



The Index of Economic Well-being: An Overview

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The Index of Economic Well-Being: An Overview

In the fall of 1998 the Centre for the Study of Living Standards (CSLS) introduced a new indicator of sustainable development for Canada (Osberg and Sharpe, 1998), appropriately called the Index of Economic Well-being (IEWB). Since then the CSLS has continued to develop the Index, producing estimates for the United States (Osberg and Sharpe, 1999), the provinces (Osberg and Sharpe, 2000b), OECD countries (Osberg and Sharpe, 2000a) and updated estimates for Canada and the United States (Osberg and Sharpe, 2001).¹ The Index has stimulated much interest among researchers and policy analysts, particularly at the international level.²

The objective of this paper is to provide a comprehensive overview of the Index of Economic Well-being. The paper is divided into three main parts. Part one discusses the motivation and genesis of the project, namely the work of Lars Osberg on the measurement of economic well-being for the MacDonald Commission in the mid-1980s. The second part sets out the four components of the Index and briefly presents estimates of the Index. The third part of the paper discusses a number of the lessons learned from this project that may be relevant to other indicator initiatives. These include data issues (e.g. comparability of data over time and across space, treatment of missing data points); methodology issues involved in the construction of the index (e.g. transformation of trends for variables where a decrease represents an improvement, growth rate versus level comparisons); conceptual issues resolved and unresolved in the construction of the index (e.g. construction of a stock of human capital, treatment of costs of CO₂ emissions, quantification of the social costs of environmental degradation); and the weighting of the four components of the Index.

Background behind the Index

The Index of Economic Well-being originated in a research paper one of us (Lars Osberg) did for the MacDonald Commission in the mid-1980s (Osberg, 1985). This paper was motivated by the belief that commonly used indicators of economic welfare, such as GDP per capita, were not truly capturing trends in economic well-being.

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

¹ The original work on the Index was funded by the Applied Research Branch of Human Resources Development Canada, who published the first estimates for Canada (Osberg and Sharpe, 1998). Subsequent work has not received external funding.

² In addition to the large number of presentations made on the Index to Canadian audiences, the index has been presented at conferences and seminars in England, France (OECD), Spain, the Netherlands, Poland, Hong Kong, and the United States.

resources, or to replace governments; hence the calculation of measures of economic well being is an important issue. However, current measures – such as trends in per capita disposable income - may not necessarily be a good guide to popular perceptions of trends in economic well being.

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. 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. Dissatisfaction with the GDP as a measure has led to a number of proposals for substitute measures (e.g. the Genuine Progress Indicator).

Summarizing the economic well being of a complex society inevitably requires a series of ethical and statistical judgments. There are many different dimensions to well being, which are valued to different degrees by different observers. With a single index number it may be difficult to disentangle the relative importance of value judgments 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.

In our view, the construction of measures of economic well being is 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 judgments and statistical judgments to be separated. Furthermore, excess aggregation offers no guide to policy priorities.

Osberg’s 1985 proposal was 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

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

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 (question 1) from the debate on ends (issue 2) or the discussion of means (item 3).

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, 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.

An Index of Economic Well-being

GDP is a measure of the aggregate marketed income of a society, however “income” is a flow variable that does not directly consider the aggregate value of the bequest this generation will leave to its descendants. Although those 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, trends in average income do not reveal the chances which individuals have to share personally in the prosperity of the average. Individuals are justifiably concerned about where they might sit in the distribution of income, and the degree to which their personal economic future is secure. The four components or dimensions of economic well-being are, therefore:

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

by risk aversion, 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.

- 2.2 net societal accumulation of stocks of productive resources
 - net accumulation of tangible capital, housing stocks and consumer durables, net changes in the value of natural resources stocks; environmental costs, net change in level of foreign indebtedness; accumulation of human capital and R&D investment
- 2.3 income distribution - poverty and inequality,
 - the intensity of poverty (incidence and depth) and the inequality of income;
- 2.4 economic insecurity,
 - economic security from job loss and unemployment, illness, family breakup, poverty in old age;

A fuller discussion of the rationale for this framework of consumption, accumulation, distribution and insecurity can be found in Osberg (1985). We distinguish these four main dimensions of economic well-being to enable persons with differing value judgements (e.g. a greater or lesser 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.

We recognize that the System of National Accounts has, thanks to many years of development effort by international agencies, produced an accounting system for GDP which is rigorously standardized across countries. Internationally comparable statistics on other dimensions of economic well-being are far less complete. However, using GDP per capita as a measure of well-being would implicitly: (1) assume that the aggregate share of income devoted to accumulation (including the value of unpriced environmental assets) is automatically optimal, and (2) set the weight of income distribution or economic insecurity to zero, by ignoring entirely their influence. Neither assumption seems justifiable.

Average Consumption Flows

Current consumption is certainly an important component of economic well being – but a better measure than GDP per capita is required. The objective of this section is to estimate its average effective level, and the reason for discussing our methodology in some detail is to show specifically how GDP can be improved on. Figure 5 presents our final calculation of trends.

The starting point is aggregate real personal consumption per capita in constant prices. 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 that also influence consumption flows,

such as leisure, regrettables, the underground economy⁴ 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 preference (wherever possible) is to include, rather than exclude, imprecise measures. Since omitting a variable would implicitly set its value to zero, an imprecise measure is likely to embody a smaller error than omitting a variable. However, sometimes there is no estimate available at all and omission is sometimes unavoidable.

Life expectancy has increased significantly in recent years North America, and we have every reason to believe that having a long life is an important component of well-being. 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.

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), 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 now alive. In aggregating over the population 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 the Index, 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. However, we do recognize the crudity of this measure of an existential issue.

Data on life expectancy are taken from the OECD Health Data CD-ROM. Between 1971 and 1996, Canada enjoyed 7.9 per cent increased life expectancy and the United States was up 7.0 per cent. Personal consumption per capita is adjusted upward by the increase in life expectancy relative to base.

⁴ Earlier versions of this paper presented estimates of the underground economy, based on benchmark estimates by Statistics Canada, the Bureau of Economic Statistics, and the trend in the share of the self-employed in total employment, on the argument that the self-employed have greater opportunity to hide income than paid workers. 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 by tax authorities. We do not include these estimates in this paper, because they make very little difference to measured output trends. Because the base level of underground activity is a relatively small share of GDP, the trend in a small number is an even smaller fraction of GDP.

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. When comparing the average effective consumption of individuals 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. All western countries have experienced a long-term decline since the 1970s in average family size – in the US, a 13% decline (from 3.67 to 3.18). The “LIS” equivalence scale (i.e. the square root of family size) has been applied to average family income to construct an index of equivalent family income (1981= 100), which is used to adjust personal consumption per capita.

Some of the economic activity included in GDP does 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 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, an increase in police expenditures that only serves to maintain the crime rate unchanged should not be counted as an increase in (public sector) consumption.

This paper uses the estimates of costs of commuting, crime, house pollution abatement and auto accidents constructed by Anielski and Rowe (1998) and subtracts these from the value of current consumption.

Among OECD countries there are major differences in both the initial level and trends over time in the average annual number of hours worked. Given these differences, level and growth rate comparisons of economic well-being are affected by working time differences. In this paper, we want to compare economic well-being over time and across countries. Ideally, one would like estimates of the proportion of non-market time that is spent in home production and the proportion of market remunerated time that consists of on the job leisure, in order to account for changes in the pace of work, both at home and in the workplace. Such measures are, however, infrequently available for any one country and difficult to compare across countries. We, therefore, proceed by standardizing for hours of paid work in relative, not absolute, terms, where the benchmark is the average annual hours worked per adult of working age in the United States in 1980.

Unlike the Measure of Economic Welfare (Tobin and Nordhaus 1972), no attempt is made here to define leisure activities, estimate the amount of leisure enjoyed, and place a value on this total leisure time. Rather, we adjust the value of consumption for differences in paid hours relative to a benchmark, with countries having average annual hours worked less than the benchmark (USA 1980) having a positive adjustment to consumption and countries having more working time than the benchmark having a negative adjustment. Within the United States, years with fewer hours worked than those in the benchmark year have positive adjustments and those with more hours worked, negative adjustments.

Our methodology is equivalent to saying that at the margin, individuals ascribe a value equal to the after tax average wage to changes in non-working time that are not due to unemployment fluctuations. By comparing changes in working time to a benchmark level, we avoid the necessity of placing a monetary value on infra marginal hours of leisure, which might be highly problematic. Estimates of relative working time per person employed are adjusted for the employment/working age population ratio to provide estimates of relative non-working time on a working age population (15-64) basis to account for differences in employment/population ratios across countries. These estimates are then valued at the after tax wage rate to provide estimates of the value of relative non-working time per working age person. This figure is then adjusted by the working age population/total population ratio to control for differences in demographic structures across countries. This amount, expressed in constant prices of the national currency, is then added to consumption flows to produce a working time-adjusted estimate of consumption relative to the U.S. benchmark. However, unemployment does not constitute leisure. To account for involuntary leisure we subtract average annual hours of unemployment per working age person from the relative non-working time estimate.

There are very large differences in working time per employee across countries, and in 1997 the United States had the second highest average annual hours worked at 1883 hours per year. Between 1980 and 1997 most of the countries on which we have data experienced declines in working time, while the United States experienced increases. Average annual hours of non-working time relative to the 1980 U.S. benchmark are calculated as the difference between a country's average annual hours worked per working age person in a given year and the 1980 figure for the United States (1225 hours). By 1997, per adult working hours in the USA were 204 hours above their 1980 level, but only up 38 hours in Canada. Since some of these changes are large (204 hours is equivalent to 4 hours per week) they represent substantial changes in well-being, which should be reflected in a reasonable measure of economic progress. However, since leisure hours receive zero valuation in GDP accounting, neither the declines nor the increases are reflected in GDP per capita.

Estimates of the imputed value of non-working time per person are expressed in constant prices in national currency units. These estimates are calculated as the product of the average annual number of hours of non-working time per working age person

relative to the U.S. 1980 benchmark, after tax hourly compensation and the ratio of the working age population to the total population. Because we use national currency units (as opposed to common currency units), and because we are evaluating differentials at the margin, level comparisons of the aggregate value of non-working time are not possible.

Some hours of unemployment are not by choice and do not contribute to economic well-being. Indeed, if there are psychological costs to unemployment, such hours may have strong disutility associated with them. The Index cannot provide estimates of the negative utility of unemployment time, nor the partial value of such time. As an approximation, however, in the calculation of the imputations for the value of non-working time, we can deduct hours of unemployment – i.e. assign such hours zero value.

The provision of non-marketed or heavily subsidized services by the government is part of the consumption flow. Current expenditure data (all levels of government including defense and capital consumption allowances, but excluding debt service charges and transfer payments) are taken from the OECD national accounts, expressed in constant prices in national currency units. The importance of government final consumption expenditures relative to personal adjusted consumption was 24.3 per cent in the United States- lower than in Canada (29.1 per cent).

The components of per capita consumption flows (adjusted personal consumption, government consumption, the cost of regretables and the imputation for non-working time) are summed to total consumption flows adjusted for hours worked and given in index form for Canada and the United States for the 1971-99 period in Figure 1.

Accumulation, Sustainability and the Intergenerational Bequest

If individuals alive today care about the well being of future generations, measurement of trends in current well-being should include consideration of changes in the well-being of generations yet unborn. This consideration of future generations can also be justified on the grounds that a concept of “society” should include both present and future generations. Either way, wealth accumulation by this generation will increase the bequest left to future generations, and is an important component of well-being.

Figure 2 provides our estimates of trends in the accumulation of productive assets for Canada and the United States for the 1971-99 period. We emphasize that this component of economic 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 returns from those assets. Financial “Generational Accounting” techniques focus on the distributional impact of government debt – but in this section we are concerned with the real accumulation of the total stock of productive assets. It is the stocks of “wealth” left to the next generation, broadly conceived to include environmental and human resources as well as physical capital stock, which will determine whether a society is on a long-run sustainable trajectory of aggregate consumption, irrespective of the distribution of those consumption flows at the individual level.

The physical capital stock includes residential and non-residential structures, machinery, and equipment in both the business and government sector. The greater the capital stock, the greater is the 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. Data for the current net fixed capital stock, expressed in constant prices of national currency units, have been taken from the OECD publication *Flows and Stocks of Fixed Capital*. It is assumed that the estimates are internationally comparable, although the use of different depreciation rates by statistical agencies may reduce comparability for both level and rate of growth comparisons. Between 1980 and 1996, the increase in the fixed capital stock, on a per capita basis, was higher in Canada (27.4 per cent) than in the United States (24.3 per cent).

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. Statistical agencies do not produce R&D stock data, but OECD data on annual flows of total business enterprise expenditure on research and development can be accumulated into a stock of R&D capital valued at cost of investment - a depreciation rate of 20 per cent on the declining balance is assumed. Between 1980 and 1996, the rate of change in the per capita real business enterprise R&D stock for business enterprises ranged was much higher in the United States (91 per cent) than in Canada (27 per cent)

Current consumption levels could be increased by running down stocks of non-renewable natural resources or by exploiting renewable resources in a non-sustainable manner, but this would be at the cost of the consumption of future generations. A key aspect of the wealth accumulation component of economic well-being is net changes in the value of natural resources. 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 Statistics Canada (1997) has provided estimates for both physical and value estimates of natural resources such as forests, energy reserves, and minerals. These were used in the construction of the index of economic well-being for Canada and the United States (Osberg and Sharpe 1998, 1999).

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 many countries over the last three decades, and there is a strong relationship between educational attainment and individual income. The Index uses an admittedly crude and incomplete (but feasible) input cost method - the cost per year of education expenditures at the primary, secondary and post secondary levels. Yearly estimates of the distribution of education attainment in the population were then

used to compute the total cash cost of production of human capital in education. OECD data on the educational attainment of the 25-64 population and expenditure per student (available in both local currency and U.S. dollars) for the early childhood, primary, secondary, non-university tertiary and university level education were used to estimate the per capita stock of human capital. In order to distinguish clearly inter country differences in the quantity of education obtained, as opposed to differences in its cost of production, we apply a common cost base (the cost of education in the United States) to both countries.

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 citizens of one country to residents of other countries will lower the aggregate future consumption options of those citizens, increases in the level of foreign indebtedness reduce economic well-being within a given country. Estimates of the net investment position, expressed in current U.S. dollars, are published in the IMF's *International Financial Statistics Yearbook*. These estimates have been converted to current price national currencies at market exchange rates and then deflated by the GDP deflator and adjusted for population to obtain real per capita estimates in the net international investment position, expressed in national currency units.

Like the excess depletion of natural resources, current consumption 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. Countries pass on from generation to generation both a natural and man-made national heritage. If this heritage were damaged, the economic well-being of future generations would be reduced. Since it is very difficult, if not impossible, to put a monetary value on, for example, the pristine condition of national parks, or historic 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 for which indicators of environmental quality can be developed.

Probably the best-known environmental change is global warming 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.

The conceptual issues to be dealt with in estimating the costs of CO₂ emissions 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. Fankhauser (1995) has estimated that the globalized social costs of CO₂ emissions (with no adjustment for different national costs) at \$20 U.S. per ton in 1990. World Bank researchers (Atkinson et al. 1997) have applied this number to CO₂ 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 CO₂ emissions in 1997 were 22,636 millions of metric tons. Based on the \$20 U.S. per ton cost of CO₂ emissions, the world social cost of CO₂ emissions was \$452,720 million. This amount was allocated on the basis on a country's share of nominal world GDP, expressed in U.S. dollars. It was then converted into national currency at the purchasing power parity exchange rate and divided by population. As these costs represent a loss in the value of the services provided by the environment, they can be considered a deduction from the total stock of wealth of the society. For example, in 1997, per capita stocks of wealth in Canada were reduced by \$415 Canadian because of the social costs imposed by CO₂ emissions according to this methodology.

As the estimates of the physical capital stock, the R&D capital stock, net foreign debt, and environmental degradation are expressed in value terms, they can be aggregated and presented on a per capita basis. Net foreign debt per capita is a negative entry, while the social costs of CO₂ emissions are subtracted from the stocks of wealth. For the 1980-1996 period, estimates for the five components of the wealth stock included in this paper are available. The rate of change for per capita real wealth stocks in national currency at constant prices was 16.0 per cent in the United – significantly lower than in Canada (23.3 per cent).

Income Distribution - Inequality and Poverty

The idea that “Social Welfare” depends, in general, on both average income and 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. Since Atkinson (1970) it has been recognized that 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, and will assign some negative weight to inequality among the non-poor.

Since the economic well-being of the population is affected both by inequality in

the distribution of income and by the extent of poverty, 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 should place some weight (β) on a measure of inequality in the aggregate distribution of income and some weight ($1-\beta$) on a measure of poverty.

The most popular measure of inequality in the distribution of income is undoubtedly the Gini index. For the purposes of the construction of the index of economic well-being, we have chosen the Gini coefficient of after-tax household income.⁵ Income inequality in 1994 as measured by the Gini coefficient was considerably larger in the United States (0.387) than in Canada (.287).

Recently, Osberg and Xu (1997) 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, changes in poverty depend on changes in the poverty rate and the average poverty gap ratio. The overall index of equality is a weighted average of the indices of poverty intensity for all units or households and the Gini coefficient, with the weights 0.75 and 0.25 respectively. Figure 3 presents the trend in the index of economic equality from 1971 to 1999 for Canada and the United States.

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, which have to be considered a subtraction from well-being.

Although public opinion polling can reveal that many 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. Consequently, there is no generally agreed definition of economic insecurity. We argue that economic insecurity is, in a general sense, "the anxiety produced by a lack of

⁵ 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. Phipps and Burton (1996) 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).

economic safety – i.e. by an inability to obtain protection against subjectively 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. Ideally, one would measure trends in economic security with data which included (for example) the percentage of the population 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 widely available. 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.

Over fifty years ago, the United Nations’ Universal Declaration of Human Rights stated:

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]⁶

For the Index, 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 that it affects. Figure 8 presents the results. 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.

The economic risk associated with unemployment can be modeled 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 changes in the employment rate (employment/population ratio). Changes in this ratio reflect changes in the unemployment rate and changes in the participation rate (both cyclical and structural). The extent to which people have been protected by unemployment insurance (UI) from the financial impacts of unemployment can be modeled as the product of: 1) the percentage of the unemployed who claim regular UI benefits, and 2) the percentage of average weekly wages replaced by UI.

In the Index, we do not attempt to model the psychological insecurities associated with health. Recent decades have seen both substantial advances in medical technology

⁶In 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.

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.

Viewed from a longer-term perspective, the economic insecurities associated with illness in developed economies certainly dropped considerably with the introduction of universal health insurance in many countries. However, a full estimate of the trend in economic anxieties associated with ill health should include the risk of loss of earnings. Historically, a portion of the labour force has had some income loss protection through sick leave provisions in their individual or collective employment contracts. One implication of a trend to short-term contract employment and self-employment in developed economies is an increase in the fraction of the population whose employment income ceases totally in the event of ill health. Data limitations prevent us from modelling such risks. Instead, we focus on the risk of health care costs, assuming that risk is proportional to the share of uninsured private medical care expenses in disposable income.

The OECD Health Data CD-ROM provides a long time series on medical care expenses as a proportion of disposable income (excluding medical insurance premia and net of insurance reimbursement for medical expenses). This was much higher (14.0 per cent) in the United States than in Canada (3.2 per cent). 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).

When the UN Universal Declaration of Human Rights was drafted in 1948, the percentage of single parent families was relatively high in many countries, 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)⁷ * (the average poverty gap ratio among single female parent families). The product of these last two variables is proportional to the intensity of poverty.

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

⁷ However, $RATE = INCIDENCE \times AVERAGE \ DURATION$. 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 implicitly account jointly for the duration of poverty spells and for their likelihood.

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. The annual divorce rate in 1996 was 4.33 per cent of legally married couples in the United States but lower in Canada (2.62 per cent). The poverty rate for single female parents in the most recent year (in brackets) from LIS micro-files was slightly higher - at 44.0 per cent (1997) - in the United States than in Canada, 40.7 per cent (1994). The difference in average poverty gap ratio for single female parents was greater - United States (39.6 per cent), Canada (27.5 per cent).

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).

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 poverty rate for the elderly in the most recent year (in brackets) for LIS micro-data files was much higher in the United States, at 24.4 per cent (1997) than in Canada, 4.8 per cent (1994). The average poverty gap ratio for the elderly was also higher in the United States (24.4 per cent), than in Canada (13.4 per cent).

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 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).

The four risks discussed above have been aggregated into an index of economic security using as aggregation weights the relative importance of the four groups in the population:

- For unemployment, the proportion of the population aged 15-64 in the total population.
- 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.
- For old age poverty, the proportion of the population in immediate risk of poverty in old age, defined as the proportion of the population aged 45-64 in the total population.

The above proportions have been normalized for all years to one. For example the weights for Canada in 1997 were the following: unemployment (0.2779), illness (0.4160), single parenthood (0.2158), and old age (0.0904). Implicitly, by expressing

changes as proportionate to an initial base, we are assuming that individuals habituate to a given level of background stimulus, but respond similarly to proportionate changes in stimulus.

Based on the above weights, the overall index of economic security for Canada and the US is shown in Figure 4. The decline in economic security in Canada in the 1990s is notable.

Estimates of Trends in the Overall Index of Economic Well-being

Trends in any index are determined by the choice of variables that are included in the index, the trends in those variables, and the weights these variables receive. Since the four main dimensions of average consumption, intergenerational 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, and this has been a major feature of our previous papers. However, for present purposes we present only a simple average of the four components of well-being (Figure 5 and Table 1) and refer readers interested in sensitivity testing to Osberg and Sharpe (1999, 2000a).

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 somewhat Rawlsian perspective would assign greater importance to poverty than to overall inequality trends. On this basis, a weight of 0.1877 ($=0.25*0.75$) has therefore been given to the poverty intensity and 0.0625 ($=0.25*0.25$) to the Gini -i.e. 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.

We are acutely conscious that the data sources available to us are far from what we would like. However, we hope that enough data remains to give a preliminary indication of trends in economic well-being from a broader perspective than that provided by GDP accounting. In earlier work, (e.g. Osberg and Sharpe, 2000a) we have examined explicitly the sensitivity of our overall index of economic well being to the weighting of its components. Generally, the more heavily current average consumption is emphasized, the closer our index comes to GDP per capita. However, in every instance the consideration of a wider range of issues than those recognized in GDP accounting reduces the measured increase in economic well-being.

In the United States, GDP per capita increased by approximately 30% over the 1980 to 1997 period, but our "standard" index is essentially flat, with a total increase of 3% over the period. The US has been marked by a substantial increase in economic inequality over this period, and increases in money income have been limited to the top end of the income distribution. As well, increases in money income in the U.S. have been obtained at the cost of substantial increases in working hours. Hence, this is not an unreasonable finding. Since Canada saw a substantial decrease in economic security in

the 1990s, with no counterbalancing gain in average consumption, there was a slight decline in overall economic well being for the period as a whole.

Level Comparisons of Economic Well-being

Comparisons of the level of well-being across countries are inherently much more problematic than comparisons of the trends in various components of economic well-being within countries. In cross country comparisons, the institutional context of economic data differs to a far greater extent than in within country, over time comparisons. Calculations of purchasing power parity equivalence across several countries have greater uncertainty than comparisons of within country consumer price levels. Statistical agencies in different countries differ in their data availability and data gathering practices to a greater degree than they change those practices over time in the same country. For all these reasons, the Index avoids direct commentary on comparative levels of economic well-being.

Lessons Learned from Construction of the Index of Economic Well-being

The experience over the last three years of construction the Index of Economic Well-being has provided a large number of lessons that may be relevant to other researchers working in the social and economic indicators area. These issues are discussed below.

General Issues⁸

A key decision made from the start was to construction an actual index of economic well-being, not a set of economic well-being indicators. We believe that this decision to develop a composite indicator was the appropriate one. Its great advantage is that it produced bottom lines for the four components of the Index and the overall Index. These bottom lines have been very useful in capturing media attention and stimulating public interest in the exercise. In addition, the detailed sets of indicators that have been developed to derive the five bottom lines mean that it is very easy to identify the drivers of the bottom lines for the trends in the four components of the Index and the overall Index.

In setting up an index explicitly based on sub indices with specific weights (0.4 for consumption, 0.1 for accumulation and .25 for each of inequality and insecurity) we were not actually doing anything that other indices did not also do. [The Human Development Index of the UNDP is, for example, based on sub indices of real per capita GDP, education and life expectancy, each of which receive equal weight.] However, we provided the underlying sub-indices explicitly and said specifically that the weights attached to each sub index would vary, depending on the values of the observer. We did this because we think that all indices have implicit in them a set of value choices [equal

⁸ See Sharpe (1999) for a general discussion of issues in the construction of composite indicators.

weighting, as in the HDI, *is* a value choice] and we wanted to be transparent about ours – and to enable other analysts, with different value emphases, to use our data to aggregate the sub-indices into an overall measure of well-being. [In practice, the weights used often do not matter much for the assessment of overall trends, but we thought it important to be able to show that explicitly.]

However, in retrospect it is clear that we did two things, in one step, that could be done in separate steps, and that we confused readers in the process. We tried to introduce the idea that there are four main components of the Index of Economic Well-Being (Average Consumption, Accumulation, Distribution and Insecurity) at the same time as we discussed the possible differences people might have in their preferences for each component. In retrospect, it would have been clearer if we had first introduced an index in which there are four components and each component has equal weight, and then, in a separate section, introduced the idea of differential weights. The trend lines for an overall index with a weighting of [.25, .25, .25, .25] are almost identical to those of an index with component weightings of [.4, .1, .25, .25] and we would have been spared the criticism that it was our own particular values that generated the overall result.

Data issues

The data requirements for construction of for the Index of Economic well-being have been immense, with information on over 20 variables needed for a long period. For a number of the variables such as poverty rates and gaps, the CSLS had to calculate the numbers from micro-data sets such as the Survey of Consumer Finances and the Luxembourg Income Study. For other variables such as the stock of human capital, R&D stocks, and the costs of CO2 emissions, the CSLS had to develop new estimates. Extrapolation and interpolation were used to develop estimates for years where data were unavailable.

In thinking of how to operationalize a new index, one can either specify a wish list of the variables that ideally would be available to construct the index, or work with the data that actually is available now. If one asks for the ideal set of variables, one can never hope to describe past trends in well being, because the requisite data were not collected at the time. The strategy of specifying the ideal set of variables has the potential advantage of influencing future data gathering by statistical agencies, but only if calculation of the IEWB is adopted as an agency priority (and if that is to happen, the feasibility and utility of the index has to be shown, in a concrete way).

Working with the data that now exists does, however, force many compromises, since clearly the data gathering was not done with the needs of the IEWB in mind. The longer the time span over which we want to calculate the index, and the larger the number of countries we want to compare, the greater the number of compromises which are required. If we are to maintain comparability among countries, we have to restrict attention to a lowest common denominator of available data, with the implication that a multinational comparison (e.g. of the OECD nations) presents estimates for Canada (based on the limited set of variables that are available for all countries) which are

somewhat different from the estimates we present based on the maximum use of available Canadian data series.

Methodological Issues

In the Index of Economic Well Being we consider both average income and the distribution of income. However, the literature on average trends and distributional trends has typically measured these two types of trends with opposite signs. In thinking about trends in average income, it is clear that an increase is a “good thing”. However, distributional trends have typically been analyzed with reference to measures of inequality and poverty, for which increases are “bad things”. Similarly, economic insecurity may arise from the probability of unemployment, and to what extent the income loss from such unemployment is replaced by unemployment insurance, but the desired attribute is “security”.

One way of dealing with the necessity of “inverting” a standard measure is to take the reciprocal – however that technique has a highly nonlinear impact⁹ on the transformed variable. The implication is that in order to maintain a comparable magnitude of the change in measured “equality” as the change in measured “inequality” in standard measures such as the Gini index, a linear transformation is desirable.

At the most general level of abstraction, it is clear that “well-being” or “sustainability” or “Human Development” are, over the entire range of possible outcomes, best thought of as ordinal and not cardinal numbers. Those analysts who (like ourselves) are willing to try to assign specific numbers to such imprecise magnitudes must justify their efforts with the thought that they are constructing statistical series that are a local approximation. If one thinks, for example of the impact of average income levels on economic well being, the utility that individuals derive from income could quite possibly change in a number of ways over the entire range of possible income levels. The rationale for a local linear approximation to an unknowable functional form is based on the hypothesis that, for example, although it would be hard to imagine how well off Canadians would feel if their incomes were 0.001 of current levels of income, one can imagine the impact of a 10% change. We think it is reasonable to ask the question how well being has changed over periods of time such as 20 or 25 years and for the range of changes typically observed in such time frames – but larger shifts strain the credibility of particular index values.

⁹ If the measure of inequality were the Gini index and one were to compare a decrease in inequality such as a change from 0.4 to 0.35 or a change from 0.2 to 0.15, taking the reciprocal would mean that the former change registers as an increase in equality from 2.5 to 2.87 (an absolute change of 0.37 or about 14%) and the latter change registers as an increase from 5 to 6.66 (which is an absolute change of 1.66 or approximately 33%).

In general, numerical indices which are expressed relative to a base year are sensitive to how that base is constructed.¹⁰ There does not seem to be any way around this fact, and it is a problem common to all indices – not just our own.

The convention of multiplying the index of the variable by –1 and then adding 2 was adopted. The disadvantages of this approach are that it is hard for the uninitiated to understand and makes the calculation of percentage changes problematic. But it appears that no better methodology has been developed.

Conceptual Issues

Many conceptual issues were tackled in the construction of the Index, including the treatment of the underground economy, the valuation of life expectancy, the valuation of non-working time, the construction of the stock of human capital, the modeling of the risks of unemployment, old age poverty, financial loss from illness, and single-parent poverty.

By far the greatest conceptual challenge for the Index has been the integration of the environmental degradation into the Index. Indeed, this challenge has only very partially been met by the inclusion of the costs of CO₂ emissions. Putting monetary values on changes in ecosystems is extremely difficult. An alternative approach is to develop indexes of the state of different ecosystems without resorting to aggregation of the changes in the different states by prices. We plan work along these lines in the near future.

Conclusion

It is increasingly being recognized that the sustainability of stocks, particularly environmental stocks, inequality, and economic security are important components of economic well-being. The purpose of this Index of Economic Well-being is to provide an empirical embodiment of this recognition.

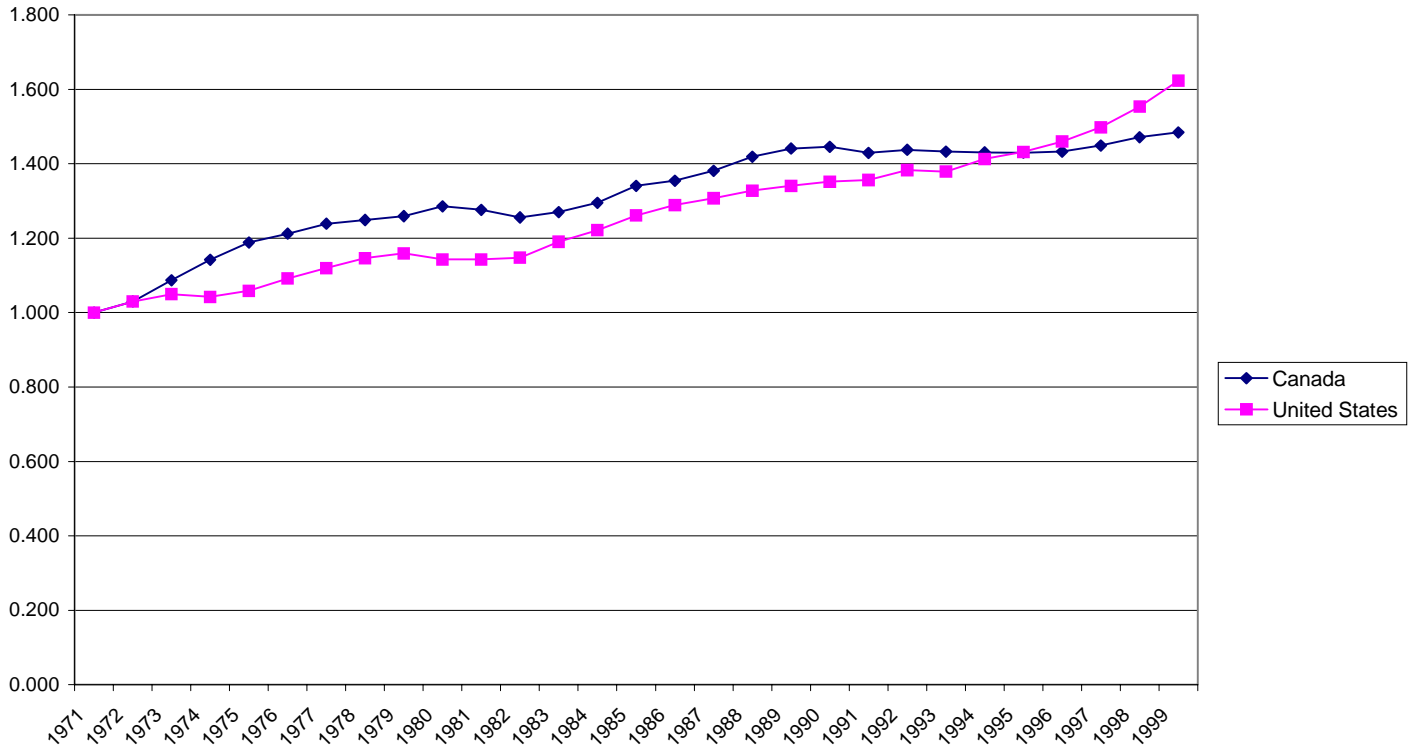
The Index is an on-going exercise, with much work left to do. Nevertheless, we believe that the Index at this stage in its development represents an important addition to the literature of measures of economic well-being both for Canada and for other countries. We would be happy to receive comments and suggestions on this work in order to improve it.

¹⁰ A change in unemployment from 10% in the base year to 13% can also be seen as a change in employment from 90% to 87%. If one calculates an index of unemployment, the change from 1 to 1.3 looks considerably larger than a change from 1 to 0.966. Similarly, an index of pollutants in the atmosphere could be expressed as parts per million that are, or are not, of a particular chemical compound and an index of risk of nuclear reactor malfunction risk could be expressed as a probability of breakdown (e.g. .0001) or as a probability of safe operation (e.g. 0.9999). Clearly, a given change in absolute probability or parts per million looks very different in percentage terms, depending on the choice.

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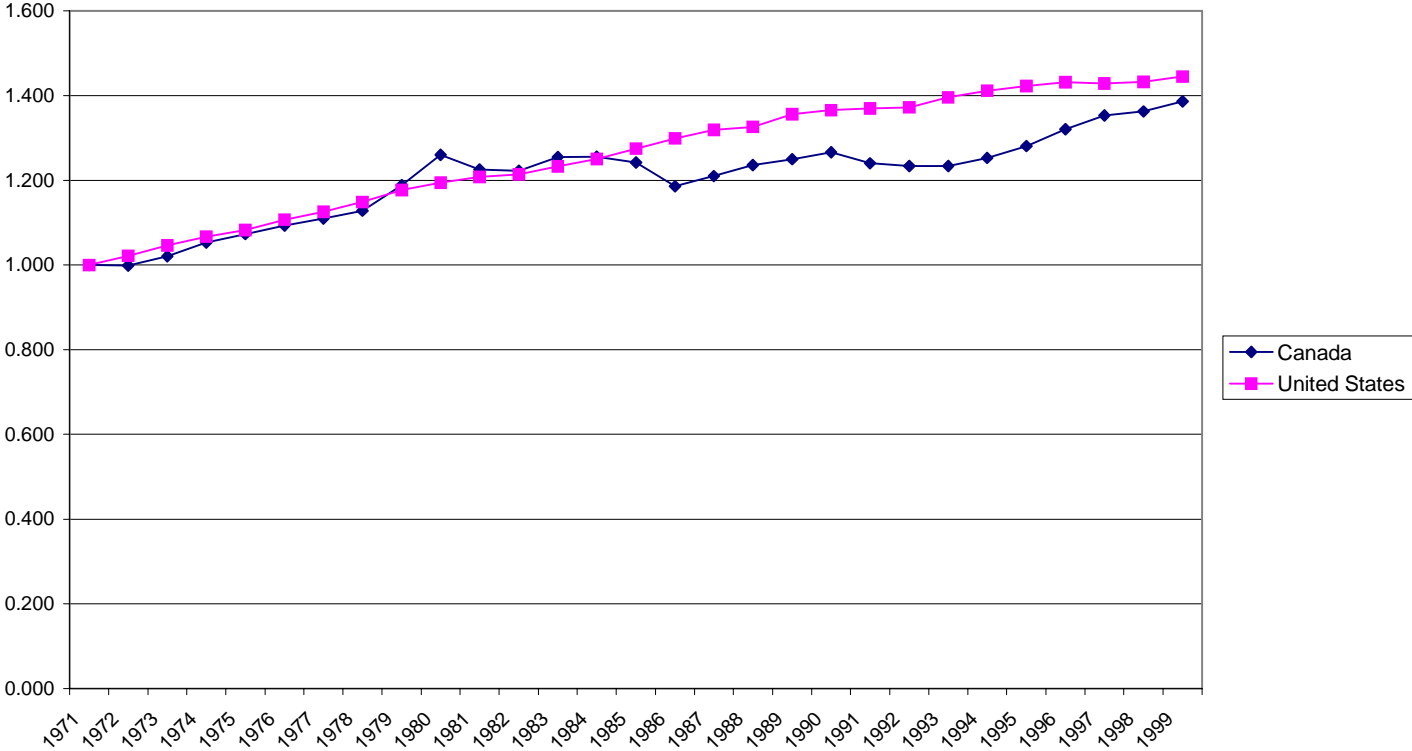
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Figure 1
Trends in Average Consumption in the USA and Canada



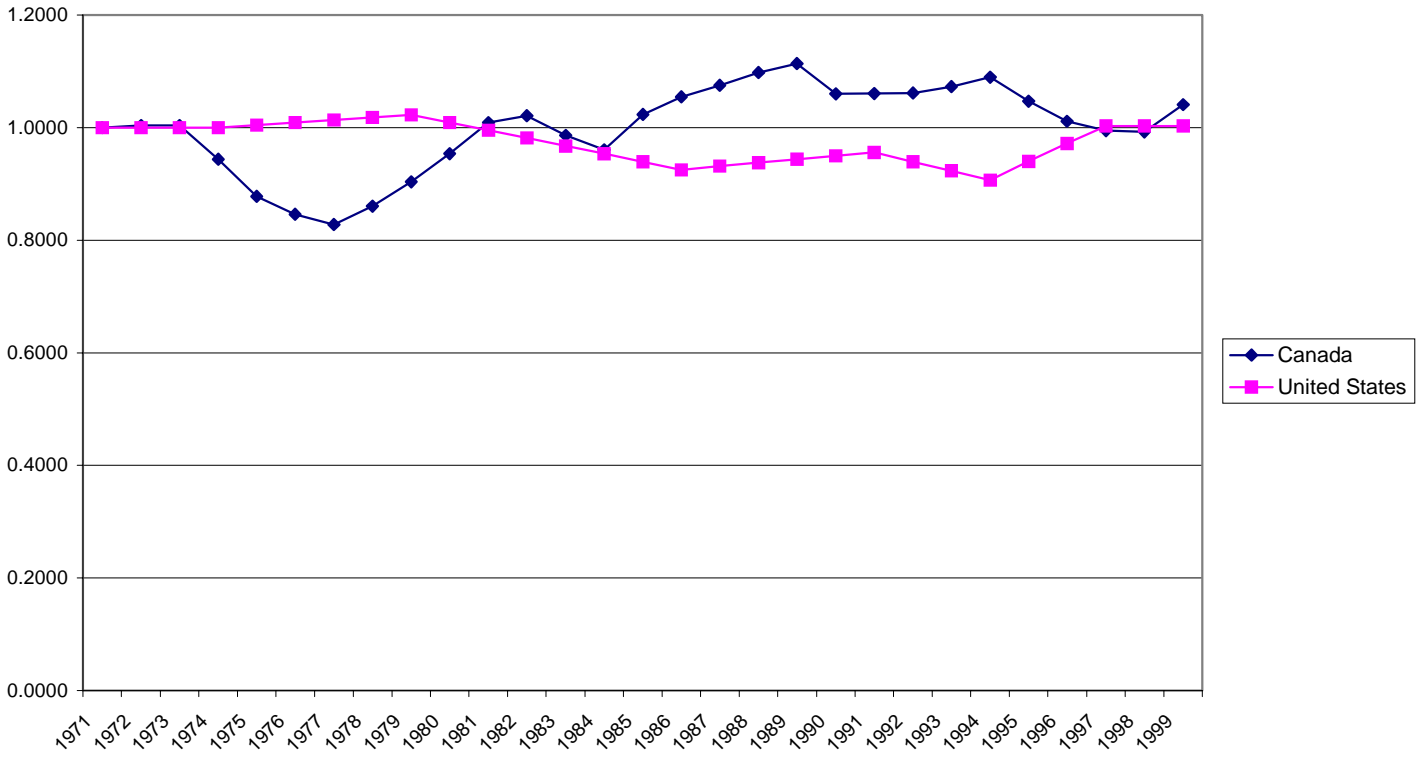
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Figure 2
Wealth Accumulation Trends in the United States
and Canada



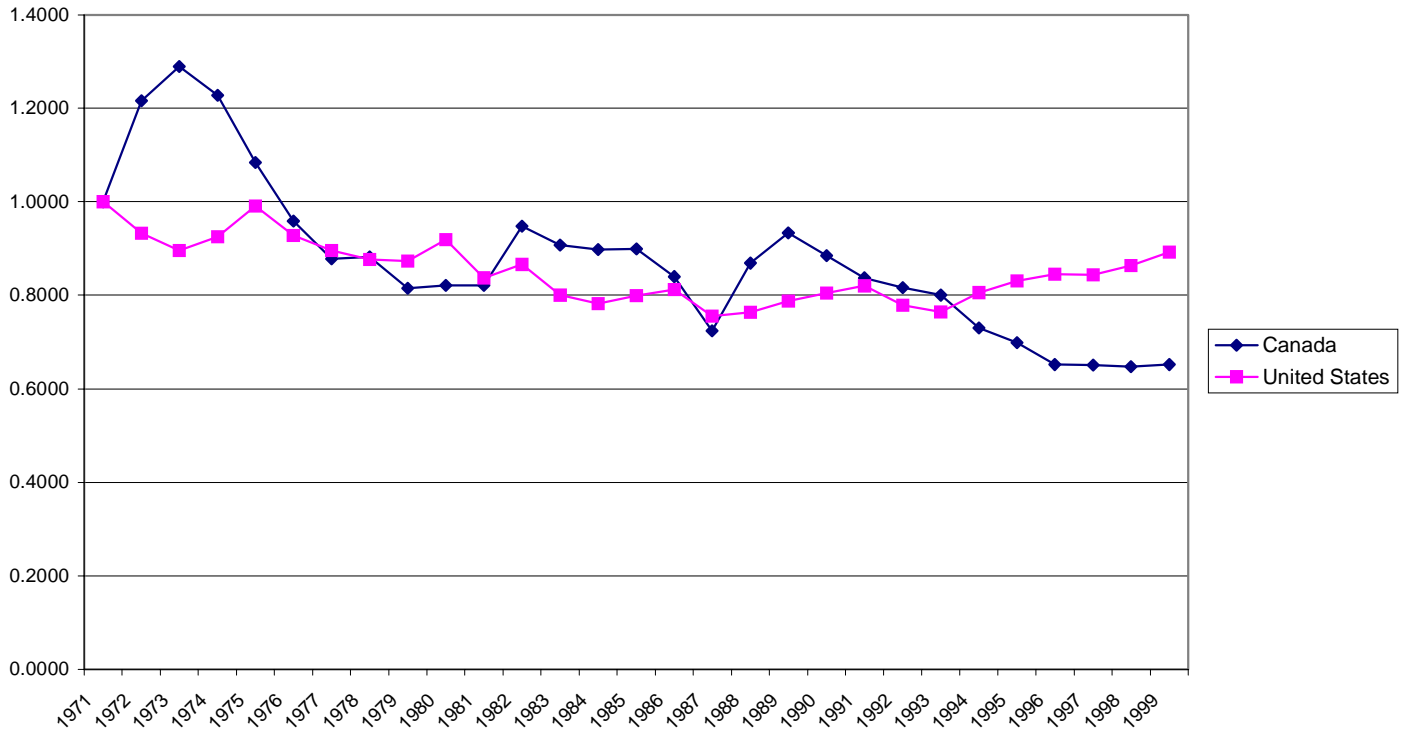
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Figure 3
Trends in Income Equality



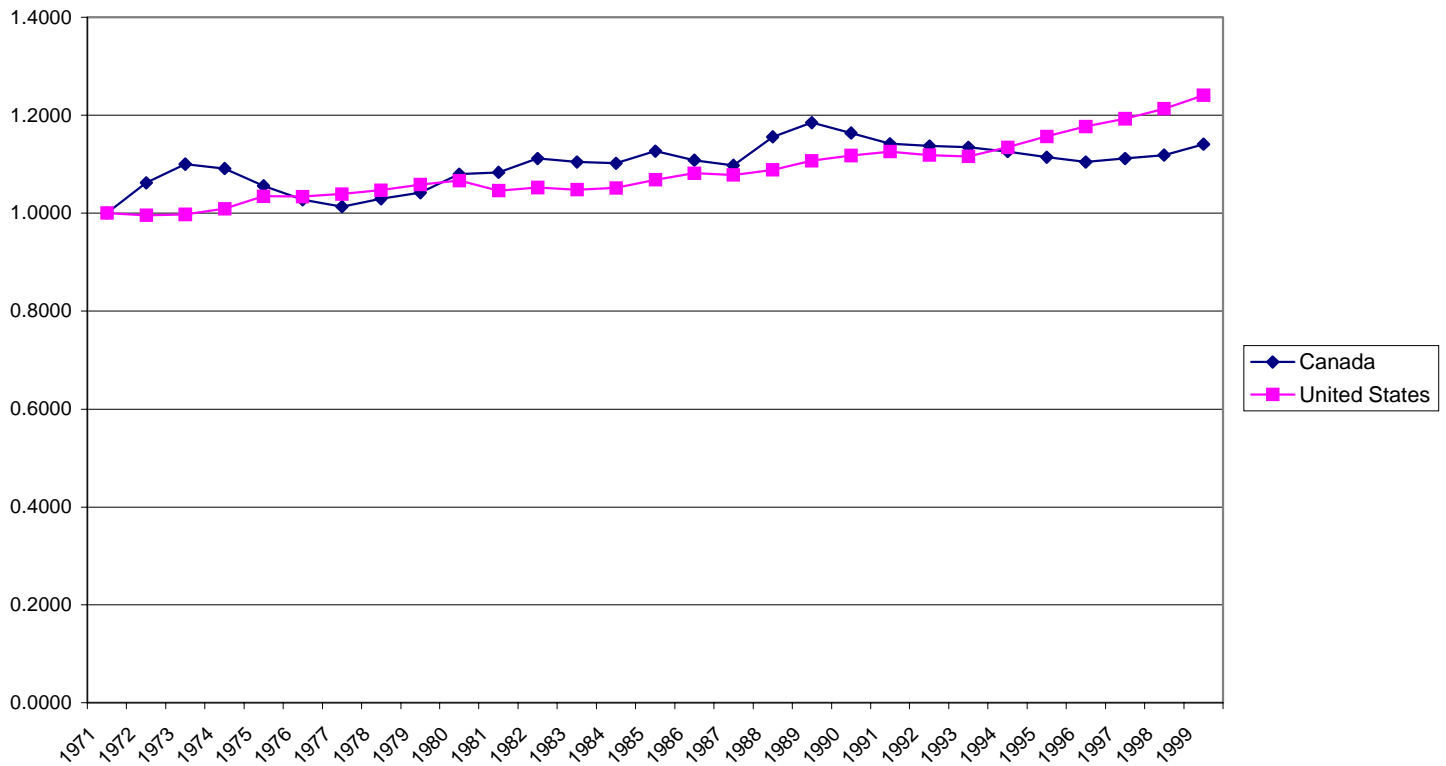
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Figure 4
Trends in Economic Security



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Figure 5
Trends in Economic Well-Being in Canada and the USA
[Equal weighting of Consumption, Accumulation, Distribution and Economic Security]



Source: see table A1

TABLE A1

Index of Adjusted

total Consumption

W ealth Stocks

equality measures

Economic Security

well-being index

	Canada United States		Canada United States		Canada United States		Canada United States		Canada United States	
1971	1.000	1.000	1.000	1.000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1972	1.030	1.030	0.999	1.021	1.0034	1.0000	1.2160	0.9330	1.0620	0.9961
1973	1.087	1.050	1.020	1.046	1.0034	1.0000	1.2895	0.8956	1.1000	0.9979
1974	1.142	1.042	1.053	1.067	0.9435	1.0000	1.2278	0.9253	1.0917	1.0087
1975	1.189	1.058	1.073	1.083	0.8782	1.0046	1.0843	0.9915	1.0560	1.0343
1976	1.212	1.092	1.093	1.107	0.8458	1.0091	0.9591	0.9282	1.0275	1.0341
1977	1.239	1.120	1.109	1.126	0.8278	1.0137	0.8779	0.8959	1.0135	1.0389
1978	1.249	1.146	1.128	1.149	0.8602	1.0182	0.8821	0.8773	1.0298	1.0475
1979	1.259	1.159	1.188	1.177	0.9034	1.0228	0.8144	0.8733	1.0414	1.0582
1980	1.286	1.143	1.260	1.194	0.9536	1.0090	0.8213	0.9193	1.0801	1.0664
1981	1.276	1.143	1.226	1.208	1.0088	0.9952	0.8213	0.8375	1.0830	1.0460
1982	1.256	1.148	1.223	1.214	1.0209	0.9814	0.9481	0.8663	1.1119	1.0525
1983	1.270	1.191	1.255	1.233	0.9862	0.9674	0.9077	0.8008	1.1046	1.0480
1984	1.295	1.222	1.256	1.250	0.9605	0.9534	0.8975	0.7819	1.1023	1.0519
1985	1.341	1.261	1.242	1.275	1.0236	0.9393	0.8995	0.7992	1.1265	1.0687
1986	1.354	1.289	1.186	1.299	1.0548	0.9251	0.8397	0.8124	1.1085	1.0814
1987	1.381	1.307	1.210	1.319	1.0750	0.9313	0.7238	0.7557	1.0974	1.0784
1988	1.419	1.328	1.236	1.326	1.0978	0.9374	0.8688	0.7633	1.1555	1.0887
1989	1.441	1.341	1.250	1.356	1.1135	0.9435	0.9339	0.7878	1.1847	1.1071
1990	1.445	1.352	1.266	1.365	1.0594	0.9496	0.8852	0.8047	1.1641	1.1179
1991	1.429	1.356	1.240	1.370	1.0608	0.9556	0.8371	0.8200	1.1420	1.1256
1992	1.437	1.383	1.234	1.372	1.0615	0.9395	0.8163	0.7791	1.1372	1.1184
1993	1.432	1.379	1.233	1.396	1.0729	0.9232	0.8007	0.7647	1.1348	1.1157
1994	1.431	1.413	1.253	1.412	1.0893	0.9069	0.7299	0.8056	1.1258	1.1343
1995	1.430	1.432	1.281	1.423	1.0466	0.9400	0.6989	0.8313	1.1140	1.1566
1996	1.433	1.460	1.321	1.432	1.0115	0.9721	0.6522	0.8453	1.1043	1.1772
1997	1.449	1.498	1.353	1.429	0.9946	1.0031	0.6509	0.8439	1.1119	1.1935
1998	1.471	1.554	1.363	1.432	0.9926	1.0031	0.6472	0.8635	1.1185	1.2131
1999	1.484	1.623	1.386	1.445	1.0406	1.0031	0.6517	0.8924	1.1408	1.2409