very little attention to the measurement of insecurity (see Osberg, 1998) and the measures of economic insecurity are correspondingly underdeveloped.

[6] Consumption can also be calculated on a household basis. As the rate of growth of households has been faster than that of the overall population since 1971, consumption flows based on the number of households have risen at a slower pace than that based on population.

have ranged widely. The most comprehensive study, by Statistics Canada (1994), calculated that in Canada in 1992 consumption expenditure was underestimated by 3.5 per cent.

Since there always has been some level of "underground" activity, the issue for the measurement of trends in well-being is whether or not the prevalence of the underground economy has changed substantially over time. Rising tax rates may have increased the incentive to go underground, but the increased penetration of franchise systems in the small business sector and the greater computerization of business records may have also made it more difficult to escape detection.

For the purposes of this paper, the aggregate value of unrecorded consumption expenditure has been benchmarked at the 1992 Statistics Canada estimate. As the self-employed have more opportunity to engage in unreported economic transactions than paid workers, we have assumed that the size of this unrecorded consumption expenditure has varied over time in proportion to the percentage of self employed in the total employment.[7] This share has risen from 11.2 per cent in 1971 to 17.9 per cent in 1997, a 59.7 per cent increase. This factor was applied to the 3.5 per cent benchmark figure for 1992. This meant that underground consumer expenditure was equivalent to 2.60 per cent of recorded consumption in 1971, with the proportion rising to 4.14 per cent in 1997 (Table 1). Personal consumption has been adjusted for this upward trend in underground activity.

the value of increased longevity

The life expectancy of Canadians has increased significantly in recent years, and we have every reason to believe that having a long life is an important component of the well-being of Canadians. Between 1971 and 1997 average life expectancy at birth increased 5.6 years from 73.0 years to 78.7 years, a 7.8 per cent rise (Table A6).[8] It is interesting to note that the rate of increase in life expectancy has not slowed down over the last 25 years. The 0.3 per cent average rate of increase in life expectancy over the 1971-97 period is the same as that experienced between 1951 and 1971 (although the rate appears to have decelerated to 0.2 per cent in the 1990s). The economic value of these extra years of life should be included in the total consumption flows of individuals, since presumably people care both about how much they consume per year, and how many years they get to consume it.[9]

Years of life are one thing, and years of healthy, enjoyable life are a slightly different thing. A full appraisal of the value of increased longevity should consider trends in morbidity and health-adjusted life expectancy (HALE),[10] as well as easier-to-measure trends in longevity. However, in considering either, one has to face the issue that the value of more years of life may look very different, the closer one actually is to death. Changes in life expectancy are occurring "in real time" and are affecting the well-being of all Canadians now alive. In aggregating over the population of Canadians now alive, one is aggregating over individuals at very different points in the life course. Although the economist's reflex is to consider the discounted value of lifetime utility, it may be highly problematic to view the value of additional years of life as discounted to the point of view of a teenager. For the purposes of

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[7] A recent study by Schuetze reported by Little (1998) found that the opportunity to underreport income has fuelled the growth of self-employment.

[8] Male life expectancy increased 6.3 years or 9.1 per cent from 69.4 to 75.7. Female life expectancy increased 5.0 years or 6.5 per cent from 76.5 to 81.5. The greater rise in male life expectancy increased from 90.7 per cent to 92.8 the average life span of men relative to women. It is interesting to note that the rate of increase in life expectancy has not slowed down over the last 25 years. The 0.3 per cent average rate of increase in life expectancy over the 1971-96 period is the same as that experienced between 1951 and 1971.

[9] Dan Usher (1980) of Queen's University has developed a methodology for the estimation of the value of increased longevity.

[10] Wolfson (1996) found for 1990-92 that the HALE for 15 year olds was 7.8 years less than life expectancy (55.6 versus 63.4 years). However, since there is no time series on health-adjusted life expectancy for Canada, we do not know if the rate of increase in the HALE has been greater than life expectancy over time.

this paper, we adopt the simple expedient of considering an increase in consumption per year or consumption for an increased number of years to be equivalent – i.e. we add to consumption flows in each year the percentage increase in average life expectancy.[11]

For all years after 1971, personal consumption per capita is adjusted upward by the increase in life expectancy relative to 1971. For example, average life expectancy increased 7.8 per cent between 1971 and 1997, so average personal consumption is adjusted upward by 7.8 per cent in 1997 because of this development.

<u>reduced economies of scale in household consumption</u>

When individuals cohabit in households, they benefit from economies of scale in household consumption. There is a large literature on the estimation of "equivalence scales", which attempt to account for the magnitude of such economies of scale in households of different sizes.[12] When comparing the average effective consumption of Canadians over time, the implication is that as households have shrunk in average size, economies of scale have been lost. Trends in average per capita consumption should therefore be adjusted for the average loss over time of economies of scale in household consumption.

Since economies of scale diminish in family size, the extent of change in economies of scale depends on where change occurs in the distribution of family sizes.[13] As a consequence, we use Osberg's (1997) estimates of equivalent income using the Statistics Canada LICO scales, which were calculated from 1975 to 1994 for all individuals in SCF micro-data. The ratio of aggregate equivalent income to aggregate money income is a measure of aggregate living standard gains due to household economies of scale – but these gains have been shrinking over time as household size has shrunk.. We therefore scale average money income down by an (increasing) fraction to represent the percent of effective consumption lost to decreasing economies of scale, relative to a 1971 base year.

In Survey of Consumer Finance data, Osberg (1997) finds that average family size in Canada for all families fell from 2.83 in 1975 to 2.59 in 1984, to 2.51 in 1989, and to 2.41 in 1994 (a 20.3 per cent decline in family size). Equivalence scales are non-linear functions of family size. Using the OECD or the Statistics Canada scale, a decline of 14.8 per cent from 2.83 family members to 2.41 from 1975 to 1994 would (holding per capita money income constant) reduce equivalent income by about 10 per cent, or 0.50 per cent per year. This rate has been applied to the 1971-97 period, resulting in a reduction of effective consumption of about 12.2 per cent for the period as a whole.

<u>regrettables and intermediate consumer goods</u>

It can be argued that certain types of economic activity included in GDP do not contribute to economic welfare, but rather are defensive expenditures, or intermediate inputs, that individuals make in order to be able to produce or consume. The costs households pay in order to commute to work are considered in the GDP to be part of household consumption, but the expenses which firms incur to bring materials to the work site are seen as an intermediate input in production. Since intermediate inputs in the business sector are netted out in the calculation of value added, it can be argued that similar expenditures by households should be subtracted from marketed consumption to obtain a better

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[11] Implicitly, this procedure ignores both the differential value which individuals might place on changes in mortality probability at different ages and the distribution, by age, of actual changes in mortality probability.

[12] See, for example, Burkhauser et al (1996) or Phipps and Garner (1994).

[13] Even though the impact on average household size is the same, the impact on average living standards of (for example) a five-person household splitting will differ from the impact of a two-person household splitting, since the latter change will imply a greater loss of economies of scale.

estimate of true consumption flows. Similarly, if the good that individuals want to consume is "a crime free street", but it now takes a greater expenditure on police services to produce that good, this should not be counted as an increase in consumption.

The GPI has developed methodologies for estimating the costs of crime, cost of commuting, cost of pollution abatement, and the cost of auto accidents. Messinger and Tarasofsky (1997) has made estimates for these variables for Canada (Table A5). The costs of commuting are defined as the cost of travelling to and from work using either public transportation or private vehicle, as well as an estimate of time use while commuting. The cost of crime and auto accidents are defined as the costs associated with medical and legal expenses and expenditures related to lost or damaged property. The cost of household pollution abatement represents the expenditure on air and water filters and devices to improve air and water quality in the home.

Estimates of these costs, expressed in 1992 dollars per capita, are highlighted below.[14]

· The cost of commuting in 1971 was estimated at $600, increasing 61.5 per cent to $969 in 1997.
· The cost of home pollution abatement in 1971 was estimated at was $29, increasing 65.5 per cent to $48 in 1997.
· The cost of auto accidents was estimated at $423 in 1971, increasing 57.2 per cent to $665 in 1997.
· The cost of crime in 1971 was at $112 per capita, rising 39.4 per cent to $156 in 1997.

These estimates are very likely too low in absolute terms, since there is no consideration of any indirect influences – e.g. the impact of crime on residential neighbourhoods. However, it is not so much the absolute level, but the lack of any overall trend that is significant for the measurement of trends in aggregate economic well-being. Taken together, the four regrettable discussed above totaled $1,164 per capita in 1971 (11.7 per cent of adjusted personal consumption excluding regrettables, that is consumption adjusted for the underground economy, life expectancy and family size) and $1,839 in 1997 (12.0 per cent). This represents a 58.0 per cent increase over the 1971-97 period, compared to 54.8 per cent for adjusted personal consumption excluding regrettables.

The values for the four regrettables have been subtracted from personal consumption after the adjustments for the underground economy, family size, and life expectancy (Table 1).

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[14]In addition to the four regrettables discussed in the paper, a number of other expenditures could be considered defensive in nature, but are not included. For example, we have not made any adjustment to the value of government expenditure on defense. Presumably, the desired good which defense expenditures are trying to produce is "national security", which does not increase during an arms race, even if defense expenditure does. However, expenditure on the Canadian Armed Forces is partly devoted to activities, such as disaster relief, which do correspond to greater utility for Canadians. We have not yet developed a way to disentangle the components of Canadian defense expenditures which do, and which do not, correspond to greater utility.

Table 2: Canada, Components of Total Consumption

Year	Adjusted Personal Consumption per capita (1992 $)	Gov't Real Current Expenditure Per Capita (1992 $)	Unpaid Work Per Capita (Replacement by Generalist) (1992 $)	Total Consumption Flows Per Capita (1992 $)	Index 1971=1.01
	A	B	C	D=A+B+C	E=Index of D
1971	8,743	4,200	6,212	19,156	1.0000
1972	9,047	4,240	6,206	19,494	1.0176
1973	9,613	4,386	6,260	20,259	1.0576
1974	10,085	4,600	6,301	20,987	1.0956
1975	10,361	4,838	6,341	21,540	1.1244
1976	10,590	4,865	6,386	21,841	1.1402
1977	10,749	5,032	6,441	22,223	1.1601
1978	11,000	5,069	6,508	22,578	1.1786
1979	11,239	5,072	6,579	22,890	1.1949
1980	11,407	5,181	6,633	23,220	1.2122
1981	11,371	5,194	6,684	23,250	1.2137
1982	10,974	5,241	6,629	22,844	1.1925
1983	11,168	5,275	6,586	23,029	1.2022
1984	11,526	5,284	6,547	23,358	1.2194
1985	12,013	5,461	6,511	23,984	1.2520
1986	12,193	5,509	6,470	24,172	1.2619
1987	12,610	5,516	6,545	24,671	1.2879
1988	13,009	5,693	6,617	25,319	1.3217
1989	13,274	5,754	6,663	25,692	1.3412
1990	13,216	5,875	6,724	25,815	1.3476
1991	12,756	5,965	6,801	25,522	1.3323
1992	12,728	5,943	6,870	25,542	1.3334
1993	12,743	5,851	6,946	25,540	1.3333
1994	12,930	5,677	7,027	25,635	1.3382
1995	12,948	5,588	7,113	25,648	1.3389
1996	13,093	5,454	7,202	25,750	1.3442
1997	13,501	5,390	7,299	26,190	1.3672

Sources: A-Table 1, B - Appendix Table A2, C - Appendix Table A3.

leisure

With the increased employment/population ratio of the last two decades, the work-hours of Canadian families have risen substantially, and a decrease in leisure, everything else being equal, decreases economic welfare. The valuation of leisure poses a major challenge, although data on leisure time can be obtained residually from data on hours worked and directly from time-use surveys. It should be noted that the increase in unemployment and involuntary part-time unemployment during the 1980s and 1990s cannot be considered an increase in leisure time.

The average work week for full-time workers has declined greatly in the first half of this century, but the fall has been much less since 1950, with little change in recent years. In 1870, standard weekly hours in manufacturing were 64.0 (Ostry and Zaidi, 1979: Table IV-1). This fell to 58.6 in 1901, 50.3 in 1921, 48.7 in 1946 and 43.6 in 1951. By 1976, it had only reached 39.4 hours. Labour Force Survey Data show that the average usual weekly hours of all workers only fell from 39.0 in 1976 to 37.8 in 1996 despite the growth in part-time employment. Average hours of full-time workers exhibited no downward movement. On a family basis, however, the last 25 years have seen a substantial increase in market work, as two parent families increasingly become two earner families.[15]

There are two main approaches to the valuation of leisure. The first, used by Nordhaus and Tobin in the construction of the Measure of Economic Welfare (MEW), is to place a value on the total amount of leisure. The second, used by the Redefining Progress Institute (1995) in the construction of the Genuine Progress Indicator (GPI), is to value changes in leisure relative to the amount of leisure enjoyed in the base year.

Messinger and Tarasofsky (1997) estimated the value of leisure in Canada using both approaches. Based on the MEW approach, they impute a value of $518.5 billion (1986 dollars) to leisure in 1995, or $17,509 per capita, nearly one and one half the value of marketed consumption. This is an increase of 5.2 per cent over the 1971 per capita valuation. Based on the GPI methodology, they value the loss of leisure time relative to the 1970 base at $16.7 billion (1986 dollars) in 1994, or $571 per capita.

Since the GPI methodology estimates there has been a fall in leisure equal in value to a 2.8% cut in total consumption (i.e. personal consumption plus government services and unpaid work), while the MEW methodology indicates an increase in leisure equal to 4.5% of the value of total consumption, clearly any perception of trends depends on the methodology chosen. Other estimates indicate that if the market and non-market work hours of Canadians aged 20 to 59 are added together, there is not much of any trend over time (Bittman, 1998).

Many Canadian families are feeling the time crunch of two demanding jobs, plus family responsibilities, but although some families are working more, there has also been a substantial trend to earlier retirement. Although work hours and leisure are unequally distributed among people and may be poorly distributed over the life cycle, there does not

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[15]Kilfoil (1998) notes that the husband/wife families in the top 5% of the earnings distribution worked an average of 3097 hours in 1975, but keeping the same position took 4026 hours of paid work in 1994 – while at the median of the household earnings distribution, the increase in average household hours was from 2500 to 3043.

appear to be reliable evidence of a significant trend in the average. Hence, this paper will not attempt to assign a value to leisure, or to trends in its magnitude.

At this point, since our focus is on trends in *aggregate* consumption, we are concerned with the aggregate amount of leisure enjoyed by Canadians, as a part of aggregate consumption. The *distribution* of hours of leisure is another issue. Picot (1996) has pointed to the increase in the percentage of individuals working very short weekly hours *and* the increased percentage working very long hours – although the inequality of weekly working hours has increased, the average is nearly constant. At the family level, Kilfoil (1998) has emphasized that working age families have less leisure now than in the early 1970s, due to the increase in paid hours worked by married women entering the paid labour force over the period 1971-1996. However, the trend to earlier retirement also means that over the life cycle, Canadians are now enjoying more aggregate years of leisure, albeit in the latter part of their lives. Since there are offsetting trends in the distribution of leisure, near constancy in its aggregate level may mask declines in the utility derived from leisure, but we leave consideration of distributional issues to Section 2.3.

positional goods

Positional goods can be defined as those goods in limited supply that provide utility only because they are inherently scarce. For example, only one type of motorcycle can be "the fastest in town", and if the point of the purchase of motorcycles is to be the fastest, increased competitive expenditures on horsepower generate no aggregate increase in utility. To the extent that individuals' overall satisfaction is related to the consumption of positional goods, increases in aggregate consumption will raise economic well-being by less than the increase in dollar value of consumption. As it is unclear how to quantify the relative importance of positional goods and their implications for economic well-being, this aspect of economic well-being has not been developed in the current version of our work.

2.1.2 Government services

The provision of non-marketed or heavily subsidized services by the government is part of the consumption flow of Canadians. These data are available from the national accounts. Current expenditure by all levels of government including defense and capital consumption allowances, but excluding debt service charges and transfer payments (which influence marketed consumption) are used. Current dollar data are deflated by the price index for government current expenditures on goods and services. This measure rose from $4,200 (1992 dollars) in 1971 to $5,390 in 1997, a 28.3 per cent increase (Table 2).

2.1.3 Unpaid work

Unpaid work contributes to economic welfare and thus should be included in an index of economic well-being. Unpaid work consists of both household work and volunteer work.[16]

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[16]Statistics Canada has identified the following types of unpaid work: food and meal preparation; food or meal clean-up; cleaning; laundry and ironing; clothes repair and shoe care; home repair and maintenance;

Statistics Canada (1996) has produced estimates of unpaid work for Canada and the provinces for the years 1961, 1971, 1981, 1986, and 1992, expressed in 1986 dollars. Data for other years have been interpolated or extrapolated. Estimates in 1986 dollars have been rebased to 1992 dollars with the CPI.

There are a number of methodologies for the valuation of unpaid work, including opportunity cost before tax or after tax, or at the replacement cost using a specialist or generalist. The value of unpaid work is not surprisingly greatest when it is valued on the basis of opportunity cost before taxes, followed by replacement cost using a specialist, opportunity cost after tax, and finally replacement cost using a generalist. The rate of growth over time however is not greatly affected by which valuation method is used.

This paper uses the value of unpaid work per capita based on replacement with a generalist – which amounts to $6,212 in 1971 (1992 dollars) and $7,299 in 1997, an increase of only 17.5 per cent (Table 2). Increased female and youth participation, the expansion in the range of personal services available to households provided by the market, and the increase in the number and quality of time-saving household production innovations such as the microwave oven may have tended to decrease the *relative weight* of unpaid household work.

2.1.4   Total consumption flows

Total per capita consumption is defined as the sum of personal consumption (adjusted for the growth of the underground economy, increased life expectancy, smaller household size, and certain regrettable expenditures), government services and unpaid work. In 1971, it amounted to $19,156 (Table 2). By 1997, it had reached $26,190, a 36.6 per cent increase. The slower per capita growth over the 1971-97 period of unpaid labour (17.5 per cent), meant that the rate of growth of total consumption flows was much less than adjusted personal consumption (a 54.4 per cent increase).

2.2 Wealth Stocks, Sustainability and the Intergenerational Bequest

In our view, measurement of trends in well-being should include consideration of changes in the well-being of generations yet unborn. This consideration of future generations can be justified either on the grounds that those Canadians now living care about the well-being of future generations or on the grounds that a concept of "Canadian society" should include both present and future generations. Either way, wealth accumulation by this generation of Canadians will increase the bequest left to future generations, and is an important component of well-being.[17] We would emphasize that this component of economic

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gardening and grounds maintenance; pet care; other domestic work, not elsewhere classified; physical care-children; education-children; medical care-children; other care-children; personal care-adults; medical care-adults; household management and administration; shopping for goods and services; transport-children; transport-all other household work; volunteer work; other help and care; and transport-other unpaid work. In 1992, household work represented 94 per cent of total unpaid work, with volunteer work the remainder.

[17]If one could assume that income flows were always optimally divided between consumption and savings, one could omit separate consideration of consumption and wealth accumulation and concentrate on trends in average income. However, since aggregate wealth accumulation depends heavily on the political process, and because capital markets have significant imperfections, this seems too hopeful by far – for

well-being consists of those stocks of real productive assets that can generate real income for future generations – not the financial instruments that will determine the allocation of the return from those assets. The stocks of "wealth" left to the next generation, broadly conceived to include environmental and human resources as well as physical capital stock, will determine whether Canadian society is on a long-run sustainable trajectory.

2.2.1 Physical capital stock

The physical capital stock includes both residential structures and machinery and equipment and non-residential, and both the business sector and the government sector. The greater the capital stock, the greater is future productive capacity and future potential consumption flows, and economic well-being. The capital stock data are based on the perpetual inventory method where investment flows are accumulated over time, with depreciation rates applied to the different assets. Statistics Canada produces estimates of the various components of the capital stock in current and constant prices by province for the 1961-1997 period.

In 1971, the net non-residential capital stock per capita, expressed in 1992 dollars, was $11,548 (Table A7). By 1997, it had increased to $16,805, up 45.5 per cent. The per capita housing stock was $11,954 in 1971, rising 109.5 per cent to $24,990 in 1997. The total capital stock (residential and non-residential) was $23,502 per capita in 1971, rising 77.8 per cent to $41,795 in 1997 (Table 3).

2.2.2. Research and development capital stock

Closely related to the physical capital stock is the concept of the research and development (R&D) capital stock. In an era of rapid technological change, expenditure on R&D is a crucial ingredient in the ability of society to innovate and create wealth. Statistics Canada does not produce R&D stock data. The Center for the Study of Living Standards has constructed a R&D stock series for Canada and the provinces from Statistics Canada's annual flows of general domestic expenditure on research and development (GERD). The stock of R&D capital is valued at cost of investment, and a depreciation rate of 20 per cent on the declining balance is assumed.

The R&D stock more than tripled from $17,152 million (1992 dollars) in 1971 to $56,130 in 1997 (Table A8). On a per capita basis, the R&D capital stock rose from $788 in 1971 to $1,856 in 1997, a 135.5 per cent increase.

2.2.3 Value of natural resource stocks

The current consumption of Canadians could be increased by running down our stock of non-renewable natural resources or by exploiting our renewable resources in a non-sustainable manner, but this would be at the cost of the consumption of future generations of Canadians. A key aspect of the wealth accumulation component of economic well-being is net changes in the value of natural resources.

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further discussion, see Osberg (1985).

Table 3: Canada, Stocks of Wealth

Year	Total Per Capita Net Capital Stock (1992 $)	Per Capita Depreciated Accumulated Stock GERD (1992 $)	Total Real Per Capita Value of Nat. Res. (1992 $)	Human Capital per capita (1992 $)	Per Capita Real Net Int'l Investment Position (1992 $)	Per Capita Greenhouse Gas Emission Cost (1992 $)	Total Real Per Capita Wealth (1992 $)	Index 1971=1.00
	A	B	C	D	E	F	G=A+B+C+D+E-F	H-index of G
1971	23,502	788	15,170	52,654	-5,512	362	86,239	1.0000
1972	24,037	835	14,358	53,106	-5,560	364	86,412	1.0020
1973	24,900	872	14,810	53,642	-5,416	369	88,438	1.0255
1974	25,743	897	15,963	54,301	-5,217	379	91,308	1.0588
1975	26,562	918	16,905	54,936	-5,572	384	93,365	1.0826
1976	27,463	932	17,216	55,623	-6,123	391	94,719	1.0983
1977	28,320	951	17,189	56,400	-6,345	391	96,125	1.1146
1978	29,145	978	18,323	56,979	-7,562	393	97,470	1.1302
1979	30,064	1,011	22,729	57,490	-8,002	397	102,894	1.1931
1980	30,926	1,046	26,453	58,286	-7,610	396	108,704	1.2605
1981	31,972	1,098	21,777	59,167	-8,339	403	105,272	1.2207
1982	32,469	1,158	20,109	59,974	-7,634	387	105,689	1.2255
1983	32,934	1,208	20,615	60,972	-7,582	389	107,758	1.2495
1984	33,381	1,270	20,158	61,605	-7,772	396	108,246	1.2552
1985	34,044	1,342	18,265	62,363	-8,653	401	106,961	1.2403
1986	34,775	1,413	12,473	63,092	-9,222	400	102,132	1.1843
1987	35,703	1,465	13,472	63,751	-9,392	402	104,598	1.2129
1988	36,805	1,506	13,508	64,521	-9,005	402	106,934	1.2400
1989	37,854	1,535	13,897	64,482	-9,087	397	108,284	1.2556
1990	38,675	1,576	13,844	67,941	-9,452	388	112,196	1.3010
1991	39,311	1,613	10,617	68,625	-9,635	379	110,153	1.2773
1992	39,715	1,648	9,409	69,568	-10,447	376	109,518	1.2699
1993	40,021	1,695	8,578	70,768	-11,049	384	109,629	1.2712
1994	40,378	1,744	9,028	71,831	-11,227	400	111,355	1.2912
1995	40,821	1,786	9,546	72,260	-10,823	400	113,191	1.3125
1996	41,271	1,823	9,306	72,853	-10,369	400	114,484	1.3275
1997	41,795	1,856	9,159	73,964	-10,573	400	115,801	1.3428

Sources: A - Appendix Table A7, B- Appendix Table A8, C- Appendix Table A12,
D - Appendix Table A13, E - Appendix Table A14, F- Appendix Table A25.

From an intergenerational perspective, it is the value of the natural resources, not their physical extent, which counts. The valuation of these resources poses conceptual problems, but estimates certainly are possible. Statistics Canada (1997) has recently provided both physical and value estimates of natural resources such as forests, energy reserves, and minerals. [Data on the value of fish stocks have not yet been developed.]

The estimated market value is the price the resources would bring if sold on the open market. It is based on the difference between the annual cost of extraction of a given resource and the revenue generated from the sale of the resource. In other words, the total value or wealth associated with a stock is calculated as the present value of all future annual rent that the stock is expected to yield. This amount of rent is determined by the quality of the resources, the state of existing extraction technologies, the price of the resource, and factor costs.

Table A9 presents estimates of the current dollar value of timber stocks in Canada, and estimates of the per capita constant dollar value (the GDP deflator was used to deflator nominal values to 1992 dollars).[18] In 1971, the value of timber was $2,831 (1992 dollars) per capita. By 1997, it had risen to $3,527, a 24.6 per cent increase.

Table A10 presents estimates of the value of the five types of energy resources (crude oil reserves, natural gas reserves, crude bitumen reserves (tar sands), subbituminous coal and lignite reserves, and bituminous coal). It should be noted that this valuation is based on remaining established reserves, which represent only a small proportion of known reserves and ultimately recoverable resources.[19] The per capita value of energy resources has fluctuated dramatically over the 1971-97 period, going from $3,917 in 1971 to a peak of $14,410 in 1983, reflecting increased energy prices and rising proven reserves. By 1997, the per capita value had fallen to $2,789, which is 28.8 per cent below the 1971 level.

Table A11 presents estimates of the value of 10 minerals (copper, potash, silver, sulphur, uranium, gold, iron, nickel, lead, and molybdenum), again based on remaining established reserves. The per capita value of mineral deposits has fallen from $8,421 in 1971 to $2,843 in 1997, a 66.3 per cent decrease.

In addition to the data on the value of natural resources, Statistics Canada produces estimates of the physical size of the resources. Over the period for which data are available (which varies by resource), the physical extent of timber stocks has fallen slightly. Concerning the five types of energy resources for which data are available, stocks for three have increased (natural gas, bituminous coal, crude bitumen,) one is unchanged (subbituminous coal and lignite reserves), and one has fallen (crude oil). For the 10 minerals for which data on reserves are available, four have increased (uranium, sulphur, potash, gold) and six have decreased (silver, copper, iron, nickel, lead, molybdenum).

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[18]The estimates are based on a positive return to produced capital. Statistics Canada also produces an estimate based on a zero return to produced capital.

[19]For example, based on the situation in 1992, Natural Resources Canada and the National Energy Board (see Statistics Canada, 1996:Table 6.1) provided the following estimates of the the remaining established reserves of energy resources, as a proportion of ultimately recoverable resources: crude oil (7.9 per cent); crude bitumen (0.98 per cent); Western Canada natural gas (26.5 per cent); frontier natural gas (0.11 per cent); and coal (8.3 per cent).

Table A12 and Table 3 aggregate the data on the value of timber, energy, and mineral resources into one global measure for the value of natural resources for Canada. Between 1971 and 1997, the total per capita value (1992 dollars) of natural resources fell 39.6 per cent from $15,170 in 1971 to $9,159 in 1997, largely due to the fall in the value of mineral resources. In 1997, timber represented 38.5 per cent of the total value of natural resources, followed by minerals at 31.0 per cent and energy at 30.5 per cent.

2.2.4 - Stocks of human capital

The human capital accumulated by the workforce generates both current and future income. Trends in the stock of human capital, including both formal educational attainment levels and on-the-job training, are important determinants of current and future economic well-being. School retention and participation in post-secondary education have increased dramatically in Canada over the last three decades,[20] and there is a strong relationship between educational attainment and individual income.

One approach to the valuation of human capital is to estimate the returns associated with different levels of educational attainment of the population and compute the implicit present discounted value of education (Jorgenson and Fraumeni, 1992). [A major problem with this methodology, however, is that it imputes to education stocks any differential in the structure of wages that is correlated with education.] A second, input-based approach is to apply the perpetual inventory method of estimating the physical capital stock based on investment flows and depreciation assumptions to public and private expenditure on education and training (Kendrick, 1976). A third approach to human capital accounting is to develop methods for systematically evaluating and recording knowledge assets acquired through experience, education, and training (OECD, 1996).

Our approach in this paper is admittedly crude and incomplete and will be improved upon at a later date. We estimate the cost per year of education expenditures at the primary, secondary and post secondary levels and use yearly estimates of the distribution of education within the population to compute the total cash cost of production of human capital in education. Our estimates of the change over time in the value of human capital stocks are, therefore, under-estimates, since we do not yet account for the cost of student time in human capital production or for the value of experience or on-the-job training.

In 1992-93, the average cost of educating a student at the elementary-secondary level in Canada, calculated by dividing total expenditure at the level by enrolment, was $6,518,. At the community college level, the cost was $11,348 and at the university level $20,269.

The average number of years of education assumed for each educational attainment group are given below (with the average cost in 1992-93 of educating an individual at that level of educational attainment in brackets):

· for the 0-8 year group is 8 years ($52,144);

· for the some secondary education group 10 years ($65,180);

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[20] The increase has been particularly large in Atlantic Canada – see Osberg (1994).

·   for graduated high school 12 years ($78,216);

·   for some post-secondary 12 years of elementary-secondary school and the average of one year of community college and one year of university (($94,025);

·   for post-secondary certificate 12 years of elementary-secondary school and two years of community college ($100,912); and

·   for university graduates 12 years of elementary-secondary school and five years of university (an average of four years of undergraduate study and one year of graduate or professional study) ($179,561).

The size of the population and stock of human capital by educational attainment is found in Table A13.

In 1971, human capital per capita, expressed in 1992 dollars, was $52,654. By 1997 the stock of human capital had reached $73,964, up 40.5 per cent. This was 77 per cent higher than the stock of physical capital and over eight times that of the stock of natural resources.

Like these other assets, the value of the human capital of living Canadians represents the future consumption that possession of such assets enables. The endogenous growth perspective has argued that the benefits of societal learning are partly the output such learning enables in the current generation and partly the fact that future generations can start learning at a higher level. As a consequence, higher levels of education produce a higher long run growth rate, as well as a higher current level of income [Galor and Zeira (1993), Eckstein and Zilcha (1994)]. If this is correct, a production cost valuation of human capital may underestimate considerably the value of the human capital stock investments.

2.2.5 Net foreign indebtedness

We do not count the gross level of government, or corporate, debt as a "burden" on future generations, and we do not count as part of the intergenerational bequest the value of paper gains in the stock market. In general, financial instruments represent both assets to their holders and liabilities to their issuers. The distribution of such assets/liabilities will play a major role in allocating the real returns to the future capital stock, but the issue at this point is the aggregate value of the intergenerational bequest.

However, net debt to foreigners is another issue. Since interest payments on the net foreign indebtedness of Canadians to other countries will lower the aggregate future consumption options of Canadians, increases in the level of foreign indebtedness reduce economic well-being. Unlike many of the other stock variables, well developed data are available. Statistics Canada publishes data on net foreign indebtedness for both direct foreign investment and portfolio investment. In this paper, we will not attempt any estimate of the more controversial aspects of the net costs of equity investments and foreign ownership (e.g.

possible foreign sourcing of suppliers).

Table A14 gives estimates of the net international investment position of Canadians. On a per capita basis, with the figures expressed in 1992 dollars, Canada's net foreign debt nearly doubled from $5,512 to $10,573 between 1971 and 1997.

2.2.6 State of the Environment and National Heritage

Like the excess depletion of natural resources, the current consumption of Canadians can be increased at the expense of the degradation of the environment, reducing the economic well-being of future generations. Consequently, changes in the level of air and water pollution should be considered an important aspect of the wealth accumulation of Canadians.

Canadians pass on from generation to generation both a natural and made-made national heritage. If this heritage were damaged, the economic well-being of future generations of Canadians would be reduced. Since it is very difficult, if not impossible, to put a monetary value on, for example, the pristine condition of our national parks, or the Parliament Buildings, there will be no attempt to set an aggregate value to these assets. However, the issue of *trends* in well-being is the *change* in such assets, which is easier to measure and indexes of indicators of environmental quality can be developed.[21]

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[21] Environment Canada produces environmental indicators in a number of areas, including urban air quality, urban water quality, climate change, acid rain, toxic contaminants, and stratospheric pollutants (See the Environment Canada website (www.ec.gc.ca) for the National Environmental Indicator Series) There is no one indicator that attempts to combine trends in these different areas, so it is difficult to identify an overall trend in environmental conditions.

What is interesting however is that many if not most environmental indicators have shown an improvement over time. A sampling of these developments is highlighted below:

· the concentration of DDE and PCBs in double-crested Cormorant eggs in different locations across Canada has decreased significantly since the first half of the 1970s;
· emissions of sulphur dioxide had been cut in half in Eastern Canada between 1980 and 1994;
· the number of days in Canadian cities with airborne particles exceeding the national objective has fallen greatly since 1979;
· the average annual benzene concentrations in Canadian cities has fallen in the 1990s; and
· the proportion of the population with wastewater treatment in Canada increased from 70 per cent in 1983 to 90 per cent in 1994.

There have been however a number of negative developments, as noted below:

· the amount of greenhouse gas emissions in equivalent tones of carbon dioxide increased 8.3 per cent between 1981 and 1992, a negative development because of the implications for global warming (Table A16);
· the average amount of ozone in the atmosphere, measured in Dobson units, at three locations in Canada (Toronto, Edmonton, and Resolute) has fallen 6.8 per cent between 1971 and 1994, indicating a deterioration in air quality (Table A16); and
· over the past half century, Canada's average annual temperature has increased 0.4C.
The Fraser Institute has recently issued a report on environmental indicators for Canada and the United States (Hayward and Jones, 1998). It shows that for Canada over the 1980-95 period the relative severity of environmental problems in the areas of air quality, water quality, and natural resources improved, while it deteriorated for solid waste. Overall, there was a 10.8 per cent reduction in the severity of environmental problems.

Osberg (1985a) has argued that heritage preservation laws can be seen as an optimal intergenerational contract, which constrains the present generation not to despoil irreplaceable assets. In the presence of such constraints, the current generation still has to decide how large a bequest to future generations to leave in the form of replaceable assets, but the "national heritage" remains untouched. As a consequence, (like the family heirloom that is never priced because it will never be sold), trends in economic well-being can be evaluated without placing an explicit monetary value on irreplaceable environmental and cultural assets.

Probably the best known environmental problem is global warning arising from increased emissions of greenhouse gases, the most common of which is carbon dioxide emissions. Fortunately, data are available on these emissions and it is possible to estimate the costs of these emissions. These costs can then be subtracted from the stock of wealth to obtain an environmentally adjusted stock of wealth.

Needless to say there are major conceptual issues to be deal with in estimating the costs of CO_2 emissions. These include whether the costs should be viewed from a global, national or sub-national perspective, whether the costs increase linearly with the levels of pollution, whether the costs should be borne by the producer or receptor of trans-border emissions, and whether costs should vary from country to country or be assumed the same for all countries. Since global warming affects all countries, we estimate world total costs of emissions and allocate these costs on the basis of a country's share of world GDP.[22]

Fankhauser (1995) has estimated that the globalized social costs of CO_2 emissions (with no adjustment for different national costs) at $20 US per ton in 1990 (or $24.40 Canadian based on Statistics Canada purchasing power parity estimate of 1.22). World Bank researchers (Atkinson et al, 1997) have applied this number to CO_2 emissions in developed countries to estimate the value of the loss of environmental services as a proportion of output and the measure of genuine saving.

According to data from the International Energy Agency, world CO_2 emissions in 1997 were 22,636 millions of metric tons (see Table A25). Based on the $24.40 Canadian per ton cost of CO_2 emissions, the world social costs of CO_2 emissions was $552,327 million. Given Canada's 2.1 per cent share of world GDP, our share of the world cost of CO_2 emissions was 11,634 million, or $400 per capita. As these costs represent a loss in

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[22] Data on CO_2 emissions for Canada are published by Environment Canada (Jaques, 1997) and currently available for the 1958-1995 period at the national level and for the 1990-95 period for the provinces. With the approach adopted in this paper, these data are not directly used for the calculation of the social costs of CO_2 emissions for Canadians. They do enter indirectly through Canada's contribution to world CO_2 emissions.

the value of the services provided by the environment, they can be considered a deduction from the total stock of wealth of the society. In 1997, the overall value of stocks of wealth in Canada were reduced by 0.35 per cent from the social costs imposed by CO_2 emissions according to this methodology.

2.2.7 Estimates of total wealth

As the estimates of the physical capital stock, the R&D capital stock, and natural resource wealth, human capital, net foreign debt, and environmental degradation are expressed in value terms, they can be aggregated and presented on a per capita basis (Table 3). Net foreign debt per capita is a negative entry, while the social costs of CO_2 emissions are subtracted from the stocks of wealth.

In 1971, the value, on a per capita basis and expressed in 1992 dollars, the value of the stock of physical capital, R&D, and natural resources, minus debt foreign debt, was $86,239, with the human capital constituting the lion's share of the wealth (61.1 per cent), followed by physical capital (27.3 per cent). By 1997, the value of the wealth stock had risen to $115,801, a 34.3 per cent increase.

2.2.8 Other wealth variables

Data for the above variables have been used in the construction of the index of economic well-being presented in this paper. In addition, a number of other variables, whose estimation may be more problematic, are discussed briefly below.

consumer durables

The stock of consumer durables contributes directly to the well-being of Canadians. Statistics Canada's household facilities survey provides data on the ownership of a large number of household equipment. From these data, the Center for the Study of Living Standards has constructed an index of household penetration for 14 types of household equipment over the 1968-95 period (Table A15).[23]

In 1971, the average household penetration rate for the 14 items of household equipment in the index was 40.5 per cent. By 1995 it had reached 75.0 per cent, a 81.0 per cent increase.

Given data on the number of households and the value of the 14 items of household equipment, an estimate of the total value of these consumer durables can be built up from the data on the penetration rates.

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[23] Items included in the index with the 1996 penetration rate given in brackets are bath facilities (99.8 per cent), flush toilets (99.8 per cent), refrigerators (99.6 per cent). telephones (98.7 per cent), colour TVs (98.5 per cent), microwave ovens (85.3 per cent), video recorders (83.5 per cent), automatic washing machines (78.0 per cent), clothes dryers (76.5 per cent), one or more automobiles (73.6 per cent), freezers (57.1 per cent), dishwashers (47.7 per cent), home computers (31.6 per cent), and air conditioners (29.3 per cent).

<u>social capital</u>

It has been argued by a number of authors that "social capital" is highly important for economic productivity. Social capital can be taken to include the social institutions that produce habits of honesty and co-operation, a justifiable sense of mutual trust in business dealings and a willingness to compromise in negotiations – all of which clearly help to make economic transactions run more smoothly. Recently, Knack and Keefer (1997) have found that countries scoring higher on measures of social capital tend to grow more rapidly over time. Despite the potential importance of this variable, it is not included at this time.

2.3 Inequality and Poverty

The idea of a "Social Welfare Function" which is a positive function of average incomes and a negative function of the inequality of incomes has a long tradition in welfare economics. However, in measuring the level of social welfare, the exact relative weight to be assigned to changes in average incomes, compared to changes in inequality, cannot be specified by economic theory. Indeed, the measurement of inequality itself depends on the relative value which the observer places on the utility of individuals at different points in the income distribution. For a "Rawlsian", only changes in the well-being of the least well off matter, but others will admit some positive weight for the income gains of the non-poor,[24] and will assign some negative weight to inequality among the non-poor.

Since the economic well-being of the population is affected by inequality in the distribution of income and by the extent of poverty[25], there are two issues: 1) one's perspective on the importance of inequality/poverty compared to trends in average income, and 2) one's view of the relative weight to be placed on poverty compared to inequality. We therefore suggest that a compound sub-index to recognize explicitly these issues would place some weight (β) on a measure of inequality in the aggregate distribution of income and some weight (1-β) on a measure of poverty.

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[24] Jenkins (1991) surveys the issues involved in measurement of inequality.

[25] Wilkinson (1996) argues that greater inequality increases the mortality rate. Daly and Duncan (1998) argue that absolute deprivation reduces life expectancy and conclude that policies targeted at increasing the incomes of the poor are likely to have a larger effect on mortality risk than policies designed to reduce inequality more generally.

Table 4: Canada, Index of Economic Inequality

Year	Poverty Intensity	Poverty Intensity Index	Gini Coeff. (income after tax)	Gini Coeff. (income after tax), Index	Overall index of Inequality
	A	A'	B	B'	C=-1*(A'*0.75+B'*0.25)
1971	0.051	1.000	0.373	1.000	-1.000
1972	0.051	1.000	0.368	0.987	-0.997
1973	0.051	1.000	0.368	0.987	-0.997
1974	0.055	1.084	0.363	0.973	-1.056
1975	0.059	1.170	0.364	0.976	-1.122
1976	0.061	1.205	0.374	1.003	-1.154
1977	0.063	1.239	0.362	0.971	-1.172
1978	0.060	1.192	0.367	0.984	-1.140
1979	0.058	1.145	0.355	0.952	-1.097
1980	0.055	1.075	0.358	0.960	-1.046
1981	0.051	1.008	0.351	0.941	-0.991
1982	0.050	0.990	0.353	0.946	-0.979
1983	0.052	1.027	0.363	0.973	-1.014
1984	0.054	1.065	0.359	0.962	-1.040
1985	0.050	0.982	0.358	0.960	-0.976
1986	0.048	0.940	0.359	0.962	-0.945
1987	0.046	0.914	0.357	0.957	-0.925
1988	0.045	0.886	0.355	0.952	-0.902
1989	0.044	0.867	0.352	0.944	-0.886
1990	0.048	0.940	0.352	0.944	-0.941
1991	0.047	0.933	0.357	0.957	-0.939
1992	0.047	0.933	0.356	0.954	-0.939
1993	0.047	0.916	0.358	0.960	-0.927
1994	0.046	0.898	0.354	0.949	-0.911
1995	0.048	0.952	0.357	0.957	-0.953
1996	0.048	0.952	0.362	0.971	-0.957
1997	0.048	0.952	0.362	0.971	-0.957

Sources: A - Appendix Table A18, B- Appendix Table A17.

The most popular measure of inequality in the distribution of income is undoubtedly the Gini index. Statistics Canada has published Gini indices for three definitions of income: income before transfers, total money income, and income after tax (Table A17). For the purposes of the construction of the index of economic well-being, we have chosen the income after tax measure as it represents the best measure of purchasing power. This measure of income inequality for all persons has shown little fluctuation over the 1971-97 period.[26] In 1997, it was 0.362 down 2.9 per cent from 0.373 in 1971.

 Recently, Osberg and Xu (1998) have noted that the Sen-Shorrocks-Thon measure of poverty intensity is both theoretically attractive as a measure of poverty, and also convenient, since it can be decomposed as the product of the poverty rate, the average poverty gap ratio and the inequality of poverty gap ratios. Furthermore, since, the inequality of poverty gap ratios is essentially constant, poverty intensity can be approximated as the product of the poverty rate and the average poverty gap ratio.

An earlier version of this paper used Statistic Canada's low-income cutoffs (LICOs) as an indicator of poverty. Because of problems with consistency in the series over time (particularly before 1980) with the use of different base years, we have now adopted the Low Income Measure (LIM), defined as the proportion of the population with income below one half the median adjusted income.[27] This is consistent with the methodology of most international studies of poverty. In contrast, the LICO is a uniquely Canadian methodology, which includes both absolute and relative components of poverty.

The proportion of Canadians living below the LIM has been relatively stable over time, rising from 14.5 per cent in 1971 to a peak of 17.0 per cent in 1977, then falling to 15.1 per centin 1985 (see Table A18). Since then it has shown extremely little annual variation, remaining in the 14.2-15.1 range.

The poverty gap is defined as the gap between the average income of those below the poverty line or LIM cutoff and the cutoff. The poverty gap ratio is this gap divided by the LIM cutoff (one half median income). This ratio also has *been relatively* stable over time, falling from 35 per cent in 1971 to 32 per cent in 1997, a 8.6 per cent decline.

The overall intensity of poverty is *approximately equal to* the product of the poverty rate

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[26] Since there is no data available on inequality and poverty within families, we have no option but to follow the standard pattern of assuming that equivalent income is equally shared among family members. Sharif and Phipps (1994) have demonstrated that if children do not in fact share equally in household resources, inequality within the family can make a very big difference to perceptions of the level of child poverty – and the same implications would hold for gender inequalities. However, since the issue for this paper is the *trend* of poverty, our conclusions will hold unless there has been a systematic trend over time in the degree of inequality within families (e.g. if senior citizen families, whose share of the poverty population has fallen over time, have systematically different levels of within-family inequality than younger families).

[27] The poverty thresholds or levels for the LIM and LICO are quite similar. For example, the LIM threshold based on one-half median adjusted family unit income for a family of four in 1996 was $25,304 (1996 dollars). The LICO threshold for a family of four was $27,036 (1996 dollars), based on the unweighted average for the five thresholds based on the population of the community of residence.

and the poverty gap ratio, and registered a 4.8 per cent decline over the 1971-97 period.

The overall index of equality is a weighted average of the indexes of the poverty intensity for all units or households and the Gini coefficient for after-tax income, with the weights 0.75 and 0.25 respectively. The index is multiplied by –1 in order to reflect the convention that increases are desirable. Table 4 shows that equality index increased from -1.0 in 1971 to -0.957 in 1997.

other indicators of inequality

By using measures of aggregate inequality, and aggregate poverty, we implicitly impose the ethical value of anonymity, and count the poverty of any person as being of equal social concern, regardless of their identity or such characteristics as age or gender. Those observers who consider the poverty of a particular group (e.g. women) to be of greater ethical concern, will want to calculate the poverty rate and average poverty gap ratio separately and aggregate them with differential weights. Such observers would also presumably want to use an index of inequality (such as the Theil index) which can be decomposed into between group and within group inequality. This has not been done in the current version of our work, but could be, if demand warranted.

Those who are concerned with norms of equity between groups may in addition wish to consider additional indicators of inequality, such as the earnings gap between men and women. In 1971, the earnings ratio between women and men for full-year, full-time worker was 59.7 per cent (Table A19). By 1995, it had risen 22.4 per cent to 73.1 per cent. Such differentials are reflected in the aggregate Gini index of all incomes, and in the rate and extent of poverty, but only enter our measures of poverty and inequality in so far as they affect those aggregate measures.

2.4 Insecurity

If individuals knew their own economic futures with certainty, their welfare would depend only on their actual incomes over their lifetimes, since there would be no reason to feel anxiety about the future. However, uncertainty about the future will decrease the economic welfare of risk averse individuals. Individuals can try to avoid risk through social and private insurance, but such mechanisms do not completely eliminate economic anxieties. Given the value Canadians place on economic security, insecurity reduces economic well-being.

Although public opinion polling can reveal that many Canadians feel themselves to be economically insecure, and that such insecurity decreases their subjective state of well-being, the concept of economic insecurity is rarely discussed in academic economics.[28] Consequently, there is no generally agreed definition of economic insecurity. Osberg (1998) has argued that economic insecurity is, in a general sense, "the anxiety produced by a lack of economic safety – i.e. by an inability to obtain protection against subjectively

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[28] To be precise, in the ECONLIT database from 1969 to December 1997, there are nine matches to the term "economic insecurity". A search of the Social Sciences Index from 1983, and the PAIS International and PAIS Periodicals/Publisher Index from 1972, yielded eleven matches. The Social Sciences Citation Index for the years 1987-1997 was similarly unproductive.

significant potential economic losses." In this sense, individuals' perceptions of insecurity are inherently forward looking, the resultant of their expectations of the future and their current economic context – hence only imperfectly captured by measures such as the ex post variability of income flows.[29] Ideally, one would measure trends in economic security with data which included the percentage of Canadians who have credible guarantees of employment continuity and the adequacy of personal savings to support consumption during illness or unemployment. However, such data is not available (the last survey of asset holdings in Canada took place in 1983/84).For these reasons, rather than attempt an overall measure of economic insecurity, this paper adopts a "named risks" approach, and addresses the change over time in four key economic risks.

Fifty years ago, the United Nations' Universal Declaration of Human Rights declared:

> *Everyone has the right to a standard of living adequate for the health and well-being of himself and of his family, including food, clothing, housing and medical care and necessary social services, and the right to security in the event of unemployment, sickness, disability, widowhood, old age or other loss of livelihood in circumstances beyond his control.* [Article 25][30]

For this paper, we construct measures of the percentage change over time in the economic risks associated with unemployment, illness, "widowhood" (or single female parenthood) and old age. In each case, we model the risk of an economic loss associated with the event as a conditional probability, which can itself be represented as the product of a number of underlying probabilities. We weight the prevalence of the underlying risk by the proportion of the population which it affects. The core hypothesis underlying the measure of economic insecurity proposed here is that changes in the subjective level of anxiety about a lack of economic safety are proportionate to changes in objective risk.

2.4.1 – Unemployment

The economic risk associated with unemployment can be modelled as the product of the risk of unemployment in the population and the extent to which people are protected from the income risks of unemployment. We have taken as a proxy for the risk of unemployment the employment rate (employment/population ratio).[31] Changes in this ratio reflect changes in the

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[29] For example, a tenured professor with occasional consulting income may have a variable income stream, but feel little insecurity – and data only on individuals' income streams cannot reveal who had a long term employment guarantee (like tenure), and who sweated out a series of short term contract renewals..

[30] In the 1990s, the gender specificity of the language of 1948 will strike many people as odd – but Article 2 makes it clear that all Articles of the Universal Declaration of Human Rights are to be guaranteed to male and female persons equally.

[31] Readers who are familiar with our earlier papers will note that we have changed our measure of unemployment insecurity. In this paper, we essentially model "security" – we start from the employment/population ratio, the percentage of the unemployed who get benefits and the percentage of average earnings replaced. This is akin to looking at the glass as if it is "three quarters full", with the significant implication that a given absolute change in joblessness will have a smaller proportionate impact on the employment/population ratio. As a consequence, this paper shows a distinctly less sharp decline in security in the 1990s than our previous work. In our earlier papers, we emphasized "insecurity", and

unemployment rate and changes in the participation rate (both cyclical and structural). The extent to which people have been protected by UI from the financial impacts of unemployment can be modelled as the product of: 1) the percentage of the unemployed who claim regular UI benefits (which has declined precipitously in recent years – from 83 per cent in 1990 to under 42 per cent in 1997) and 2) the percentage of average weekly wages replaced by UI.

The index of security from unemployment has shown considerable variation over the 1971-97 period (see Table 5). It doubled in the early 1970 with the increased generosity of UI. In the 1990s it has fallen by more than half due to the falling employment rate, reflecting higher unemployment and the falling participation rate, and cuts to the UI/EI program in both coverage and benefit levels.[32]

2.4.2 – Illness

Viewed from a longer term perspective, the economic insecurities associated with illness in Canada certainly dropped considerably with the introduction of Medicare in the late 1960s. Since our other data series are often difficult to obtain prior to 1971, the period covered by the present study is 1971 to 1997, which therefore unfortunately largely omits the improvement in economic well-being that Medicare represented. Nevertheless, it is still of interest to examine how the economic insecurities associated with illness have evolved over the last quarter century.

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constructed a measure based on the percentage of the unemployed that do not get benefits, the percentage of the labour force unemployed, the percentage of average wages not replaced by UI/EI, etc. This change in the "framing" of unemployment and insecurity can be criticized, on the grounds that anxiety is driven by changes in the probability of danger, rather than by the converse probability of safety (e.g. safety boards normally think of changes in the probability of an airplane crash, rather than the probability of safe arrival). We have changed to a focus on "employment" because the increased proportion of two earner households may have reduced insecurity by decreasing the probability that a household will lose all employment income due to unemployment. However, it is also true that households may depend on having two pay cheques to meet family needs, such as mortgage obligations – see Fortin (1995).

[32] For discussion of this issue, see HDRC (1998).

Table 5: Risk imposed by unemployment, Canada

Year	Employment rate	% of the unemployed receiving reg.benefits	Average weekly benefits/ average weekly earnings (%)	ER Index	UR Index	UI coverage	multi-plicative Index
	A	B	C	D= index of A	E=Index of B	F=Index of D	G=D*E*F
1971	54.5	73.71	31.25	1.0000	1.0000	1.0000	1.0000
1972	54.9	94.93	45.27	1.0073	1.2878	1.4486	1.8792
1973	56.4	107.40	46.64	1.0349	1.4570	1.4925	2.2504
1974	57.3	110.88	45.98	1.0514	1.5042	1.4714	2.3269
1975	56.9	98.03	45.51	1.0440	1.3299	1.4563	2.0220
1976	57.1	83.54	44.53	1.0477	1.1333	1.4250	1.6919
1977	57.0	76.09	44.18	1.0459	1.0322	1.4138	1.5262
1978	57.9	75.44	45.20	1.0624	1.0234	1.4464	1.5726
1979	59.2	70.97	41.19	1.0862	0.9628	1.3181	1.3785
1980	59.7	67.26	41.65	1.0954	0.9124	1.3328	1.3321
1981	60.4	66.61	40.14	1.1083	0.9037	1.2845	1.2864
1982	57.5	75.95	39.69	1.0550	1.0304	1.2701	1.3807
1983	57.1	74.58	40.19	1.0477	1.0118	1.2862	1.3634
1984	57.9	73.71	40.14	1.0624	1.0000	1.2846	1.3647
1985	58.9	74.12	40.96	1.0807	1.0055	1.3108	1.4244
1986	59.9	76.04	42.04	1.0991	1.0316	1.3453	1.5253
1987	60.8	75.61	42.42	1.1156	1.0257	1.3575	1.5533
1988	62.0	82.11	43.20	1.1376	1.1139	1.3825	1.7518
1989	62.4	83.78	43.88	1.1450	1.1366	1.4041	1.8273
1990	61.9	83.07	45.43	1.1358	1.1269	1.4538	1.8609
1991	59.8	77.92	46.17	1.0972	1.0570	1.4776	1.7137
1992	58.4	70.41	46.14	1.0716	0.9551	1.4763	1.5110
1993	58.2	65.45	45.89	1.0679	0.8879	1.4684	1.3922
1994	58.5	58.51	44.31	1.0734	0.7937	1.4179	1.2080
1995	58.6	52.06	44.09	1.0752	0.7062	1.4108	1.0713
1996	58.6	48.37	43.57	1.0752	0.6562	1.3941	0.9836
1997	58.9	42.25	41.74	1.0807	0.5731	1.3357	0.8273

Source: Table A24, Data on employment rate are from Historical Labour force Survey 71F0004XCB.

We would emphasize that we do not attempt to model the psychological insecurities associated with health – just the economic risks. Recent decades have seen both substantial advances in medical technology and increased awareness of health hazards (such as Jakob-Kreutzfeld Syndrome -"mad cow disease") which were previously unimaginable. It is not clear whether subjective anxieties about health have increased or fallen as a result.

 Our objective is only to model the trend in economic anxieties associated with ill health, but at this stage of our research, there is an important omission. The economic risks associated with illness are partly the risk of loss of earnings. Historically, a portion of the Canadian labour force have had some protection against such losses through sick leave provisions in their individual or collective employment contracts. One implication of the trend to short term contract employment and self employment in Canadian labour markets is an increase in the fraction of the population whose incomes ceases totally, in the event of ill health. This paper does not attempt to model such risks.

Instead, we focus on the risk of large out of pocket health care costs.
Health Canada publishes a series on total health expenditures by sector (federal, provincial, municipal, workers' compensation, private). In 1991, net private expenditure was $16,848 million, or 25.4 per cent of total health expenditure. The 1992 Famex shows average household expenditure on health care of $1,035, broken down into $658 for direct costs to household ($233 for medicinal and pharmaceutical products, $138 for eye-care goods and services, and $184 for dental care) and into $378 for health insurance premiums ($174 for private health care plans). We exclude expenditure on private health insurance premiums (since these are in fact a way of avoiding health care cost risk) and express remaining private expenditures on health care (net of health insurance reimbursements) as a percentage of total after-tax personal income.

Private expenditures on health have risen 82.7 per cent from 2.55 per cent in 1971 to 4.66 per cent in 1997, with almost all the relative increase taking place in the 1980s and 1990s. This increase has been caused by a number of factors, including delisting of certain medical services provided in the past by provincial health plans, large increases in drug prices, the aging of the population, supplier-induced increases in patient demand for health services, and medical advances that have produced medical services not previously available.

However, to follow the convention that increases in the sub-components of the index of economic security are improvements, we want an index of "security" and not an index of "insecurity", hence we multiply the risk of illness where increases are negative for economic well-being by –1. A negative sign therefore indicates that an increased negative value represents a decline in well-being (and a decreased negative value an increase in well-being).

Table 6: Canada, Risk imposed by Illness

Year	Medical Care Expenses,% of Disposable income	Index
1971	2.55	-1.000
1972	2.55	-1.000
1973	2.55	-1.000
1974	2.55	-1.000
1975	2.55	-1.000
1976	2.52	-0.988
1977	2.55	-1.000
1978	2.55	-1.000
1979	2.56	-1.004
1980	2.67	-1.047
1981	2.66	-1.043
1982	2.78	-1.090
1983	2.88	-1.129
1984	2.92	-1.145
1985	3.03	-1.188
1986	3.18	-1.247
1987	3.24	-1.271
1988	3.28	-1.286
1989	3.30	-1.294
1990	3.43	-1.345
1991	3.62	-1.420
1992	3.80	-1.490
1993	3.96	-1.553
1994	4.12	-1.616
1995	4.24	-1.663
1996	4.47	-1.753
1997	4.66	-1.829

Note: Data for 1996-1997 were extrapolated on the assumption of constant growth from the 1990 to 1995 period.

2.4.3 – Single Parent Poverty

When the UN Universal Declaration of Human Rights was drafted in 1948, the percentage of single parent families was relatively high, partly as a result of World War II. At that point in time, "widowhood" was the primary way in which women and children lost access to male earnings. Since then, divorce and separation have become the primary origins of single parent families. However, it remains true that many women and children are "one man away from poverty", since the prevalence of poverty among single parent families is extremely high.

To model trends in this aspect of economic insecurity, we multiply (the probability of divorce) * (the poverty rate among single female parent families)[33] * (the average poverty gap ratio among single female parent families)[34]

We stress that in constructing a measure of the economic insecurity associated with single parent status, we are *not* constructing a measure of the social costs of divorce. Economic well being is only part of social well being, and divorce has emotional and social costs (e.g. for the involved children) that are not considered here. Arguably, over time the social costs associated with divorce (e.g. stigma) have changed, as the institution of marriage itself has changed – but such issues lie well beyond the scope of this paper.

Table 7 shows that the divorce rate has more than doubled over the period rising from an annual rate of 0.59 per cent per legally married couple in 1971 to 1.22 per cent in 1997. The poverty rate for households headed by lone-parent females, defined on a LIM basis, rose 10.9 per cent between 1971 and 1997 from 49.5 per cent to 54.9 per cent, while the average poverty gap ratio fell 22 per cent from 41 per cent to 32 per cent. The overall index 81.2 per cent, indicating a major increase in the risk of poverty for households headed by a lone female.

Again, to follow the convention that increases in the sub-components of the index of economic security are improvements, we want an index of "security" and not an index of "insecurity", hence we multiply the risk of single-parenthood where increases are negative for economic well-being by –1. A negative sign therefore indicates that an increased negative value represents a decline in well-being (and a decreased negative value an increase in well-being).

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[33] However, RATE= INCIDENCE x AVERAGE DURATION. Since the poverty rate among single parents is equal to the conditional probability that a single parent will enter poverty and the average duration of a poverty spell, we do implicitly account jointly for the duration of poverty spells and for their likelihood.

[34] This procedure effectively ignores single male parents. While the authors of this paper feel this is an important group, males comprise only about 10 per cent of the single parent population, and their income loss on divorce is considerably less than that of women.

2.4.4 – Old Age

Since income in old age is the result of a lifelong series of events and decisions, which we cannot hope to disentangle in this paper, we model the idea of "insecurity in old age" as the chance that an elderly person will be poor, and the average depth of that poverty.

The elderly poverty rate, defined on a LIM basis, declined from 26.5 per cent in 1971 to 9.6 per cent in 1997 (see Table 8). In contrast, the average poverty gap ratio declined from 25 per cent to 10. Consequently, the overall index of risk of poverty intensity fell 86 per cent between 1971 and 1997.

Again, to follow the convention that increases in the sub-components of the index of economic security are improvements, we want an index of "security" and not an index of "insecurity", hence we multiply the risk of elderly poverty where increases are negative for economic well-being by –1. A negative sign therefore indicates that an increased negative value represents a decline in well-being (and a decreased negative value an increase in well-being).

2.4.5 Overall Index of Economic Security

The four risks discussed above have been aggregated into an index of economic security (Table 9). The aggregation weights are the relative importance of the four groups in the population (Table A20).

·   For unemployment, the proportion of the 15-64 population in the total population (66.8 per cent in 1997).

·   For illness, the proportion of the population at risk of illness, which is 100 per cent.

·   For single parent poverty, the proportion of the population comprised of married women with children under 18 (51.9 per cent in 1997).

·   For old age poverty, the proportion of the population in immediate risk of poverty in old age, defined as the proportion of the 45-64 population in the total population (21.7 per cent in 1997).

The above proportions have been normalized for all years to one (Table A20), giving in 1997 the following weights-unemployment (0.2779), illness (0.4160), single parenthood (0.2158), and old age (0.0904).

Table 7: Canada, Risk imposed of Single Parent Poverty

Year	% of Women and children at Risk of Widowhood	Divorce rate (% of legally married couples) (A)	Poverty rate (%) for single women with children under 18 (B)	Poverty gap/poverty rate or average depth of poverty (C)	Index of A (A')	Index of B (B')	Index of C (C')	Multiplicative index (A'*B'*C')*-1
1971	57.73	0.585	49.5	0.41	1.000	1.000	1.0000	-1.0000
1972	57.50	0.631	49.5	0.41	1.079	1.000	1.0000	-1.0786
1973	57.28	0.706	49.5	0.41	1.207	1.000	1.0000	-1.2068
1974	57.05	0.854	52.8	0.40	1.460	1.066	0.9634	-1.4988
1975	56.83	0.947	56.0	0.38	1.619	1.131	0.9268	-1.6974
1976	56.60	1.001	55.5	0.41	1.711	1.121	0.9878	-1.8951
1977	56.38	1.010	55.0	0.43	1.726	1.111	1.0488	-2.0119
1978	56.15	1.032	54.8	0.45	1.764	1.107	1.0854	-2.1197
1979	55.93	1.064	54.6	0.46	1.819	1.103	1.1220	-2.2509
1980	55.70	1.095	52.7	0.45	1.872	1.065	1.0976	-2.1872
1981	55.48	1.180	50.8	0.44	2.017	1.026	1.0732	-2.2215
1982	55.25	1.215	45.2	0.39	2.077	0.913	0.9512	-1.8040
1983	55.03	1.171	51.0	0.38	2.002	1.030	0.9268	-1.9115
1984	54.80	1.103	56.8	0.37	1.885	1.147	0.9024	-1.9525
1985	54.58	1.040	57.1	0.39	1.778	1.154	0.9512	-1.9507
1986	54.35	1.302	56.1	0.37	2.226	1.133	0.9024	-2.2763
1987	54.13	1.586	55.8	0.38	2.711	1.127	0.9268	-2.8325
1988	53.90	1.367	54.4	0.37	2.337	1.099	0.9024	-2.3175
1989	53.68	1.312	53.7	0.35	2.243	1.085	0.8537	-2.0770
1990	53.45	1.263	59.0	0.36	2.159	1.192	0.8780	-2.2595
1991	53.23	1.235	58.1	0.36	2.111	1.174	0.8780	-2.1757
1992	53.00	1.258	54.7	0.34	2.150	1.105	0.8293	-1.9706
1993	52.78	1.238	53.7	0.31	2.116	1.085	0.7561	-1.7358
1994	52.55	1.246	54.4	0.32	2.130	1.099	0.7805	-1.8269
1995	52.33	1.222	54.9	0.32	2.089	1.109	0.7805	-1.8082
1996	52.10	1.225	54.9	0.32	2.093	1.109	0.7805	-1.8120
1997	51.88	1.225	54.9	0.32	2.093	1.109	0.7805	-1.8120

Nate: Data for 1996, 1997 is assumed to be equal data for 1995.

Table 8: Canada, Risk imposed by Old Age

Year	% 45-64 of pop 18+	Elderly poverty rate (A)	Elderly poverty gap (% of poverty line) (B)	Poverty intensity (C=A*B)	Poverty Intensity *Index, C'*
1971	28.60	26.5	0.25	0.0663	-1.0000
1972	28.41	26.5	0.25	0.0663	-1.0000
1973	28.21	26.5	0.25	0.0663	-1.0000
1974	28.02	32.0	0.27	0.0847	-1.2780
1975	27.82	37.4	0.28	0.1047	-1.5807
1976	27.63	38.1	0.30	0.1122	-1.6943
1977	27.33	38.7	0.31	0.1200	-1.8109
1978	27.03	37.4	0.29	0.1064	-1.6068
1979	26.73	36.0	0.26	0.0936	-1.4128
1980	26.43	33.4	0.24	0.0785	-1.1848
1981	26.13	30.8	0.21	0.0647	-0.9763
1982	25.98	22.8	0.18	0.0410	-0.6195
1983	25.98	21.4	0.18	0.0384	-0.5801
1984	25.78	19.9	0.18	0.0358	-0.5407
1985	25.59	17.5	0.17	0.0298	-0.4491
1986	25.39	18.9	0.16	0.0302	-0.4565
1987	25.46	17.0	0.16	0.0272	-0.4106
1988	25.53	20.4	0.16	0.0326	-0.4927
1989	25.59	19.7	0.14	0.0276	-0.4163
1990	25.66	17.2	0.13	0.0224	-0.3375
1991	25.73	12.7	0.12	0.0152	-0.2300
1992	25.80	11.7	0.12	0.0140	-0.2119
1993	25.87	12.5	0.15	0.0188	-0.2830
1994	25.93	9.9	0.13	0.0129	-0.1943
1995	26.00	9.6	0.10	0.0096	-0.1449
1996	26.07	9.6	0.10	0.0096	-0.1449
1997	26.14	9.6	0.10	0.0096	-0.1449

Note: Data on Poverty rate & Poverty Gap for 1996, 1997 is assumed to be equal data for 1995.
Poverty Intensity = Poverty rate * Poverty gap

Table 9: Index of Economic Security, Canada

Year	Index 1 Unemployed Risk	Index 2 Illness Risk	Index 3 Single Parent Poverty Risk	Index 4 Old Age risk	Weight for Index of WAP (15+ Pop/ All Pop)	Weight for Index of Pop under risk for health	Weight for Index of women in poverty	Weight for Index of Elderly Pop	Weighted Index 1 Unemployment	Weighted Index 2 Health	Weighted Index 3 Women	Weighted Index 4 Old Age	Average Weighted Index
	A	B+2	C+2	D+2	E	F	G	H	I=A*E	J=B*F	K=C*G	L=D*H	M=I+J+K+L
1971	1.0000	1.0000	1.0000	1.0000	0.2635	0.4180	0.2413	0.0772	0.2635	0.4180	0.2413	0.0772	1.0000
1972	1.8792	1.0000	0.9214	1.0000	0.2640	0.4183	0.2405	0.0771	0.4961	0.4183	0.2216	0.0771	1.2132
1973	2.2504	1.0000	0.7932	1.0000	0.2663	0.4173	0.2390	0.0773	0.5994	0.4173	0.1896	0.0773	1.2836
1974	2.3269	1.0000	0.5012	0.7220	0.2690	0.4162	0.2374	0.0774	0.6259	0.4162	0.1190	0.0559	1.2170
1975	2.0220	1.0000	0.3026	0.4193	0.2717	0.4150	0.2359	0.0774	0.5493	0.4150	0.0714	0.0325	1.0682
1976	1.6919	1.0118	0.1049	0.3057	0.2703	0.4162	0.2356	0.0779	0.4572	0.4211	0.0247	0.0238	0.9269
1977	1.5262	1.0000	-0.0119	0.1891	0.2721	0.4157	0.2343	0.0778	0.4153	0.4157	-0.0028	0.0147	0.8429
1978	1.5726	1.0000	-0.1197	0.3932	0.2739	0.4151	0.2331	0.0778	0.4308	0.4151	-0.0279	0.0306	0.8486
1979	1.3785	0.9961	-0.2509	0.5872	0.2757	0.4147	0.2319	0.0776	0.3801	0.4131	-0.0582	0.0456	0.7806
1980	1.3321	0.9529	-0.1872	0.8152	0.2773	0.4146	0.2309	0.0772	0.3694	0.3951	-0.0432	0.0629	0.7842
1981	1.2864	0.9569	-0.2215	1.0237	0.2784	0.4147	0.2301	0.0768	0.3581	0.3969	-0.0510	0.0786	0.7826
1982	1.3807	0.9098	0.1960	1.3805	0.2788	0.4146	0.2291	0.0776	0.3849	0.3772	0.0449	0.1071	0.9141
1983	1.3634	0.8706	0.0885	1.4199	0.2794	0.4147	0.2282	0.0777	0.3809	0.3610	0.0202	0.1104	0.8725
1984	1.3647	0.8549	0.0475	1.4593	0.2798	0.4149	0.2274	0.0780	0.3819	0.3547	0.0108	0.1138	0.8611
1985	1.4244	0.8118	0.0493	1.5509	0.2802	0.4153	0.2266	0.0779	0.3991	0.3371	0.0112	0.1208	0.8682
1986	1.5253	0.7529	-0.2763	1.5435	0.2804	0.4157	0.2259	0.0779	0.4277	0.3130	-0.0624	0.1203	0.7986
1987	1.5533	0.7294	-0.8325	1.5894	0.2801	0.4168	0.2256	0.0775	0.4351	0.3040	-0.1878	0.1232	0.6745
1988	1.7518	0.7137	-0.3175	1.5073	0.2796	0.4175	0.2250	0.0779	0.4899	0.2980	-0.0715	0.1174	0.8337
1989	1.8273	0.7059	-0.0770	1.5837	0.2786	0.4187	0.2247	0.0780	0.5091	0.2955	-0.0173	0.1236	0.9109
1990	1.8609	0.6549	-0.2595	1.6625	0.2782	0.4193	0.2241	0.0784	0.5177	0.2746	-0.0582	0.1304	0.8645
1991	1.7137	0.5804	-0.1757	1.7700	0.2784	0.4193	0.2232	0.0791	0.4771	0.2434	-0.0392	0.1400	0.8212
1992	1.5110	0.5098	0.0294	1.7881	0.2779	0.4181	0.2216	0.0825	0.4199	0.2131	0.0065	0.1475	0.7870
1993	1.3922	0.4471	0.2642	1.7170	0.2782	0.4176	0.2204	0.0838	0.3873	0.1867	0.0582	0.1439	0.7761
1994	1.2080	0.3843	0.1731	1.8057	0.2781	0.4170	0.2192	0.0857	0.3360	0.1603	0.0379	0.1547	0.6889
1995	1.0713	0.3373	0.1918	1.8551	0.2778	0.4168	0.2181	0.0872	0.2976	0.1406	0.0418	0.1618	0.6419
1996	0.9836	0.2471	0.1880	1.8551	0.2778	0.4165	0.2170	0.0888	0.2732	0.1029	0.0408	0.1647	0.5817
1997	0.8273	0.1709	0.1880	1.8551	0.2779	0.4160	0.2158	0.0904	0.2299	0.0711	0.0406	0.1676	0.5092

Sources: Tables 5,6,7,8 for indexes, and Table A20 for weights.

In order that the base year for the indexes of all risks of economic security be the same at 1.000 in Table 9, the constant 2 has been added to the indexes of risk of illness, single parenthood, and old age, whose original base was –1.

Based on the above weights, the overall index of economic security declined 49.1 per cent between 1971 and 1997 (see Table 9 and Chart 2). The increased risk from unemployment was the driving force behind this development, both because of a rising unemployment rate and the reduced coverage provided by UI/EI. Increased private expenditure on health and increased risk of single parent poverty due to the doubling of the divorce rate and the increased poverty rate for single mothers also contributed to the rise. Canada's success story from an economic security perspective has been the fall in the poverty rate of the elderly – which has meant that those approaching old age have had a lower risk of indigence in old age to worry about.

2.4.6 - Other aspects of insecurity

unanticipated inflation

Anticipated inflation does not create "insecurity" since inflationary expectations become embedded in interest rates, which are known to both borrower and lender. Unanticipated inflation, however, causes unanticipated changes in the real value of money assets and liabilities and an unanticipated redistribution of real income. Since individuals worry about the possibility of such losses and gains, unanticipated inflation can also contribute to economic insecurity.[35]

The absolute value of unanticipated inflation (actual-expected inflation) dropped from an average of 1.49 per cent in 1975-84 to 0.73 per cent in 1985-95 (Table A21). At this time, no estimates of the costs of unanticipated inflation made been incorporated in the index.[36]
However, given the relatively small absolute change in inflation uncertainty, we expect the influence of this variable to be small.

personal security indicators

Freedom from economic catastrophe constitutes an element of economic security. Such catastrophes include crime, auto accidents and work accidents, which can cripple the ability of those affected to earn a living. The incidence of crime reported to police in Canada has increased

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[35] A related issue is the belief by some that low inflation contributes more to economic well-being and economic security that moderate inflation because low inflation is associated with less price variability. But a recent Bank of Canada paper (Ragan, 1998) concludes "… the current state of economic research-both empirical and theoretical-provides little basis for believing in significant observable benefits of low inflation such as an increase in the growth rate of real GDP. Moreover, what observable benefits do exist are unlikely to justify a policy of disinflation, even if the transitional costs of disinflation are quite moderate."

[36] To calculate the unanticipated component of inflation, one must specify a model of inflationary expectations. Since several such models exist and their virtues are arguable. In the future, we plan to adopt the simpler strategy of using the Iscan and Xu (1998) estimates of the variability of inflation as a proxy for unanticipated inflation. Since only the money denominated portions of personal wealth are exposed to inflation risk, we will multiply the year to year percentage change in inflation variability by the percentage of bonds in national balance sheet assets, weighted by the percentage of the population holding such assets.

significantly in recent years. The incidence of violent crime doubled from 491 incidents per 100,000 population in 1971 to 995 in 1995 (Table A22). The incidence of property crime rose 44.0 per cent from 3,638 incidents per 100,000 in 1971 to 5,237 in 1995.

In contrast to rising crime trends, the probability of being killed in an auto accident or on the job has fallen. In 1971, 25.3 persons per 100,000 were killed in auto accidents (Table A23). By 1996, this had fallen 59.3 per cent to 10.3 per 100,000. The probability of being injured in an auto accident also fell, but only by 11.8 per cent. The probability of being killed or injured on the job has also declined, in part because of the employment shift to less dangerous service industries.

The Canadian Council for Social Development is currently developing a personal security index, which may be useful as a sub-component of the economic security component of the index of economic well-being.

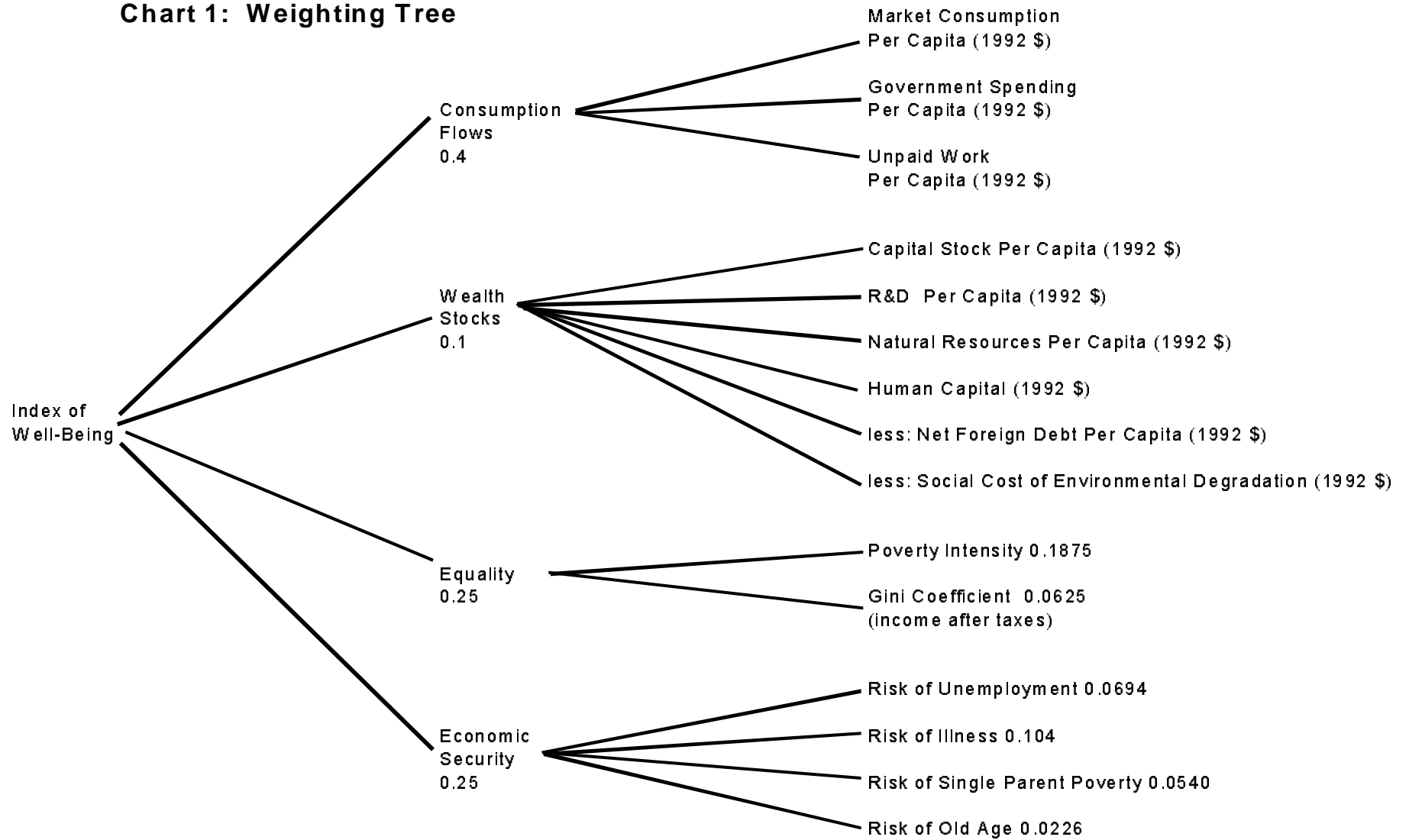## 3. Estimates of the Overall Index of Economic Well-being for Canada

3.1 Weighting of components

Trends in the index are determined by the choice of variables that are included in the index, the trends in those variables and the weights given these variables. Since the four main dimensions of average consumption, bequest, inequality/poverty and insecurity are separately identified, it is easy to conduct sensitivity analyses of the impact on perceived overall trends of different weighting of these dimensions. For discussion purposes, consumption flows have been given a weight of 0.4, wealth stocks a weight of 0.1, and equality and economic security have each been given weights of 0.25.

As the sub-components of the consumption flows and wealth stocks are expressed in dollars, there is no need for explicit weighting. Their dollar values represent implicit weights. In terms of the inequality/poverty subcomponents, a Rawlsian perspective assigns greater importance to poverty than to overall inequality trends, and a weight of 0.1877 or (=0.25*0.75) has therefore been given poverty intensity and 0.0625 (=0.25*0.25) to the Gini coefficient. In other words, poverty is given three times the weight of inequality. The subcomponents of the economic security index are weighted by the relative importance of the specific population at risk. In the total population.

The weighting of components and subcomponents of the economic well-being index are shown below and in Chart 1.

Chart 1: Weighting Tree

Consumption Flows 0.4
- Market Consumption Per Capita (1992 $)
- Government Spending Per Capita (1992 $)
- Unpaid Work Per Capita (1992 $)

Wealth Stocks 0.1
- Capital Stock Per Capita (1992 $)
- R&D Per Capita (1992 $)
- Natural Resources Per Capita (1992 $)
- Human Capital (1992 $)
- less: Net Foreign Debt Per Capita (1992 $)
- less: Social Cost of Environmental Degradation (1992 $)

Equality 0.25
- Poverty Intensity 0.1875
- Gini Coefficient 0.0625 (income after taxes)

Economic Security 0.25
- Risk of Unemployment 0.0694
- Risk of Illness 0.104
- Risk of Single Parent Poverty 0.0540
- Risk of Old Age 0.0226

Index of Well-Being

Table 10: Overall Well being Index, Canada

| Year	Consumption Flows 0.4	Wealth Stocks 0.1	Inequality Measures	Equality Measures 0.25	Economic Security 0.25	Well-being Index
	A	B	C	D=C+2	E	G=0.4*A+0.1*B+0.25*D+0.25*E
1971	1.0000	1.0000	-1.0000	1.0000	1.0000	1.0000
1972	1.0176	1.0020	-0.9966	1.0034	1.2132	1.0614
1973	1.0576	1.0255	-0.9966	1.0034	1.2836	1.0973
1974	1.0956	1.0588	-1.0565	0.9435	1.2170	1.0842
1975	1.1244	1.0826	-1.1218	0.8782	1.0682	1.0446
1976	1.1402	1.0983	-1.1542	0.8458	0.9269	1.0091
1977	1.1601	1.1146	-1.1722	0.8278	0.8429	0.9932
1978	1.1786	1.1302	-1.1398	0.8602	0.8486	1.0117
1979	1.1949	1.1931	-1.0966	0.9034	0.7806	1.0183
1980	1.2122	1.2605	-1.0464	0.9536	0.7842	1.0454
1981	1.2137	1.2207	-0.9912	1.0088	0.7826	1.0554
1982	1.1925	1.2255	-0.9791	1.0209	0.9141	1.0833
1983	1.2022	1.2495	-1.0138	0.9862	0.8725	1.0705
1984	1.2194	1.2552	-1.0395	0.9605	0.8611	1.0687
1985	1.2520	1.2403	-0.9764	1.0236	0.8682	1.0978
1986	1.2619	1.1843	-0.9452	1.0548	0.7986	1.0865
1987	1.2879	1.2129	-0.9250	1.0750	0.6745	1.0738
1988	1.3217	1.2400	-0.9022	1.0978	0.8337	1.1356
1989	1.3412	1.2556	-0.8865	1.1135	0.9109	1.1681
1990	1.3476	1.3010	-0.9406	1.0594	0.8645	1.1501
1991	1.3323	1.2773	-0.9392	1.0608	0.8212	1.1312
1992	1.3334	1.2699	-0.9385	1.0615	0.7870	1.1225
1993	1.3333	1.2712	-0.9271	1.0729	0.7761	1.1227
1994	1.3382	1.2912	-0.9107	1.0893	0.6889	1.1090
1995	1.3389	1.3125	-0.9534	1.0466	0.6419	1.0889
1996	1.3442	1.3275	-0.9567	1.0433	0.5817	1.0767
1997	1.3672	1.3428	-0.9567	1.0433	0.5092	1.0693

Sources: Tables 2,3,4,9

Table 11: Canada, Comparison of Index of Economic Well-Being to GDP per capita, MEW, GPI, and ISH Indexes

Year	Economic Well-Being Index	Sustainable MEW Index	GPI Index	ISH Index	GDP mil 1992$	Population thous.	Gdp per Capita 1992$	GDP per Capita Index
1971	1.000	1.000	1.000	1.000	370859	21,780	17,028	1.0000
1972	1.061	0.877	0.985	1.190	390702	22,253	17,557	1.0311
1973	1.097	0.934	0.990	1.167	418797	22,521	18,596	1.0921
1974	1.084	0.833	1.045	1.381	436151	22,839	19,097	1.1215
1975	1.045	0.995	1.070	1.381	445813	23,169	19,242	1.1300
1976	1.009	1.131	1.091	1.524	470291	23,482	20,028	1.1762
1977	0.993	0.991	1.036	1.548	486562	23,764	20,475	1.2024
1978	1.012	0.833	1.104	1.548	506413	24,008	21,093	1.2387
1979	1.018	1.042	1.071	1.667	527703	24,245	21,765	1.2782
1980	1.045	1.067	1.130	1.643	535007	24,548	21,794	1.2799
1981	1.055	1.096	1.251	1.548	551305	24,864	22,172	1.3021
1982	1.083	0.947	1.233	1.357	535113	25,167	21,262	1.2487
1983	1.070	1.298	1.179	1.286	549843	25,425	21,626	1.2700
1984	1.069	1.141	1.037	1.310	581038	25,671	22,634	1.3292
1985	1.098	1.029	0.968	1.333	612416	25,912	23,634	1.3880
1986	1.087	1.072	1.109	1.310	628575	26,171	24,018	1.4105
1987	1.074	1.154	1.125	1.333	654360	26,503	24,691	1.4500
1988	1.136	1.108	1.179	1.381	686176	26,856	25,550	1.5005
1989	1.168	1.072	1.158	1.381	703577	27,318	25,755	1.5125
1990	1.150	1.006	1.151	1.310	705464	27,733	25,438	1.4939
1991	1.131	1.215	1.197	1.071	692247	28,086	24,648	1.4475
1992	1.122	1.200	1.085	1.214	698544	28,481	24,526	1.4404
1993	1.123	1.145	1.041	1.190	716123	28,858	24,815	1.4573
1994	1.109	1.233	1.117	1.167	744220	29,220	25,470	1.4958
1995	1.089	1.231		1.143	760309	29,574	25,709	1.5098
1996	1.077				769730	29,918	25,728	1.5110
1997	1.069				798183	30,241	26,394	1.5501

Chart 2: Total Economic Well Being Index
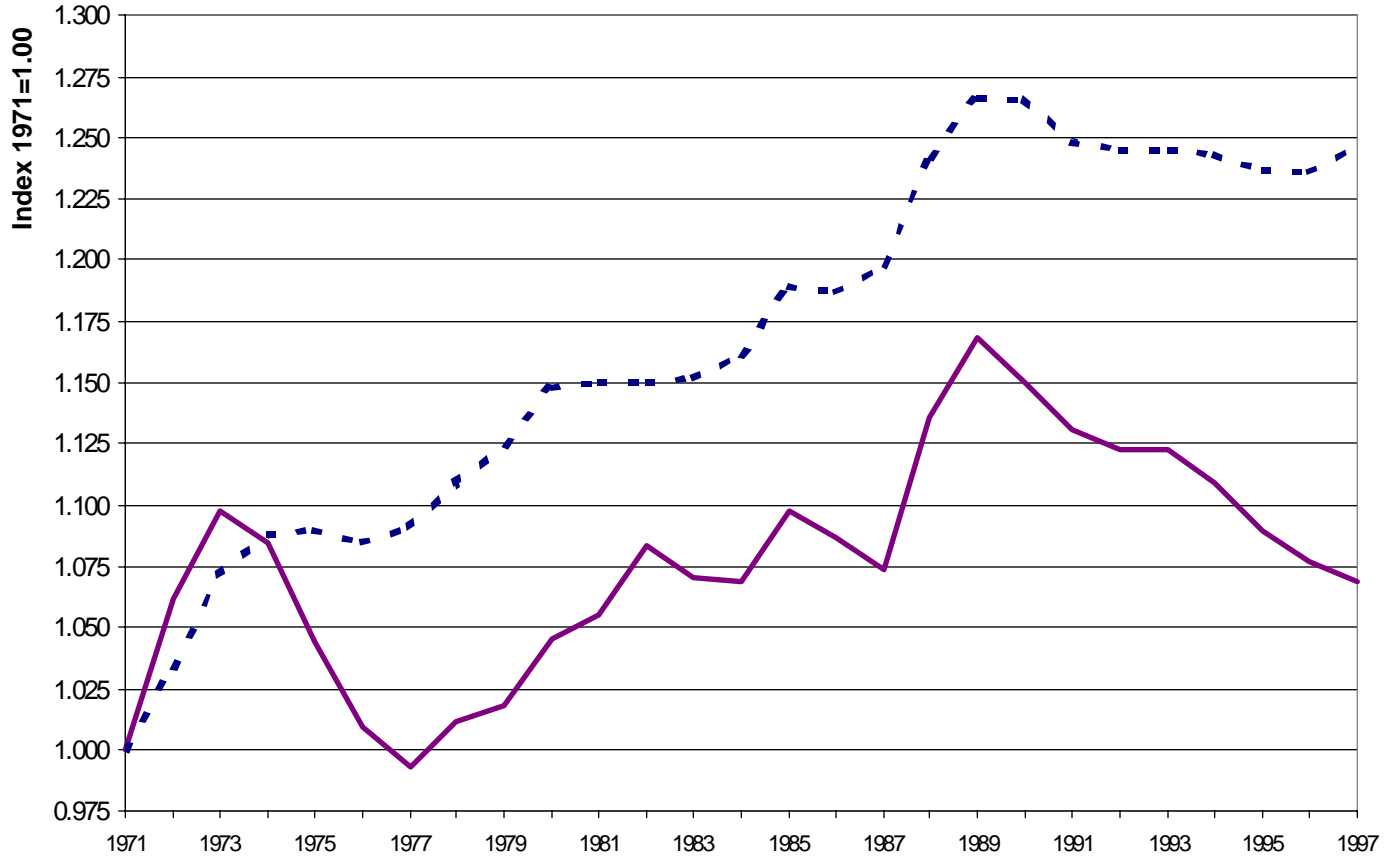
Well Being Index =0.4*Consumption+0.1*Wealth+025*Inequality+0.25*Security

Well Being Index =0.7*Consumption+0.1*Wealth+0.1*Inequality+0.1*Security

Weighting of the Index of Economic Well-being
(weights of total index in brackets)

<u>Basic Component</u>   <u>Sub-components</u>

Consumption Flows (0.40)   real total consumption (dollars per capita)
real per capita current government spending
excluding debt charges (dollars)
real current government spending on goods and
services excluding debt service (dollars per capita)
real value of unpaid labour (dollars per capita)

Stocks of Wealth (0.10)   real capital stock (including housing)
(dollars per capita)
real R&D stock (dollars per capita)
real stock of natural resources (dollars per capita)
real human capital stock (dollars per capita)
real net foreign debt (dollars per capita)
real social cost of environmental degradation
(CO2 emissions) (dollars per capita)

Equality (0.25)   LIM poverty intensity (0.1875)
After-tax income Gini coefficient (0.0625)

Security[37] (0.25)   risk of unemployment (0.0694)
risk of illness (0.1040)
risk of single parenthood (0.0540)
risk of old age (0.0226)

   The formula for the overall index follows:

IEWB= (0.4)[C+G+UP]+ (0.1)[K+ R&D+NR+HC-D-ED]+[(0.1875 (LIM)+(0.0625)Gini]+
[(0.0694)UR+(0.1040)ILL+(0.0540)SP+ (0.0226)OLD]

where

IEWB= index of economic well-being

C= real per capita adjusted personal consumption

G= real per capita current government spending excluding debt charges

UP= real value of per capita unpaid labour

K= real per capita capital stock (including housing)

R&D= real per capita stock of research and development

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[37]The weights are for 1997. The actual weights used vary by year.

NR= real per capita stock of natural resource wealth

HC= real per capita stock of human capital

D= real per capita net foreign debt

ED= real per capita social costs of environmental degradation (CO2 emissions)

LIM= poverty intensity

Gini= Gini coefficient for after tax income

UR= risk of unemployment

ILL= risk of illness

SP= risk of single parenthood

OLD= risk of old age

Table 10 shows the indexes for all four components of the index of economic well-being and the overall index. To put all the sub-components to a common base of 1, the constant 2 has been added to the index of inequality (Table 4) to covert it to an index where an increase corresponds to a rise in economic well-being.

3.2 Trends in the overall index of economic well-being

The overall index of economic well-being for Canada showed no overall trend in the 1970s, rose in the 1980s to a peak on 1.168 in 1989 (1971=1.00), and has fallen continually in the 1990s, reaching 1.069 in 1997 (Actual data for a number of series for 1997 are not yet available and estimates have been used. For this reason, the index for 1997 is preliminary and subject to revision).

Some of the year-to-year movement in the index reflects the sensitivity to the business cycle by certain components of the index. For example, consumption flows depend on personal income, which is determined largely by demand-driven employment levels. Wealth stocks include the capital stock which is determined by cyclically-sensitive investment, and the value of natural resources, which reflects cyclical commodity prices. The two inequality measures (poverty intensity and Gini coefficients) are influenced by the state of the economy (Sharpe and Zyblock, 1997). Finally, a number of the components of the economic security index are also very sensitive to the business cycle, such as the employment population ratio.

Trends in the index are, not surprisingly, very sensitive to the weighting given the four components. As mentioned earlier, for discussion purposes our preferred weighting is the following: consumption 0.4, stocks of wealth 0.1, equality 0.25, and security 0.25. Chart 2 shows trends in the index with consumption flows given a much greater weight (0.7) and the other three components each with weights of 0.1. This index exhibits a different pattern during certain periods. While the two indexes tracked each other in the early years of the 1970s, they diverged in mid-decade, with the index with the higher consumption weight

stable and the index with the lower weight declining. From the late 1970s to the late 1980s, the indexes again tracked one another. Then it the 1990s, they diverged again, with the high-consumption-weighted index falling slightly and the high-equality and security-weighted index falling much more.

Table 12: Trends in Components of the Economic Well-being Index for Canada, 1971-97 (per cent change)

	1971-97	1971-80	1980-1989	1989-1997
Overall Index (1.0)	6.9	4.5	11.7	-8.5
Consumption Flows (0.4)	36.7	21.2	10.6	1.9
Wealth Stocks (0.1)	34.3	26.1	-0.4	6.9
Inequality (0.25)	4.3	-4.6	16.8	-6.3
Economic Security (0.25)	-49.1	-21.6	16.2	-44.1

Source: Table 10

Table 12 and Chart 3 provide a breakdown of the changes in the four components of the index over the 1971-97 period and in the 1970s, 1980s, and 1990s. Over the 26 year period covered by the time series, the economic security component experienced the largest change of any of the four components of the index, down 49.1 per cent. This change reflected the large increase in the risk of illness and of single-parenthood (Table 9). There were improvements in all the other components of well-being, with consumption up 36.7 per cent, wealth stocks up 34.3 per cent and equality up 4.3 per cent.

The absolute decline in the index in the 1990s reflects fall in the indexes for consumption, equality, and security. The latter index fell 44.1 per cent due to large increases in the risks associated with unemployment and illness (Table 9).
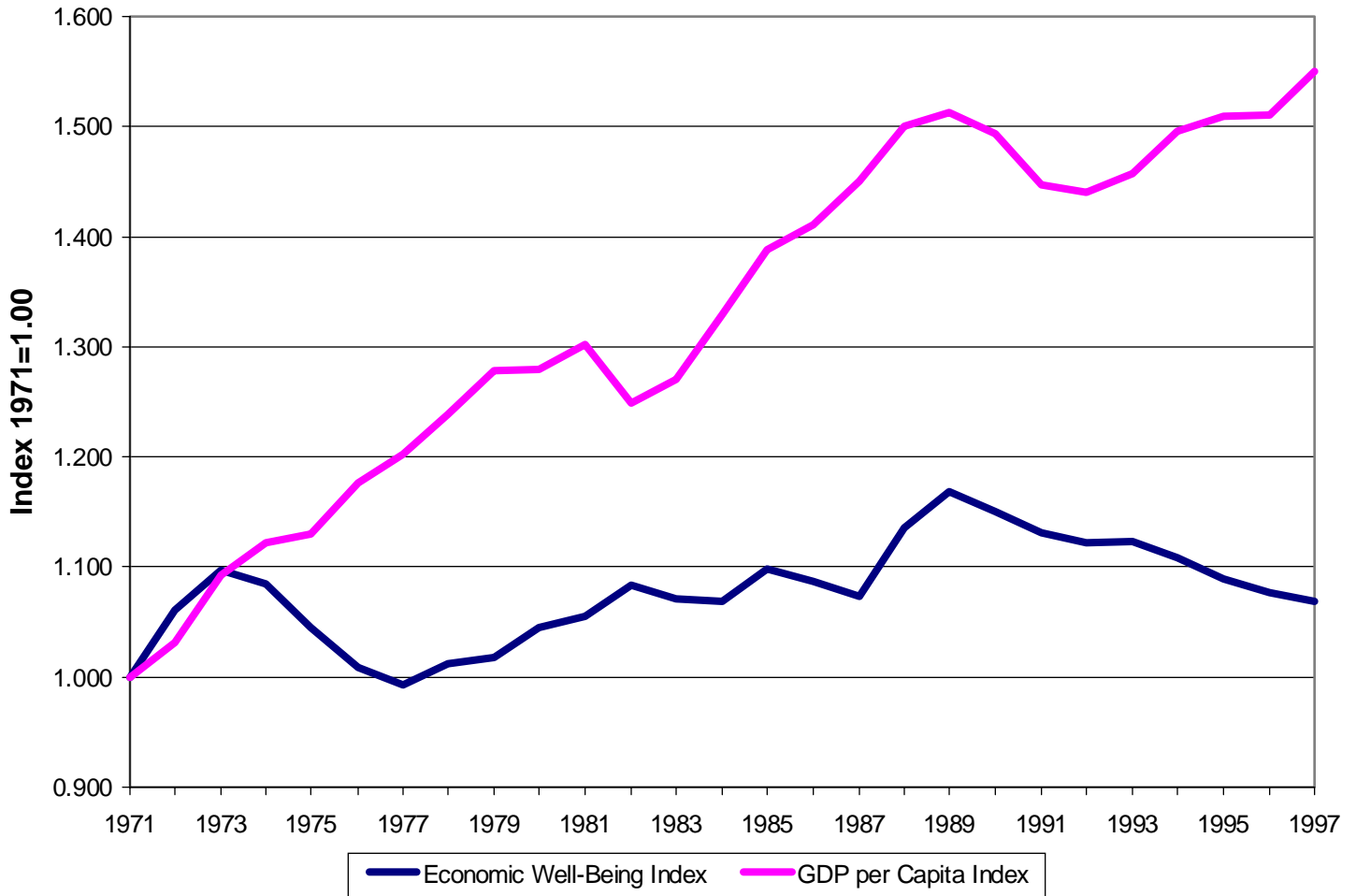
3.3 Comparisons of trends in the index of economic well-being with other indexes of well-being

Table 11 and Chart 4 show that the index of economic well-being tracked real GDP per capita in the first half of the 1970s, and then fell behind, with the gap growing greatly over time. By 1989, the GDP per capita index had reached 158.8, compared to 116.8 for the index of economic well-being, indicating growth of this conventional measure of economic welfare had been more than three times as fast as the index of economic well-being over the 1971-89 period (2.8 per cent per year versus 0.9 per cent). In the 1990s, GDP per capita fell, but by 1997 had regained its 1989 pre-recession level. The index of economic well-being has also fallen in the 1990s, but in contrast to GDP per capita has not rebounded and in 1997 was 8.6 per cent below the 1989 peak. Overall the 1971-97 period, real per capita GDP was up 58.3 per cent, nearly 10 times the rate of advance of the index of economic well-being (6.7 per cent).

The divergence between growth in GDP per capita and the economic well-being index since 1971 is partly explained by slower growth in per capita consumption and stocks of wealth, but more importantly by the failure of economic equality to increase and the large fall in economic security.

Chart 3: Total Economic Well Being Index and Components
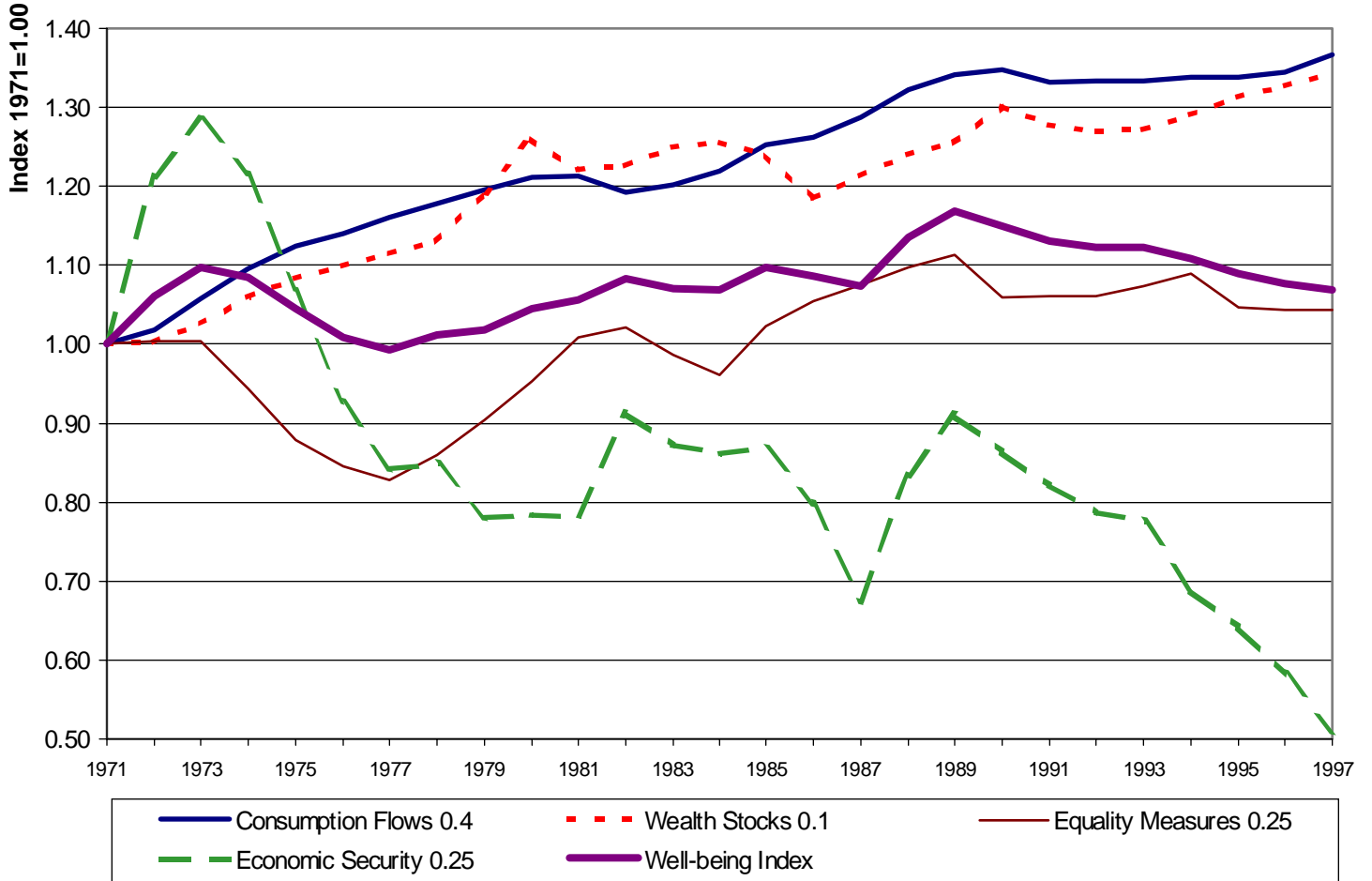
Chart 4: Trends in Economic Well-Being & GDP Per Capita Indexes

Index 1971=1.00

— Economic Well-Being Index   — GDP per Capita Index

Chart 5: Trends in Economic Well-Being, Sustainable MEW, GPI, and ISH Indexes
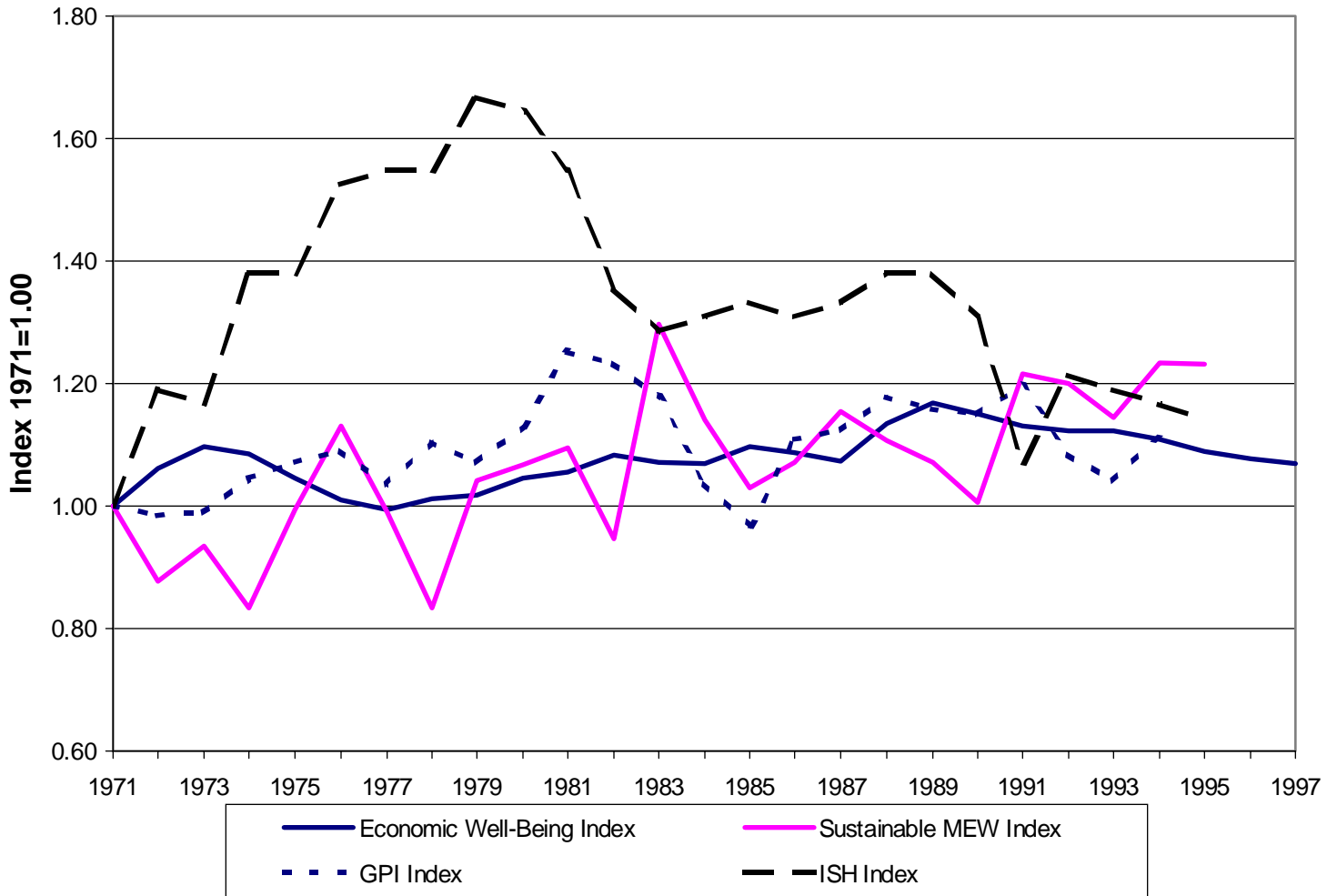
Table 11 and Chart 5 compare the trend in the index of economic well-being with that of the Genuine Progress Indicator (GPI) and the Measure of Economic Welfare (MEW), both of which Statistics Canada has estimated for Canada (Messinger, 1997), and the Index of Social Health (ISH), which Human Resources Development Canada has recently estimated for Canada and the provinces (Brink and Zeesman, 1997). The data upon which both the GPI, MEW and ISH are based are given in Tables A24-26.

Between 1971 and 1995 (the most recent year for which data are available) the GPI increased 11.7 per cent the sustainable MEW 23.1 per cent, and the ISH 14.3 per cent.[38] Thus the 8.9 per cent increase in the index of economic well-being between 1971 and 1995 represented a smaller increase than that experienced by other three alternative indicators.

4. Directions for Future Research

There are a number of priorities for future development. For consumption flows, priorities include the inclusion of data on changes in the amount of leisure time (either an index or an adjustment to consumption); better data on the valuation of increased life expectancy (either index or adjustment to consumption); and more data on regrettables such as commuting and crime-prevention expenditure (adjustment to consumption).

For stocks of wealth, priorities include the inclusion of the stock of consumer durables or a household facility index; indexes of environmental quality and sustainability; better data on the stock of human capital; and data on the stock of social capital.

For the economic insecurity component, priorities for revision are the incidence of crime; and the insecurity created by unanticipated inflation (actual minus moving average of past inflation).

5. Conclusion

This paper has developed an index of economic well-being based on four dimensions or components of economic well-being, with the weight given each component in brackets-consumption flows (0.4), stocks of wealth including physical capital and natural resources (0.1), equality (0.25), and economic security (0.25). Estimates for the index for Canada for the 1971-97 period are given.

We argue that providing explicit weights of these components of well-being is important in enabling other observers to assess whether, by their values of what is important in economic well-being, they would agree with this assessment of trends in the Canadian economy.

A key finding is the economic well-being of Canadians, at least as measured by the index constructed in this paper, has increased at a much slower rate over the last 25 years than real GDP per capita, a widely-used indicator of economic well-being. This result is consistent with the trend observed in other indexes of social and economic well-being such as the Genuine Progress Indicator and the Index of Social Health. The index also shows a large (10 per cent absolute deterioration of economic well-being in Canada in the 1990s.

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[38] Both the GPI and the MEW are expressed in dollars. In 1971, the GPI was $8,018 per capita (1986 dollars) while the MEW was $27,466.

Bibliography

Alonzo, William and Paul Starr, eds. (1987) *The Politics of Numbers* (New York: Russell Sage).

Atkinson, Anthony, Lee Rainwater and Timothy M. Smeeding (1995) *Income Distribution in OECD Countries: Evidence from the Luxembourg Income Study* (Paris:OECD).

Atkinson, Giles, Richard Dubourg, Kirk Hamilton, Mohan Munasinghe, David Pearce, and Carlos Young (1997) *Measuring Sustainable Development: Macroeconomics and the Environment* (Cheltham, UK: Edward Elgar).

Baily, Martin Neil, Gary Burtless, and Robert E. Litan (1993) *Growth with Equity: Economic Policymaking for the Next Century* (Washington, DC: Brookings Institution).

Baumol, William and Wallace Oates (1995) " Long-Run Trends in Environmental Quality," in Julian L. Simon (ed.) *The State of Humanity* (Cambridge, Mass.: Basil Blackwell) pp. 444-475.

Bettman, Otto L. (1974) *The Good Old Days-They Were Terrible!* (New York: Random House).

Bibby, Reginald (1995) *The Bibby Report: Social Trend Canadian Style* (Toronto: Stoddard).

Blanchflower, David G. and Andrew J. Oswald (1997) "The Rising Well-Being of the Young," NBER Working Paper No. 6102, July.

Blendon, Robert J., Jihn M. Benson, Mollyann Bridie, Richard Morin, Drew E. Altman, Daniel Gitterman, Mario Brossard, and Matt James (1997) "Bridging the Gap Between the Public's and Economists' Views of the Economy," *Journal of Economic Perspectives*, Volume 11, Number 3, Summer, pp. 105-118.

Boskin, M.J. (chairman), E.R. Dulberger, Z. Griliches, R.J. Gordon, and D. Jorgenson (1996) *Toward A More Accurate Measure of the Cost of Living,* Final Report to the Senate Finance Committee from the Advisory Commission to Study the Consumer Price Index.

Brink, Satya and Allen Zeesman (1997) "Measuring Social Well-Being: An Index of Social Health for Canada", Research Paper R-97-9E, Applied Research Branch, Human Resources Development Canada, June.

Brown, Clair (1994) *American Living Standards, 1918-1988* (Cambridge, Mass.: Blackwell).

Burkhauser, R.V., M. Smeeding, and J. Merz (1996). "Relative Inequality and Poverty in Germany and the United States Using Alternative Equivalence Scales," *The Review of Income and Wealth*, 42, 381-400.

Canadian Council on Social Development (1996) *Measuring Well-being: Proceedings from a Symposium on Social Indicators, Final Report* (Ottawa).

Cobb, Clifford and John B. Cobb, Jr. (1994) *The Green National Product: A Proposed Index of Sustainable Economic Welfare* (Lanham, Maryland: University Press of America).

Cobb, Clifford, Ted Halstead and Jonathan Rowe (1995) "If GDP is Up, Why is America Down?" *The Atlantic Monthly*, October.

Cobb, Clifford, Ted Halstead and Jonathan Rowe (1995) *The Genuine Progress Indicator: Summary of Data and Methodology* (San Francisco:Redefining Progress).

Crabbe, Philippe (1997) "Sustainable Development: Concepts, Measures, Market and Policy Failures at the Open Economy, Industry, and Firm Levels," Occasional Paper Number 16, Industry Canada, October.

Currie, Janet (1995) *Welfare and the Well-Being of Children* (Harwood Academic Publishers).

Daedalus (1994) Special Issue on Health and Wealth, Vol. 124, Number 4, Fall.

Dale, Ann and John B. Robinson, eds. (1996) *Achieving Sustainable Development* (Vancopuver: UBC Press).

Daly, Mary C. and Greg Duncan (1998) "Income Inequality and Mortality Risk in the United States: Is There a Link?" *FRBSF Economic Letter*, Number 98-29, October 2.

Dawson, J. C. ed., (1996) *Flow-of-Funds Analysis* (Armonk/London: M.E. Sharpe).

Eckstein, Z. and I. Zilcha (1994) "The Effects of Compulsory Schooling on Growth, Income Distribution and Welfare", *Journal of Public Economics*, Vol. 54, May, 1994, pp. 339-359.

Eisner, Robert (1989) *The Total Income System of Accounts* (Chicago: University of Chicago Press).

Evans, Robert G., Morris L. Marer and Theodore R. Marmor (1994) *Why Are Some People Healthy and Others Not? The Determinants of Health of Populations* (Hawthorne, NY: Aldine de Gruyter).

Fankhauser, S. (1995) "Evaluating the Social Costs of Greenhouse Gas Emissions," Energy Journal, Vol 15, pp. 157-84.

Fortin, Nicole (1995) "Allocation Inflexibilities, Female Labor Supply and Housing Assets Accumulation: Are Women working to pay the Mortgage," *Journal of Labor Economics* Volume 13, No. 3, pp. 524-557.

Galor, O. and J. Zeira (1993) "Income Distribution and Macroeconomics", *Review of Economic Studies*, January, 1993, Vol. 60, pp. 35-52.

Globe and Mail (1998) "Find it harder to make ends meet? You're not alone," August 4.

Gwartney, James and Robert Lawson (1997) *Economic Freedom of the World: 1997* (Vancouver: The Fraser Institute).

Hamilton, Kirk, (1994) "Green Adjustments to GDP," *Resources Policy*, Volume 20, No. 3, pp. 156-168.

Hardi, Peter and Stephan Barg (1997) "Measuring Sustainable Development: Review of Current Practice," Occasional Paper Number 17, Industry Canada, November.

Hayward, Steve and Laura Jones (1998) *Environmental Indicators for Canada and the United States*, Critical Issues Bulletin, Fraser Institute.

Henderson, D.W. (1974) *Social Indicators: A Rationale and Research Framework*, Economic Council of Canada.

Human Resources Development Canada (1995) "The Social Outlook: The Need for a Human Investment Strategy," May 26.

Human Resources Development Canada (1996) "Measuring Social Well Being: An Index of Social Health for Canada," paper presented at the CSLS session "Beyond GDP" at the annual meeting of the Canadian Economics Association, Memorial University, St. John's, Newfoundland, June 2.

Human Resources Development Canada 91998) "An Analysis of Employment Insurance Benefit Coverage," Working Paper W-98-35E, Applied Research Branch, October.

Jacques, A., F. Neitzert, and P. Boileau (1997) Trends in Canada's Greenhouse Gas Emissions, 1960-1995, Environment Canada, April.

Jencks, Christopher (1987) "The Politics of Income Measurement," in Alonzo, William and Paul Starr, eds. *The Politics of Numbers* (New York: Russell Sage).

Jenkins, S. (1991) "The Measurement of Income Inequality", pp. 3-38 in L. Osberg (Editor), *Economic Inequality and Poverty: International Perspectives*, (M.E. Sharp Inc., Armonk, New York).

Jorgenson, Dale and Barbara Fraumeni (1992) "Output of the Education Sector," in Z. Griliches (ed.) *Output Measurement in the Service Sector*, Studies in Income and Wealth, Volume 56, National Bureau of Economic Research, (Chicago: University of Chicago Press).

Lane, Robert E. (1993) "Does Money Buy Happiness," *The Public Interest*, pp. 56-65.

Lavis, John and Gregory L. Stoddart (1994) "Can We Have Too Much Health Care?" *Daedalus*, Volume 123, Number 4, Fall, pp.43-60.

Levy, Frank (1996) "Is Economic Anxiety Justified?" paper commissioned by the Competitiveness Policy Council, September, www.cais.net/cpc/running.

Litan, Robert, Robert Z. Lawrence, and Charles Schultze (eds.) *American Living Standards: Threats and Challenges* (Washington, DC: Brookings Institute).

Little, Bruce (1998) "Opportunity to under-report income fuels drive to self-employment: study," *The Globe and Mail*, October 7.

Kendrick, J.W. (1976) *The Formation and Stocks of Total Capital* (New York: Columbia University Press).

Kendrick, J.W., ed. (1996) *The New System of National Accounts*, (Boston).

(Boston/Dordrecht/London: Kluwer Academic Publishers).

Keuning, Steven (forthcoming) "A Powerful Link Between Economic Theory and Practice: National Accounting," *The Review of Income and Wealth*.

Kilfoil, M. (1998) "Two Essays Examining the Impact of Standardizing for Differences in Hours Worked on Household Earnings Distributions" PhD Thesis, Department of Economics, Dalhousie University.

Knack, S. and P. Keefer (1997) "Does Social Capital have an Economic Payoff: A Cross-Country Investigation, " *Quarterly Journal Of Economics*, Vol. CXII, November, Issue 4 pp. 1251-1288.

McFate, Katherine, Roger Lawson and William Julius Wilson, eds. (1995) *Poverty, Inequality, and the Future of Social Policy: Western States in the New World Order* (New York: Russell Sage).

Messinger, Hans and Abe Tarasofsky (1997) "Measuring Sustainable Economic Welfare: Looking Beyond GDP", paper presented at the annual meeting of the Canadian Economics Association, St. John's, Newfoundland, June 2-4.

Mishel, Lawrence and Jared Bernstein (1996) "Trouble in Paradise: Eroding Wages and Growing Income Inequality," paper commissioned by the Competitiveness Policy Council, September, www.cais.net/cpc/running

Mishel, Lawrence, Jared Bernstein, and John Schmitt (1997) *The State of Working America, 1996-97*, Economic Policy Institute (Armonk, NY: ME Sharpe).

Moss, Milton (1973) *The Measurement of Economic and Social Performance*, NBER.

National Forum on Family Security (1993) *Family Security in Insecure Times,* Volume I.

National Forum on Family Security (1996) *Family Security in Insecure Times*, Volume II and Volume III.

Nordhaus, William (1996) "Do Real Output and Real Wage Measures Capture Reality/ The History of Light Suggests Not," in Bresnehan, Timothy and R.J. Gordon (1996) eds. *The Economics of New Goods* NBER (Chicago: University of Chicago Press).

OECD (1996) *Measuring What People Know: Human Capital Accouting for the Knowledge Economy* (Paris).

OECD (1998) *Human Capital Investment: An International Comparison*, Centre for International Research and Innovation.

O'Reilly, Brian (1998) *The Benefits of Low Inflation: Taking Stock*, Technical Report No. 83, April, Bank of Canada

Osberg, Lars (1985) "The Measurement of Economic Welfare," in David Laidler (coordinator) *Approaches to Economic Well-Being*, volume 26 of the research program of the Royal Commission of the Economic Union and Development Prospects for Canada (MacDonald Commission) (Toronto: University of Toronto Press).

L. Osberg (1985a) "The Idea of Economic Well-Being" Paper presented at the 19th General Conference of the International Association for Research in Income and Wealth, Noordwijkerhout, Netherlands, August 25-31, mimeo, Dalhousie University, June.

Osberg, Lars, ed. (1991) *Income Distribution in International Perspective* (Armonk:NY, ME Sharpe).

Osberg, Lars (1992) "Sustainable Social Development," in Robert C. Allen and Gideon Rosenbluth (eds.) *False Promises: The Failure of Conservative Economics* (Vancouver: New Star Books).

Osberg, Lars (1997) "Economic Growth, Income Distribution and Economic Welfare in Canada, 1975-1994," *North American Journal of Economics & Finance*, 8(2), pp. 153-199.

Osberg, L. (1998) "Economic Insecurity" mimeo., Department of Economics, Dalhousie University.

Ostry, Sylvia and Mahmood Zaidi (1979) *Labour Economics in Canada*, Third Edition (Toronto: MacMillan).

Picot, Garnett (1996) "Earnings Inequality, Working Time and Wages Among Men and Women," Business and Labour Market Analysis Division, Statistics Canada.

Phipps, S. and T.I. Garner (1994). "Are Equivalence Scales the Same for the United States and Canada?" *The Review of Income and Wealth*, 40, 1-18.

Putnam, Robert D. (1993) *Making Democracy Work: Civic Traditions in Modern Italy* (Princeton , NJ: Princeton University Press).

Ragan, Christopher (1998) "On the Believable Benefits of Low Inflation," Working Paper 98-15, Bank of Canada.

Robinson, John B. (1996) *Life in 2030: Exploring a Sustainable Future for Canada* (Vancouver: UBC Press).

Ross, David, Richard Shillington, and Clarence Lochhead (1994) *The Canadian Fact Book on Poverty* (Ottawa: Canadian Council on Social Development).

Richardson, Sue and Peter Traves (1993) *Living Decently: Material Well-being in Australia* (Melbourne: Oxford University Press).

Sarlo, Christopher (1998) *Canadian Living Standards 1998 Report*, Critical Issues Bulletin, (Vancouver: Fraser Institute).

Sharif, N. & S. Phipps (1994) "The Challenge of Child Poverty: Which Policies Might Help?" *Canadian Business Economics*, Vol. 2, No. 3, Spring 1994, pp. 17-30.

Sharpe, Andrew and Myles Zyblock (1997) "Macroeconomic Performance and Income Distribution in Canada," *North American Journal of Economics & Finance*, Volume 8, Number 2, pp.167-199.

Slottje, Daniel J., Gerald W. Scully, Joseph G. Hirschberg, and Kathy J. Hayes (1991) *Measuring the Quality of Life Across Countries: a Multidimensional Analysis* (Boulder, Col.: Westview Press).

Smith, Phillip (1994) "The Canadian National Accounts Environmental Component: A Status Report," in *National Income ansd Expenditure Accounts, Annual Estimates, 1982-1993*, Cat. 13-201.

Statistics Canada (1994) *The Size of the Underground Economy in Canada*, Cat. No. 13-603.

Statistics Canada (1996) *Environmental Perspectives*, Cat. No. 11-528.

Statistics Canada (1996) *Households' Unpaid Work: Measurement and Valuation*, Cat.. No. 13-603.

Statistics Canada (1997) *Econnections: Linking the Environment and the Economy, Indicators and Detailed Statistics, 1997*, cat 16-200, December.

United Nations (1993) in collaboration with, Eurostat, International Monetary Fund, Organisation for Economic Co-operation and Development, and World Bank, *System of National Accounts 1993*, United Nations, New York. (Series F, No. 2, Rev. 4), 1993.

United Nations Development Program (1997) *Human Development Report: 1997* (New York: Oxford University Press).

Usher, Dan (1980) *The Measurement of Economic Growth* (Oxford: Basil Blackwell).

Vanier Institute of the Family (1994) *Profiling Canada's Families*.

Waring, Marilyn (1988) *Counting for Nothing: What Men Value and What Women Are Worth* (Wellington, New Zealand: Allen and Unwin).

Wilkinson, R.G. (1996) *Unhealthy Societies: The Afflictions of Inequality* (London: Routledge).

Wolfson, Michael (1994a) "Toward a System of Health Statistics," *Daedalus*, Volume 123, Number 4, Fall, pp.181-193.

Wolfson, Michael (1994b) "Implications of Evolutionary Economics for Measurement in the SNA: Towards a System of Social and Economic Statistics," paper prepared for the 23rd General Conference of the International Association for Research in Income and Wealth, St. Andrews, New Brunswick, August 21-27.

Wolfson, Michael (1995) "On Frameworks for Social Policy- the Measurement Perspective," comments for the Roundtable on the CHST, December 4.

Wolfson, Michael (1996) "Health-Adjusted Life Expectancy," *Health Reports*, Summer, Vol. 8, No. 1 Statistics Canada, pp. 41-45.

Woolley, Frances (1998) "Work and Household Transactions," in *How Families Cope and Why Policymakers Need to Know*, CPRN Study No. F02 (Ottawa).

World Bank (1997) *Expanding the Measure of Wealth: Indicators of Environmentally Sustainable Development*, EDS Stuidies and Monographs Series No. 17. (Washington, DC).