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AN INDEX OF ECONOMIC WELL-BEING FOR SELECTED OECD COUNTRIES

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Per capita gross domestic product (GDP) is a poor indicator of economic well-being. It measures effective consumption poorly (ignoring the value of leisure and of longer life spans) and it also ignores the value of accumulation for the benefit of future generations. Since incomes are uncertain and unequally distributed, the average also does not indicate the likelihood that any particular individual will share in prosperity or the degree of anxiety and insecurity with which individuals contemplate their futures. We argue that a better index of economic well-being should consider: current effective per capita consumption flows; net societal accumulation of stocks of productive resources; income distribution; and economic security. The paper develops such an index of economic well-being for the U.S., U.K., Canada, Australia, Norway and Sweden for the period 1980 to 1999. It compares trends in economic well-being to trends in GDP per person. In every case, growth in economic well-being was less than growth in GDP per capita, although to different degrees in different countries.

1. INTRODUCTION

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

In 1980 Ronald Reagan asked the American people a seemingly simple question: "Are you better off today than you were four years ago?" Although real gross domestic product (GDP) per capita in the U.S. was in 1980, 8.8 percent higher than in 1976, his audiences answered "No!" More recently, when Canadians were asked in 1998 how the overall financial situation of their generation compared to that of their parents at the same stage of life, less than half (44 percent) thought that there had been an improvement—despite an increase of approximately 60 percent in real GDP per capita over the previous 25 years.[1]

Note: Earlier versions of this paper were presented at the following conferences: the International Society for Quality of Life Studies, Girona, Spain, July 20–22, 2000; the International Association for Research in Income and Wealth Twenty-Sixth General Conference, Cracow, Poland, August 31, 2000; the American Economic Association, Boston, Massachusetts, January 7, 2000 and the Canadian Economics Association, Vancouver, B.C., June 2, 2000. We would like to thank the discussants at those meetings, particularly Thesia Garner and John Helliwell, and two anonymous referees for extensive comments that have greatly improved the presentation. Dimitry Kabrelyan, Jeremy Smith and Lynn Lethbridge did outstanding work as research assistants and deserve much of the credit. Remaining errors are our responsibility. All data underlying the estimates presented in this paper are freely accessible from the website of the Center for the Study of Living Standards (www.csls.ca) under Index of Economic Well-being.

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[1]For details see the August 4, 1998 press release of the Angus Reid Globe/CTV poll posted at http://www.angusreid.com/media/dsp_search_pr_cdn.cfm.

Evidently, national income accounting measures may not necessarily be a good guide to popular perceptions of trends in economic well-being.

Are such popular perceptions unreasonable?

If GDP per capita is not a good measure of economic well-being, is it possible to find a better measure, conceptually and practically?

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 well-being is an important issue.

However, although it is important, economic well-being is also only part of social and economic progress. The citizens of all countries clearly care about issues (like political freedom) and personal attributes (like literacy) for many reasons other than their economic implications. This paper's focus on the *economic* aspects of well-being does not deny the importance of non-economic issues—instead it is motivated by the idea that effective policy making often requires data that distinguishes between trends in overall economic well-being and trends in "social" or non-economic variables. In limiting its focus to attempting to provide a better index of *economic* well-being,[2] this paper therefore does not attempt the same breadth as indices such as the Genuine Progress Index[3] or the Human Development Index,[4] and is more in the spirit of the Measure of Economic Welfare (MEW) developed

[2]The social indicators literature (see Land, 2000 for a survey) develops a large number of variables on social conditions without combining them into a composite or aggregate index. This approach prevents analysts from coming to a summative judgment of trends. Hence the current paper is concerned with the development of a composite index.

[3]The Genuine Progress Indicator (GPI) produced by the think tank, Redefining Progress (Cobb, Halstead, and Rowe, 1995), is an index of 20 aspects of economic life ignored by GDP. It starts with personal consumption expenditures, makes an adjustment for income distribution, and then adds or subtracts categories of spending based on whether they enhance or detract from well-being. Additions are the value of time spent on household work, parenting, and volunteer work; the value of the services of consumer durables; the services of highways and streets. Subtractions are defensive expenditures due to crime, auto accidents, and pollution; social costs such as the cost of divorce, household cost of pollution and loss of leisure; and depreciation of environmental assets and natural resources, including loss of farmland, wetlands, old growth forests, reduction in the stock of natural resources, and the damaging effects of wastes and pollution. All categories are expressed in dollars for aggregation purposes. The GPI includes many of the variables in the Index of Economic Well-being, but gives a much greater weight to environmental variables because of the particular methodologies used to estimate the losses associated with these variables. Indeed, these losses become so large they give the GPI trends a strong downward bias. See Hagerty *et al.* (2001) for an evaluation of the GPI and a large number of other quality of life indexes.

[4]The Human Development Index produced by the United Nations Development Programme (UNDP, 2001) is a composite index with three equally weighted components: health, education, and income. Each component is expressed as the ratio of a country's performance to the range of between the minimum and maximum outcome observed in the international data. The health component is captured by life expectancy, the education component by the adult literacy rate and the combined primary, secondary, and tertiary gross enrollment rates (two-thirds of weight given to the former and one-third to the latter), and income by the logarithm of GDP per capita expressed in terms of purchasing power. Because the logarithm of income is used, income above $10,000 per capita has little effect on the HDI. The Index of Economic Well-being (IEWB) treats life expectancy as an adjustment to consumption and school enrollment rates as a determinant of the stock of human capital. Income is not, in itself, seen as a component of well-being, but consumption is. See Hagerty *et al.* (2001) for an evaluation of the HDI and a large number of other quality of life indexes.

by Nordhaus and Tobin (1972) three decades ago. The main focus of the paper is to address the fact that the measure of aggregate economic well-being now in greatest use (GDP per capita) is severely limited.

In measuring GDP, national income accountants attempt to obtain an accurate count of the total money value of goods and services produced for sale in the market in a given country in a given year. This measure is clearly important for many purposes, but it also omits consideration of many issues (for example, leisure time, longevity of life, asset stock levels) which are important to the economic well-being of individuals. All the same, for many years the System of National Accounts has been the accounting framework within which most discussions of trends in economic well-being have been conducted, and GDP per capita has often been used as a summary measure of economic trends.[5]

The compilers of the national accounts have sometimes protested that their attempt to measure the aggregate money value of marketed economic output was never intended as a full measure of economic well-being—*but* it has often been used as such. Unfortunately, if an inappropriate measure of economic well-being is used, both policy and analysis are likely to suffer. Although economic policy makers may want to increase economic well-being, if they are aiming at the wrong target they are unlikely to be fully successful in hitting the right one. However, the onus is clearly on the critics to show that alternative measures to GDP per capita are possible, plausible and make some difference. This paper, therefore, develops an Index of Economic Well-being for selected OECD countries based on four dimensions or components of economic well-being—consumption, accumulation, income distribution, and economic security.

In identifying these dimensions of economic well-being, this article recognizes explicitly that reasonable people may disagree in the relative weight they would assign to each dimension—e.g. some will argue that inequality in income distribution is highly important while others will argue the opposite. Summarizing the economic well-being of a complex society inevitably requires a series of ethical and statistical judgments. The different dimensions of well-being are valued to varying degrees by different observers—hence we would argue that it is preferable to be explicit and open about the relative weights assigned to components of well-being, rather than leaving them implicit and hidden. Furthermore, we distinguish the underlying components of economic well-being because for policy purposes, 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. For these reasons, we specify *explicit* weights to the components of well-being, and test the sensitivity of aggregate trends to changes in those weights, in order to enable others to assess whether, by their personal values of what is important in economic well-being, they would agree with an overall assessment of trends in the economy.

In everyday life, it is common to observe that debates about values, facts and economic policies are hopelessly intermingled. However, the hypothesis underlying this paper is that democratic discourse is likely to be more productive

[5]Keuning (1998) reviews the contributions of Dawson (1996) and Kendrick (1996) and the most recent (United Nations, 1993) revisions to the SNA.

if issues of values, fact and analysis can be separated as much as possible. Issues of fact can be seen as answers to the question: "Where are we?" Discussions of values can be seen as answering the query: "Where do we want to go?" There remains the crucial question of policy: "How do we get there?"—but in principle these are separable questions.

This paper is about the "Where are we?" issue. Its basic hypothesis—that a society's well-being depends on total 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.[6] The paper is divided into three main parts. Part 2 discusses how we develop estimates of the four key components or dimensions of the index—consumption flows, stocks of wealth, inequality, and insecurity—and presents preliminary estimates of the overall index and its components for the U.S., the U.K., Canada, Australia, Norway, and Sweden from 1980 to 1999.[7] Part 3 compares trends in the index and its components, and Part 4 concludes.

2. An Index of Economic Well-being

If people typically derive pleasure both from their own consumption and the well-being of future generations, they will want to consume part of their current income and save the rest. Aggregate economic well-being will therefore depend on the proportion of national income saved for the future, but GDP is a measure of the aggregate market income of a society which does not reveal the savings rate. Furthermore, there is little reason to believe that the national savings rate is automatically optimal—particularly if some assets (like the environment) do not have market prices. Hence, a better estimate of the well-being of society should consider both current consumption and the bequest this generation will leave for the benefit of future generations. As well, although trends in average income are important, individuals are justifiably concerned about the degree to which they personally will share in prosperity, and the degree to which their

[6]However, a sufficient (but not necessary) set of conditions for the index of economic well-being which we propose would be that societal economic well-being can be represented as the well-being of a "representative agent", if: (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; and (5) capital markets and public policies do not always automatically produce a socially optimal aggregate savings rate.

[7]Only these countries have a large enough number of public-use micro-data files from the Luxembourg Income Study for construction of reliable long-run time series on certain of the variables we need. Estimates of the Index of Economic Well-being for a set of countries (Belgium, Denmark, Finland, France, Italy, Netherlands, and Spain) with fewer years of micro-data files have also been developed and are posted at www.csls.ca under the Index of Economic Well-being. As well, maintaining international comparability of estimates has meant that some data used in other papers to construct the index for Canada (Osberg and Sharpe, 1998) and Canada and the United States (Osberg and Sharpe, 2002), and not available for other countries, have not been used in this paper. This has meant that the estimates in this paper for Canada and the United States are not identical to those in other papers.

personal economic future is secure.[8] The four components or dimensions of economic well-being are, therefore:

- Effective per capita consumption flows—which includes consumption of marketed goods and services, government services, effective per capita flows of household production, leisure and changes in life span.
- Net societal accumulation of stocks of productive resources—which includes net accumulation of tangible capital, housing stocks, net changes in the value of natural resource stocks, environmental costs, net change in the level of foreign indebtedness, accumulation of human capital and R&D investment.
- Income distribution—the intensity of poverty (incidence and depth) and the inequality of income.
- Economic security from job loss and unemployment, illness, family breakup and poverty in old age.

Figure 1 is a schematic representation of the four components of the Index of Economic Well-being and sub-components. Appendix 1 provides a mathematical exposition of the Index.

Each dimension of economic well-being is itself an aggregation of many underlying trends, on which the existing literature is of variable quality—and often differs across countries. By contrast, the System of National Accounts has had many years of development effort by international agencies (particularly the UN and the IMF), and has produced an accounting system for GDP which is rigorously standardized across countries. However, using GDP per capita as a measure of well-being would (1) implicitly 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.

2.1. *Average Consumption Flows*

The easiest part of current consumption to measure is purchased consumer goods and services. Data on aggregate real personal consumption expressed in national currency units in constant prices are available from the OECD National Accounts publication. All six countries experienced increases in real per capita marketed personal consumption over the 1980 to 1999 period, but there were large variations in the increase, ranging from a high of 59.4 percent in the U.K. to a low of 19.4 percent in Sweden. The increases in the other countries were: Norway (44.7 percent), Canada (30.2 percent), U.S. (48.7 percent), Australia (43.3 percent).

However, a major point of this paper is that a number of other factors also influence effective consumption flows, such as leisure, household size, regrettable expenditures, the underground economy and life expectancy. At this stage in the development of the Index of Economic Well-being, our preference (wherever

[8]A fuller discussion of the rationale for this framework of consumption, accumulation, distribution and insecurity can be found in Osberg (1985).

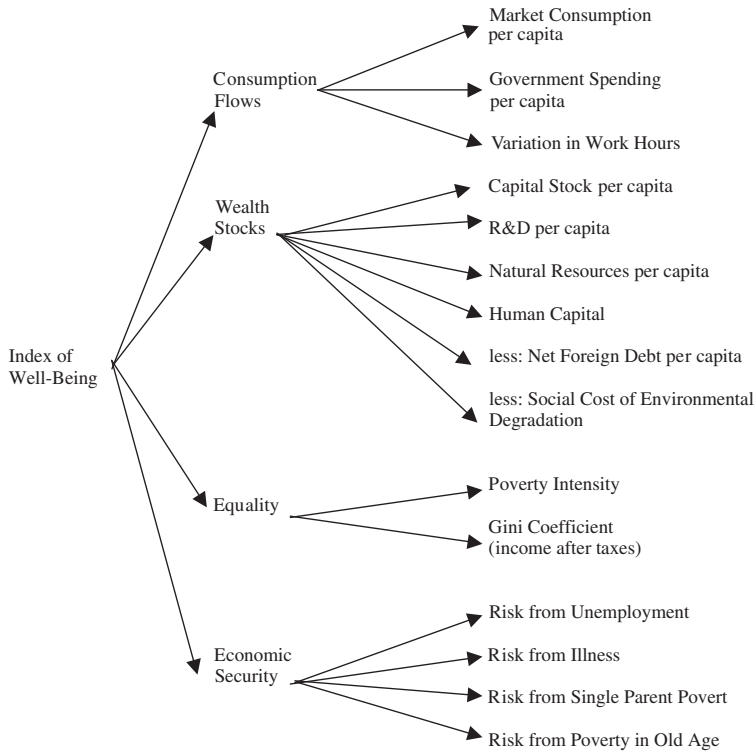

Figure 1. Weighting Tree for the Index of Economic Well-being

possible) is to include, rather than exclude, imprecise measures. Omitting a variable would implicitly set its value to zero. Hence, an imprecise measure of a variable is likely to embody a smaller error than complete omission. However, for some variables there is no estimate available at all for some countries, and omission is sometimes unavoidable.

In some instances, assessment of aggregate trends in economic well-being may not be very sensitive to the omission of a particular variable, and the ''underground economy'' may provide an example. 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. Some trends may encourage an expansion (e.g. rising tax rates), but other factors have worked in the opposite direction (e.g. the increased penetration of franchise systems in the small business sector and the greater computerization of business records). However, whatever the direction of the trend, it is from a small base. Credible benchmark estimates of the prevalence of underground activity put it at a relatively small percentage of GDP. For example, Gervais (1994) estimated the upper limit of unmeasured production to be 2.7 percent of GDP in Canada in the early 1990s. When the base level is small, the absolute size of a change is likely to be even smaller. Furthermore, comparable estimates of the underground economy are not available over time and across countries. Hence, we omit this variable.

We also omit from this paper adjustment for that fraction of consumption expenditures that are arguably (like commuting expenses) an ''intermediate input'' in the production of income or a ''defensive necessity'' (like expenditure on anti-burglary measures due to higher crime rates) to offset the impact of adverse social trends. This class of expenditure has been labeled ''regrettable expenditures'' on the grounds that increases do not indicate greater utility for consumers. In our papers estimating the index of economic well-being for Canada (Osberg and Sharpe, 1998) and the U.S. (Osberg and Sharpe, 2002), estimates for regrettable expenditures were subtracted from personal consumption. However, such data was unavailable for other countries, and since there was little *trend* in the amount of such expenditures in North America, its omission may not be crucial.

By contrast, we have good data on the significant increase in life expectancy in recent years in all the countries examined, and we have every reason to believe that having a long life is an important component of economic well-being. If one wants to measure the current consumption of this generation, 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 (Usher, 1980).

Although a longer life span is valuable to people, GDP numbers will not reveal its importance, and may move in a contrary direction. If people can make more money by assuming more risk,[9] increases in marketed output that come from greater risk taking will have costs in decreased longevity that should be counted in an index of economic well-being.[10] A complicating issue is the fact that the value of more years of healthy life may look very different, the closer one actually is to death. Changes in life expectancy and morbidity 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—and if life expectancy increases from 78 to 79, it is probably valued much less by teenagers than by 77 year olds. To obtain an average impact on well-being, we adjust per capita consumption flows in each year upward by the percentage increase in average life expectancy relative to the base year (1980).[11]

[9]For example, if fishing fleets stay in port because of stormy weather conditions, marketable output and GDP is lower. If they put out to sea, some fish would be caught (GDP would increase) and some boats would sink (average life expectancy would decline). In general, health and safety regulations may both reduce GDP and increase economic well-being.

[10]Ideally, a full appraisal of the value of increased longevity should also consider trends in morbidity and health-adjusted life expectancy (HALE). 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 or lower than life expectancy over time.

[11]Implicitly, this procedure assumes the higher values which older individuals might place on changes in mortality probability are offset by the lower valuations of younger people. As well, it ignores the distribution, by age, of actual changes in mortality probability. Recent research suggests we may be greatly underestimating the importance of increased life expectancy for economic well-being. Murphy and Topel (2002) find that the gains in life expectancy between 1970 and 1990 in the United States were worth about $2.8 trillion per year in the aggregate or about $12,000 per person per year. Nordhaus (2002) finds that the value of increases in life expectancy over the twentieth century is about as large as the value of measured growth in non-health goods and services.

Data on life expectancy are taken from the OECD Health Data CD-ROM. Between 1980 and 1999, all countries enjoyed increased life expectancy, but there was a significant variation across countries in the size of the increase, which is given in brackets: Australia (5.9 percent), Canada (4.8 percent), Norway (3.4 percent), Sweden (4.9 percent), U.K. (4.5 percent), and the U.S. (4.1 percent).

The old saying "Two can live as cheaply as one" may be romantic, but it also exaggerates the fact that when individuals cohabit in households, they save money because they benefit from economies of scale in household consumption.[12] However, households have shrunk in average size in all the countries studied, implying the loss of some of the savings in cost of living that come from sharing a household. Trends in average per capita consumption should, therefore, be adjusted for the average loss in well-being over time due to lessened economies of scale in household consumption. As well, countries differ quite a bit in the average size of households. The average family size for the most recent year available (year in brackets) was: Australia 2.46 (1994); Canada, 2.51 (1994); Norway, 2.19 (1995); Sweden, 1.85 (1992); U.K., 2.55 (1986); and the U.S., 2.58 (1997). 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 (1980 = 100), which is used to adjust personal consumption per capita. Australia had the largest downward adjustment in 1999 relative to 1980 (4.1 percent).

A major defect of GDP as a measure of well-being is that because it counts only market income, it effectively assigns a zero value to leisure time. Among OECD countries there are major differences in both the initial level and trends over time in the average annual number of hours worked. Since these differences in working hours are large—the Swedish/U.S. differential in 1999, for example, is equivalent to about five hours per adult per week—it seems important to take them into account in a measure of economic well-being.

In order to value these differences, we adjust consumption for differences in paid hours relative to a benchmark (U.S. in 1980), with countries having average annual hours worked less than the benchmark having a positive adjustment to consumption and countries having more working time than the benchmark having a negative adjustment. Our methodology amounts 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. If one thinks of total time as being allocated to paid work or household production (i.e. unpaid work) or leisure, then changes in working time mean changes in the non-working time available for *either* home production *or* leisure. Our methodology does not distinguish whether non-working time is valued as a direct source of utility (leisure) or as an indirect source (i.e. because time spent in home production produces goods and services that produce utility). Instead, we account jointly for the opportunity cost of time in home production and leisure. However, time spent in unemployment does not constitute either leisure or home production. To account for

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

involuntary leisure we subtract average annual hours of unemployment per working age person from the relative non-working time estimate (assuming that the unemployed would have wanted the average hours of work of the employed).[13]

Between 1980 and 1999, Australia, Canada, Sweden and the U.S. experienced increases in average working time per working age adult.[14] For example, by 1999, per adult working hours in the U.S. were 197.5 hours above their 1980 level of 1337.4 hours per year. In contrast, annual working hours per working age person declined over the 1980–99 period in Norway and the U.K. Since some of these changes are large (197.5 hours is equivalent to 3.8 hours per week), they imply substantial changes in well-being, which should be reflected in a reasonable measure of economic progress. Compared to a 1980 U.S. base, our imputation for changing non-working time based on the unemployment adjustment was, by 1999, worth $1234 per capita in Norway (1995 U.S. dollars), $276 for Sweden, –$265 for the U.K., –$25 for Canada, –$255 for Australia and –$1,516 for the U.S.

If we are to measure the value of consumption, we should count the provision of non-marketed or heavily subsidized services by the government as part of the consumption flow. Current expenditure data for 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 and in 1995 U.S. dollars. The importance of government final consumption expenditures relative to personal consumption expenditures differs markedly among OECD countries. In 1999, it ranged from a high of 51.0 percent in Sweden to a low of 20.7 percent in the U.S. Norway (43.4 percent), Canada (34.7 percent), Australia (30.0 percent), and the U.K. (29.0 percent) were intermediate cases. In addition, over the period there were major differences across countries in the rate of growth of real per capita government final consumption expenditures.

Total Consumption Flows

Total per capita consumption is defined as personal consumption (adjusted for changes in average household size), the adjusted relative value of leisure, and government services, the sum of which is adjusted for longevity of life. As shown in Table 1, between 1980 and 1999 the increase in real per capita total consumption flows ranged from a low of 21.1 percent in Sweden to a high of 52.6 percent in the U.K. Canada (23.4 percent), the U.S. (38.2 percent), Australia (41.6 percent), and Norway (47.9 percent) were intermediate cases.

[13]The psychological costs to unemployment imply that jobless time may have strong disutility (Clark and Oswald, 1994). We cannot, in this paper, provide estimates of the negative utility of unemployment time, nor the partial value of such time—instead, we assign such hours zero value.

[14]Annual average hours worked per working age person (ages 15–64) depend on the fraction of the population that has employment, the number of weeks per year which employed people typically work and their average hours of work per week. Countries differ primarily in the proportion of people who participate in full time paid employment (particularly large differences are observed for married women and men 50 to 64)—however in this paper we ignore *how* differences in average working hours are generated.

TABLE 1

CONSUMPTION—COMPONENTS OF AVERAGE PERSONAL CONSUMPTION

Year	Personal Consumption per capita (95 U.S.$) (A)	Average Family Size, Persons (B)	Index of Equivalent Income 1980 = 1.00 (C) = index of the square root of (B)	Adjusted Relative Cost of Leisure per capita (95 U.S.$) (D)	Government Final Consumption Expenditures per capita (95 U.S.$) (E)	Index of Life Expectancy 1980 = 1.00 (F)	Index of Total Consumption Flows per capita (G) = index of (A * C + D + E) * (F)
Australia							
1980	10,167	2.68	1.000	157	3,200	1.000	1.000
1999	14,571	2.46	0.958	–255	4,376	1.059	1.416
Canada							
1980	10,729	2.68	1.000	307	4,557	1.000	1.000
1999	13,974	2.51	0.969	–25	4,855	1.048	1.234
Norway							
1980	8,541	2.48	1.000	869	3,340	1.000	1.000
1999	12,363	2.19	0.941	1,234	5,366	1.034	1.479
Sweden							
1980	8,918	1.89	1.000	477	4,662	1.000	1.000
1999	10,648	1.85	0.988	276	5,434	1.049	1.211
U.K.							
1980	8,260	2.68	1.000	64	3,268	1.000	1.000
1999	13,170	2.55	0.976	265	3,813	1.045	1.526
U.S.							
1980	14,084	2.59	1.000	0	3,778	1.000	1.000
1999	20,950	2.58	0.997	–1,516	4,345	1.041	1.382

Source: Data Appendix posted at www.csls.ca under Index of Economic Well-being.

2.2. *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. The well-being of future generations depends on their inheritance of real productive assets, broadly conceived to include natural and human resources as well as physical capital stock. These real stocks will determine whether a society is on a long-run sustainable trajectory of aggregate consumption, irrespective of the distribution of claims on aggregate 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—all of which enable future potential consumption flows, and economic well-being. Data for the 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.[15] Between 1980 and 1999, the increase in the fixed capital stock, on a per capita basis, was notably less in

[15]See Coulombe (2000) who notes that the average depreciation rate for Canada's business sector capital stock over the 1961–97 period was 10 percent compared to 4.4 percent in the U.S.

the U.S. (30.8 percent), and Australia (27.6 percent) than in the U.K. (41.0 percent), Norway (39.9 percent), Canada (33.1 percent) and Sweden (32.5 percent).

In a knowledge-based economy, the stock of skills embodied in the workforce is also a crucial determinant of future economic well-being. There is a strong relationship between educational attainment and individual income and there is substantial evidence that education yields significant social benefits, over and above its impact on individual earnings. Although school retention and participation in post-secondary education have increased dramatically in many countries over the past three decades, human capital is intangible and is not now counted in balance sheet estimates of national wealth.

This paper estimates investment in human capital from the cost side, using the cost per year of education expenditures at the primary, secondary and post secondary levels. 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 are 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 U.S.) to all countries.

In an era of rapid technological change, expenditure on R&D is also 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 percent on the declining balance is assumed. Between 1980 and 1999, the per capita real business enterprise R&D stock increased proportionately quite rapidly in Australia and Canada—but from a relatively small base. The U.S. started with the greatest absolute stock of R&D investment and the absolute size of the increase in R&D capital in the U.S. ($1,274) is much larger than in Norway ($626), Australia ($567), Canada ($720), and U.K. ($337).[16] Only Sweden comes close at $1,010.

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. Data on trends are not available but the World Bank (1997) has produced estimates for one year (1994) of natural capital or "the entire environmental patrimony of a country" for nearly 100 countries—defined to include pastureland, cropland, timber resources, non-timber forest resources, protected areas, and sub-soil assets. On a per capita basis expressed in 1994 U.S. dollars, the values were: Canada ($36,590), Australia ($35,340), Norway ($30,220), U.S. ($16,500), Sweden ($14,590), U.K. ($4,940). Because of the lack

[16]The R&D investment series starts in 1970 so that the stock of R&D in 1970 is equal to the R&D investment that year and the series has a base of zero in 1969.

of availability of time series data, the value of natural resources is not included in the stocks of wealth component of the Index at this time.

In general, a financial instrument can be seen from two angles—it is both an asset to the holder and a liability to the issuer. If both persons are residents of the same country, these assets and liabilities offset each other. We therefore 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. Although the distribution of financial assets/liabilities will play a major role in *allocating* the future returns to the capital stock, the issue at this point is the *aggregate value* of the intergenerational bequest. However, 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 home country citizens, increases in the level of net foreign indebtedness do 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 deflated by the U.S. GDP deflator and adjusted for population to obtain real per capita estimates in the net international investment position, expressed in 1995 U.S. dollars.

As is the case with 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 wealth accumulation. 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.[17] 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 the globalized social costs of CO_2 emissions (with no adjustment for different national costs) at $20 U.S. per ton in 1990. According to data from the International Energy Agency, world CO_2 emissions in 1995 were 22,160 million metric tons. Based on the $20 U.S. per ton cost of CO_2 emissions, the world social cost of CO_2 emissions was $442,000 million. This amount was allocated on the basis of a country's share of real world GDP, expressed in U.S. dollars, 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 (worth, for example, –$317 (1995 U.S. dollars) in Canada in 1999.

[17]The conceptual issues to be dealt with in estimating the costs of CO_2 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.

Estimates of Total Wealth

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 CO_2 emissions are subtracted from the stocks of wealth.

For the 1980–99 period, estimates for the five components of the wealth stock included in this paper (Table 2) indicate per capita real wealth stocks increased by 18 percent in the U.S., much less than Norway's 55.7 percent. Sweden (20.1 percent), the U.K. (28.2 percent), Australia (30.5 percent) and Canada (35.8 percent), were intermediate cases.

TABLE 2

ACCUMULATION—STOCKS OF WEALTH, 1995 U.S.$

Year	Total Net Fixed Capital per capita	Total Business Enterprise Expenditures on R&D per capita	Total Net International Investment Position per capita	Human Capital Stock per capita	Greenhouse Gas Emission Cost per capita	Total Real per capita Wealth	Index of Total Real per capita Wealth 1980 = 1.00
Australia							
1980	44,827.5	179.4	–8,536.7	18,562.4	–299.8	54,732.8	1.0000
1999	57,188.5	746.4	–10,838.0	24,663.8	–318.6	71,442.1	1.3053
Canada							
1980	22,578.6	336.7	–6,491.5	20,563.7	–333.5	36,654.0	1.0000
1999	30,043.7	1,057.6	–6,342.3	25,347.5	–317.2	49,789.3	1.3584
Norway							
1980	51,037.4	386.6	–8,041.8	19,570.4	–301.0	62,651.7	1.0000
1999	71,425.8	1,012.9	–2,312.6	27,747.4	–339.9	97,533.6	1.5568
Sweden							
1980	43,345.3	1,593.9	–3,953.1	22,057.6	–311.8	62,731.9	1.0000
1999	57,442.7	2,604.0	–8,085.6	23,693.1	–294.0	75,360.1	1.2013
U.K.							
1980	40,111.4	850.6	1,320.8	20,055.8	–264.4	62,074.2	1.0000
1999	56,567.9	1,188.1	–3,506.2	25,629.4	–282.7	79,596.6	1.2823
U.S.							
1980	50,414.2	1,324.9	1,931.6	24,443.9	–779.4	77,335.2	1.0000
1999	65,956.9	2,599.0	–5,022.5	28,709.8	–1,006.7	91,236.5	1.1798

Source: Data Appendix posted at www.csls.ca under Index of Economic Well-being.

2.3. *Income Distribution—Inequality and Poverty*

Would economic well-being remain the same, if a society in which everyone has $500 income had a redistribution of income so that half the population had $999 and the other half had $1? Average income would remain unchanged, but the more equal society is likely to generate more aggregate utility.[18] 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

[18]Because an additional dollar of income means less to a millionaire than to a pauper, economists tend to agree that "diminishing marginal utility" is a reasonable assumption.

TABLE 3

DISTRIBUTION—ECONOMIC INEQUALITY AND POVERTY

Year	Gini Coefficient (A)	Poverty Rate (B)	Average Poverty Gap (% of Poverty Line) (C)	Poverty Intensity D = B * C	Poverty Intensity Index D′	Gini Coeff. (income after tax), Index A′	Overall Index of Inequality E = −1 * (D′ * 0.75 + A′ * 0.25)
Australia							
1980	0.3040	15.48	26.73	0.0414	1.0000	1.0000	−1.000
1999*	0.3378	17.48	27.66	0.0484	1.1685	1.1112	−1.154
Canada							
1980	0.3099	15.36	30.93	0.0475	1.0000	1.0000	−1.000
1999*	0.3238	13.52	32.71	0.0442	0.9311	1.1045	−0.960
Norway							
1980	0.2500	6.35	34.66	0.0220	1.0000	1.0000	−1.000
1999*	0.2659	9.15	28.53	0.0261	1.1866	1.0636	−1.156
Sweden							
1980	0.2139	5.49	36.02	0.0198	1.0000	1.0000	−1.000
1999*	0.2530	8.65	36.64	0.0317	1.6024	1.1832	−1.498
U.K.							
1980	0.2903	9.20	19.93	0.0183	1.0000	1.0000	−1.000
1999*	0.3430	13.20	28.49	0.0376	2.0512	1.1816	−1.834
U.S.							
1980	0.3314	17.96	34.80	0.0625	1.0000	1.0000	−1.000
1999*	0.3869	17.93	33.62	0.0603	0.9643	1.1677	−1.015

Source: Authors' calculations from LIS Database.

Notes: Poverty line = one half of median equivalent income; equivalent income = net family income after taxes adjusted by equivalence scale (square root of family size). Negative or zero income excluded.

Average Poverty Gap = ratio of the gap (between poverty line and mean equivalent income of those under poverty line) to poverty line.

*Or most recent year for which LIS data available for certain variables.

average incomes, compared to changes in inequality, cannot be specified by economic theory.

As well, poverty is not quite the same issue as inequality. Since the economic well-being of the population is affected both by inequality in the distribution of income among all people and by the adequacy of incomes for the least well-off (i.e. 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 to recognize explicitly these issues would place some weight (β) on a measure of inequality in the aggregate distribution of income and some weight ($1-\beta$) on a measure of poverty.

The most popular measure of inequality in the distribution of income is undoubtedly the Gini index of after-tax, after transfer household income. For the most recent year for which data are available for each country, this was largest (hence income inequality greatest) in the U.S. (0.387) and lowest in Sweden (0.253). 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 (Osberg and Xu, 2000). 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 poverty rate, defined as the proportion of households with income below one half median equivalent after-tax household income, varies greatly among the countries for which LIS data are available. In the mid 1990s, it ranged from a high of 18.0 percent in the U.S. and 17.5 percent in Australia to Canada (13.5 percent), U.K. (13.2 percent), Norway (9.2 percent), and Sweden (8.7 percent). There was much less variation across countries in the average poverty gap ratio: Sweden (36.6 percent), U.S. (33.6 percent), Canada (32.7 percent), Norway (28.5 percent), U.K. (28.5 percent), and Australia (27.7 percent).

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 former receiving a weight of 0.75 and the latter a weight of 0.25. The index is multiplied by –1 in order to reflect the convention that increases are desirable. Unfortunately, the LIS database allows calculation of a long time series of income distribution estimates for only a few countries. Hence, values of the income distribution and poverty variables in the years before the first LIS estimate for that country are assumed equal to the estimate for the first year of LIS data and the values for the years after the last LIS estimate are assumed equal to the estimate of the last year of LIS data. In this (and other) respects our estimates can certainly be improved, as more complete data series become available.

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 what the future holds 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, 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 significant potential economic losses.'' 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 are not widely available.

For these reasons, rather than attempt an overall measure of subjective economic insecurity, this paper adopts a ''named risks'' approach, and addresses the change over time in four key objective 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)[19]

For this paper, we construct measures of the percentage change over time in the economic risks associated with unemployment, illness, "widowhood" (interpreted here as 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 itself is the product of a number of underlying probabilities. We weight the prevalence of economic risks by the proportion of the population that it affects. The core hypothesis underlying the measure of economic insecurity we propose 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 and the extent to which people are protected from the income losses of unemployment. We have taken changes in the employment rate (employment/population ratio) as a proxy for the risk of unemployment[20] since changes in this ratio reflect both 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. Internationally comparable data on these two variables, particularly the first, have proven very difficult to obtain. Hence, an unpublished OECD series on the gross replacement rate for the unemployed has been used in the calculation of the risk of unemployment. (This series shows a markedly different trend than the UI coverage rate for certain countries such as Canada in the 1990s.)

In this paper, we do not attempt to model the psychological insecurities associated with health or confront the issue of whether more education and greater knowledge of potential health risks (even risks of very small probability—such as "mad cow disease") produce greater or less anxiety. Our focus is on the economic losses associated with illness, which certainly dropped considerably with the introduction of universal health insurance in many countries. However, data limitations force us to ignore trends in the risk of loss of earnings. Historically, a portion of the labor 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.

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

[19]Today, the gender specificity of the language of 1948 will strike many people as odd—but Article 2 makes it clear that all rights are to be guaranteed to male and female persons equally.

[20]Our approach is broadly consistent with that of Di Tella, MacCulloch, and Oswald (2001), but will provide lower estimates of the aggregate costs of increases in unemployment since the employment/population ratio exhibits less variability than the unemployment rate.

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 premiums and net of insurance reimbursement for medical expenses), which ranged from a high of 8.8 percent in the U.S. to a low of 1.3 percent in the U.K. in 1999. The proportion in the other countries was: Canada (3.5 percent), Australia (3.3 percent), Sweden (1.7 percent), and Norway (1.6 percent).

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)[21] × (the average poverty gap ratio among single female parent families).[22] 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. As well, we have not modeled the economic risks to children associated with trends in out of wedlock births. Arguably, over time the social costs associated with these trends (e.g. stigma) have changed, as the institution of marriage itself has changed—but such issues lie well beyond the scope of this paper.

Data on divorce rates are drawn from the *UN Demographic Yearbook* and estimates of the poverty rate and poverty gap ratio for single female parents calculated from the LIS micro-data tapes. The annual divorce rate in 1996 (or the most recent year before 1996 for which data are available) was 4.33 percent of legally married couples in the U.S.—significantly higher than in the U.K. (2.89 percent), Australia (2.86 percent), Canada (2.62 percent), Sweden (2.42 percent), and Norway (2.28 percent).

International differences in the economic consequences of single parent status reinforce differences in its probability. The poverty rate for single female parents in the most recent year (in brackets) from LIS micro-files ranged from a high of 45.2 percent (1997) in the U.S. to a low of 2.8 percent (1992) in Sweden—in between were Australia, 40.7 percent (1994); Canada, 43.3 percent (1998); U.K., 13.8 percent (1986); and Norway, 11.3 percent (1995). The average poverty gap ratio for single female parents in the same year was: Norway (41.6 percent),

[21]However, RATE = INCIDENCE × 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. Inadequacy of data preclude examination of household dissolution among co-habiting couples.

[22]This procedure effectively ignores single male parents, which can be justified on the grounds that males comprise, in all six countries, a small percentage of the single parent population, and their income loss on divorce is considerably less than that of women.

U.S. (39.8 percent), Canada (30.0 percent), Australia (24.5 percent), and U.K. (23.6 percent).

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 ranged from a high of 33.1 percent (1994) in Australia to U.S., 24.4 percent (1997); Norway, 12.0 percent (1995); Sweden, 6.0 percent (1992); U.K., 5.4 percent (1986); and Canada, 6.3 percent (1998). The average poverty gap ratio for the elderly in the same years ranged from a low of 9.3 percent in Norway to 27.6 percent in Australia. The U.S. (28.3 percent), Canada (14.8 percent), Sweden (12.7 percent), and U.K. (11.7 percent) were in between.

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, since increases in health costs, single parent poverty and elderly poverty risk are negative for economic well-being, we multiply such risks by −1. An increased negative value therefore represents a decline in well-being.

Overall Index of Economic Security

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 percent.
- 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 1999 were the following: unemployment (0.2772), illness (0.4066), single parenthood (0.2072), and old age (0.1090).[23] 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.

2.5. *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

[23]In order that the base year for the indexes of all risks of economic security be the same at 1.000 in Table 4, the constant 2 has been added to the indexes of risk of illness, single parenthood, and old age, whose original base was −1.

TABLE 4

ECONOMIC SECURITY

Year	Index 1 Unemployment	Index 2 Health (+2)	Index 3 Single Parent Poverty (+2)	Index 4 Old Age Poverty (+2)	Weighted Index 1 Unemployment	Weighted Index 2 Health	Weighted Index 3 Single Parent Poverty	Weighted Index 4 Old Age Poverty	Average Weighted Index of Economic Security
Australia									
1980	1.0000	1.0000	1.0000	1.0000	0.2729	0.4189	0.2283	0.0799	1.0000
1999	1.1656	0.9329	1.3656	–0.6293	0.3210	0.3830	0.2875	–0.0652	0.9262
Canada									
1980	1.0000	1.0000	1.0000	1.0000	0.2791	0.4114	0.2316	0.0779	1.0000
1999	1.2521	0.2926	1.3424	1.8814	0.3471	0.1190	0.2781	0.2051	0.9493
Norway									
1980	1.0000	1.0000	1.0000	1.0000	0.2655	0.4210	0.2231	0.0905	1.0000
1999	1.6829	0.7509	0.5885	1.6596	0.4615	0.3180	0.1204	0.1622	1.0621
Sweden									
1980	1.0000	1.0000	1.0000	1.0000	0.2781	0.4339	0.1902	0.0978	1.0000
1999	1.0031	–0.0637	1.7717	0.7801	0.2771	–0.0274	0.3193	0.0884	0.6575
U.K.									
1980	1.0000	1.0000	1.0000	1.0000	0.2643	0.4127	0.2304	0.0926	1.0000
1999	0.7876	0.0925	1.0955	1.1901	0.2124	0.0383	0.2396	0.1160	0.6064
U.S.									
1980	1.0000	1.0000	1.0000	1.0000	0.2809	0.4238	0.2109	0.0843	1.0000
1999	1.0812	0.4133	1.1736	1.3419	0.3047	0.1771	0.2250	0.1315	0.8384

Source: Data Appendix posted at www.csls.ca under Index of Economic Well-being.

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.[24]

For discussion purposes, our "standard" weighting gives each component an equal weight 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, we assign a weight of 0.75 to poverty and 0.25 to inequality. The subcomponents of the economic security index are weighted by the relative importance of the specific population at risk in the total population.

3. ECONOMIC WELL-BEING OVER TIME

We are acutely conscious that the data sources available to us are far from what we would like. We know that restricting ourselves to internationally comparable data series has meant that we have neglected issues (such as the decline in UI coverage in Canada) which are important for some countries. We also know the reliance on interpolation between the data points available in the Luxembourg Income Study implies, necessarily, that we cannot detect short period fluctuations in the distribution and security components of our index. 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.

[24]An Excel spreadsheet with the required data and programs is available on request from the authors.

TABLE 5

INDEX OF ECONOMIC WELL-BEING

Year	Consumption per capita [A]	Wealth Stocks per capita [B]	Income Distribution [C]	Economic Security [D]	Well-being Index (equal weighting)	Well-being Index (alternative weighting)	GDP per Capita Index
Australia							
1980	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1999	1.4155	1.3053	0.8458	0.9262	1.1232	1.2986	1.4779
Canada							
1980	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1999	1.2341	1.3584	1.1040	0.9243	1.1393	1.1962	1.3228
Norway							
1980	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1999	1.4787	1.5568	0.8441	1.0621	1.2354	1.3814	1.5703
Sweden							
1980	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1999	1.2113	1.2013	0.5024	0.6575	0.8931	1.0840	1.3113
U.K.							
1980	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1999	1.5257	1.2823	0.1662	0.6064	0.8952	1.2735	1.4873
U.S.							
1980	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1999	1.3822	1.1798	0.9848	0.8260	1.0932	1.2666	1.4970

Note: Equal weighting: Well-being index = $0.25 * A + 0.25 * B + 0.25 * C + 0.25 * D$
Alternative weighting: Well-being index = $0.7 * A + 0.1 * B + 0.1 * C + 0.1 * D$
Source: Data Appendix posted at www.csls.ca under Index of Economic Well-being.

Since we want to examine the sensitivity of a measure of economic well-being to alternative possible weightings of consumption, accumulation, income distribution and insecurity, Figures 2 to 7 present both a "standard" weighting, which assigns equal weight to each component, and a "consumption-oriented" alternative, which is much more heavily weighted to average consumption (0.7), and has much less weight on accumulation (0.1), income distribution (0.1) and insecurity (0.1). For each country, we compare trends in the "standard" and "alternative" indices with trends in GDP per capita.

For all countries, consideration of bequest, inequality/poverty and insecurity reduces the measured rate of growth of economic well-being, compared to the use of the GDP per capita index. 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.[25]

[25]In a mathematical sense, our indices of both consumption and wealth stocks accumulated could grow without numerical limit. This may not be environmentally possible, but it is true that these time series do not have the same mathematical properties as economic security or equality, which are inherently upper-bounded. However, we do not think this is very important. We think of the IEWB as an index of economic well-being that has defensible properties in the region of the range of values observed in actual historic data. We would not argue that extreme values of any of the components of the Index of Economic Well-being could be interpreted in the same way. If per capita consumption or wealth were to approach zero, a linear interpretation of their contribution to well-being would make little sense, and the same is true for the interpretation of indices of equality and security, were they to approach zero. We think that it is not really possible to evaluate a state of absolute equality, or absolute security, or a consumption level of a trillion dollars per year, or comparable wealth stocks, and it is also not very relevant. Real world societies are nowhere close to such extreme bounds and not likely to be in the future. However, the evaluation of economic well-being over the range of values historically observed is an important issue, and is the focus of this paper.

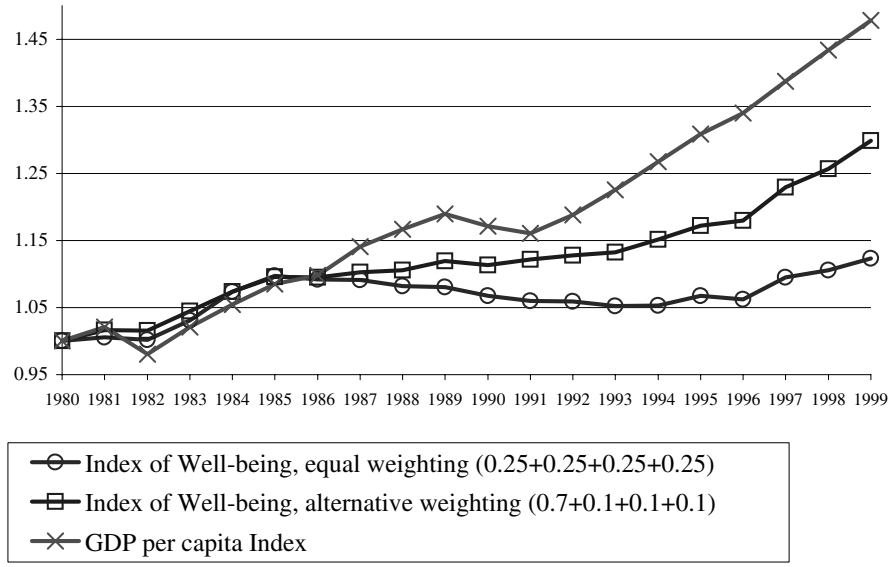

Figure 2. Australia

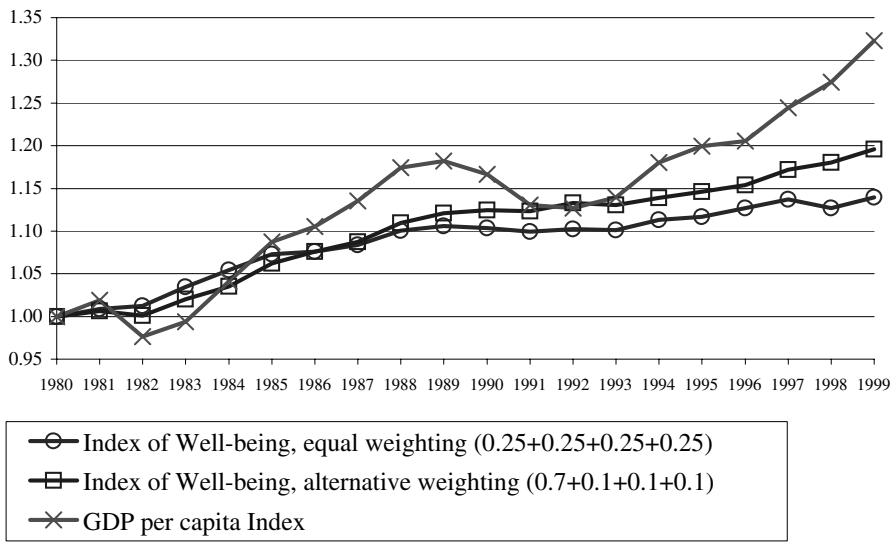

Figure 3. Canada

In some countries, the change in the perception of trends in well-being is striking. In the U.S., GDP per capita increased by approximately 50 percent over the 1980 to 1999 period, but our "standard" index is much flatter, with a total increase of 9 percent over the period. In the U.K., increases in per capita GDP were of similar size (48.7 percent), but our "standard" weighting (which has a heavy emphasis on economic inequality and insecurity) shows a decline of about 10 percent. Both the U.S. and the U.K. have been marked by a substantial

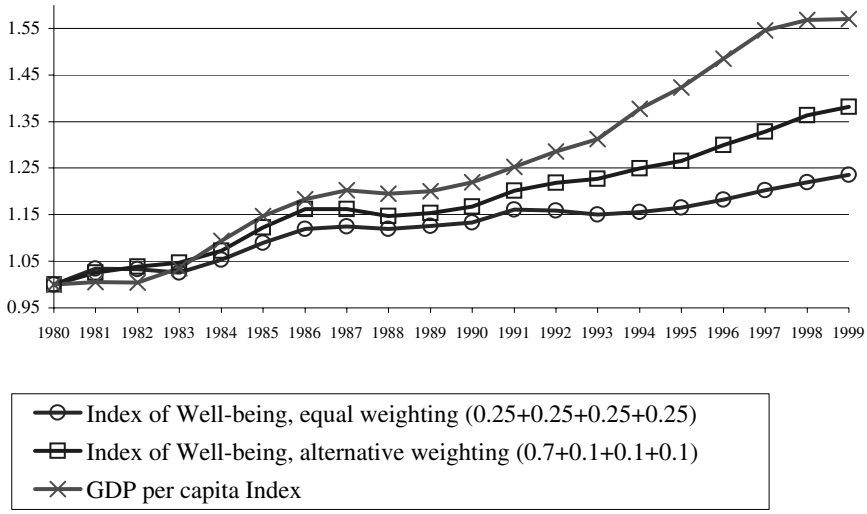

Figure 4. Norway

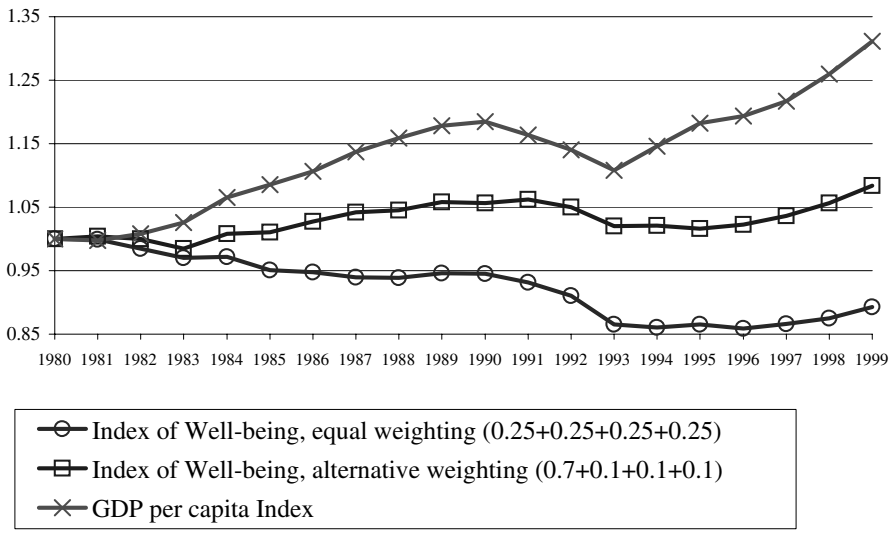

Figure 5. Sweden

increase in economic inequality over this period, and increases in money income have been limited to the top end of the income distribution (see Osberg, 2002). 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.

For the U.K. and Sweden, GDP per capita rose, while our "standard" index of economic well-being declined. In both cases, however, this qualitative result is quite sensitive to the relative weighting of current consumption compared to distribution and insecurity—the "consumption oriented alternative" index does

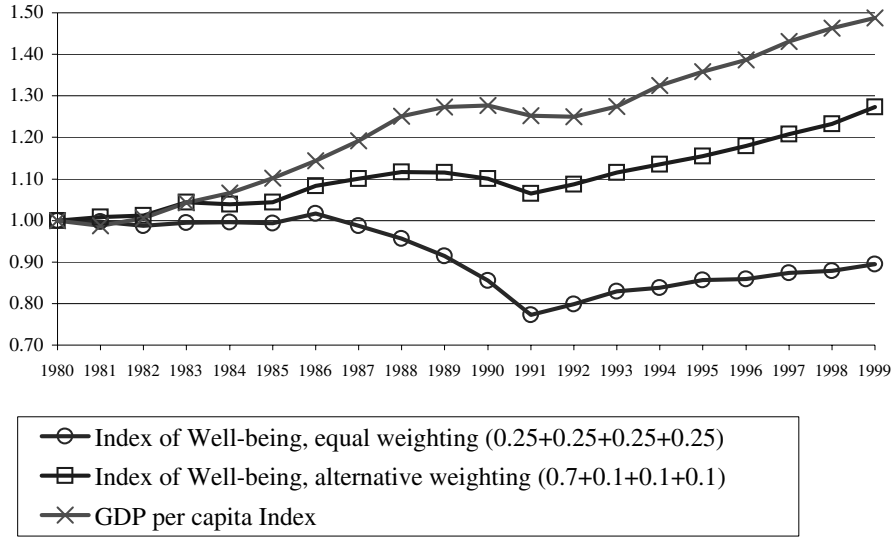

Figure 6. United Kingdom

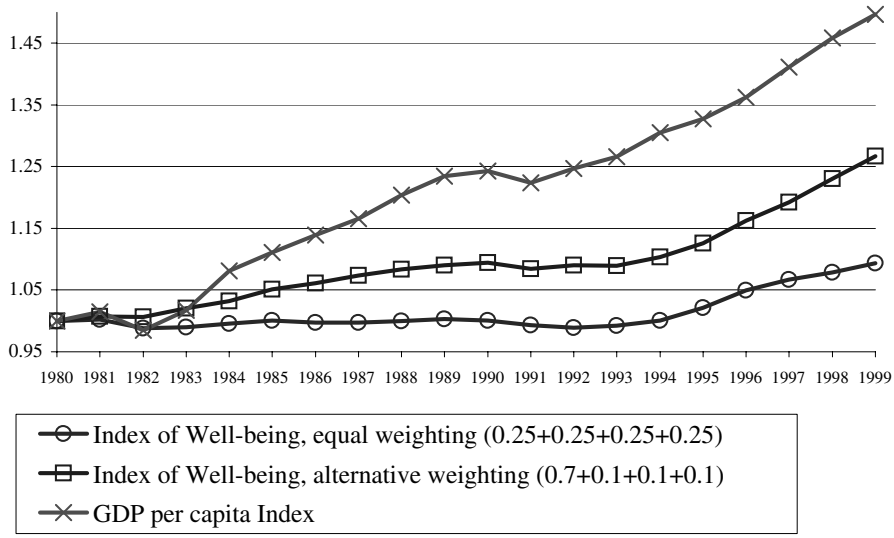

Figure 7. United States

not actually decline[26] (although it is almost flat in Swedish data). As Osberg and Xu (2000) note, recent years have seen an increase in Swedish poverty intensity, hence it is not surprising that an index which weights heavily trends in income distribution and insecurity should show a deterioration.

[26]As well, we would caution that because we have not been able to obtain, for this paper, estimates of the income replacement provided under unemployment insurance in these countries, we may be overestimating the importance for economic insecurity of the rise in unemployment in these countries.

From 1980 to 1999, Norway has the greatest increase in both GDP per capita and economic well-being, by all our calculations. In Norway, trends in economic well-being are, more or less, scaled down versions of the trend in GDP per capita. In this case, our current estimates of trends in the Index of Economic Well-being could be said to provide relatively little "value added," compared to trends in GDP per capita, since each index moves in much the same way over time (albeit showing much stronger growth in GDP per capita than in economic well-being).

However, Australia and Canada—whose economies share a relative dependence on raw materials production—are noteworthy in showing a greater cyclical sensitivity in GDP per capita than one finds in either measure of economic well-being, or in GDP per capita in other countries. In Canada and Australia, the recessions of both the early 1980s and early 1990s show up clearly in per capita GDP fluctuations—to a much greater degree than in Norway (the early 1980s recession is even less apparent in U.K. or Swedish GDP per capita data). However, in both Canada and Australia the trend in economic well-being indices is much smoother than in GDP, because changes in current income can be much more rapid than changes in wealth stocks, income distribution and insecurity.

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 describing trends, one can focus on changes at the margin (such as the *change* in environmental quality) and finesse the valuation of infra-marginal units (by avoiding the necessity of making an estimate of the total value of environmental amenities enjoyed by citizens of different 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, this paper avoids direct commentary on comparative levels of economic well-being. This issue will be addressed in future work.

4. Conclusion

Early economists were fairly broad in their conception of "prosperity," but were in no doubt that it had many positive implications. More recently, the measure of economic success has been narrower—and it falls to critics of the SNA to show that alternative measures to GDP per capita are possible, plausible and make some difference. This paper has, therefore, developed an Index of Economic Well-being based on four dimensions or components of economic well-being for selected OECD countries—consumption, accumulation, income distribution, and economic security. A key finding is that economic well-being, for at least two different sets of relative weights, has increased at a much slower rate over the last 20 years than real GDP per capita, a widely-used indicator of economic well-being.

In Norway, trends in economic well-being are qualitatively, if not quantitatively, similar to trends in GDP per capita. However, in two countries (Australia and Canada) trends in well-being are cyclically dissimilar to GDP per capita trends. In the U.S. and the U.K. the secular trend one perceives in economic well-being depends heavily on whether one uses GDP per capita or a broader index of economic well-being which includes consideration of income distribution and economic insecurity—and the same is even more true of Sweden. In some countries (e.g. Sweden) the trend one perceives in economic well-being is very sensitive to the relative weighting of consumption, accumulation, distribution and insecurity—but in others this sensitivity is much less pronounced. In short, even with the highly imperfect data available for this study, there is a good deal more information content in using a broader measure of economic well-being than GDP per capita.

Appendix 1: Mathematical Formula for the Index of Economic Well-being

The formula for the overall index follows:

$$\begin{aligned} IEWB = {} & 0.25[C + UP + G + WT](LE) + 0.25[K + R\&D + HC + NR + -D - ED] \\ & + 0.25[(0.75(LIM) + (0.25)Gini] \\ & + 0.25[(0.2772)UR + (0.4066)ILL + (0.2072)SPP + (0.1090)OLD] \end{aligned}$$

where

IEWB = index of economic well-being
C = real per capita adjusted personal consumption
G = real per capita current government spending excluding debt charges
WT = real value of changes in working time
UP = real value of per capita unpaid labor
K = real per capita capital stock (including housing)
LE = index of life expectancy
R&D = real per capita stock of research and development
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 (CO_2 emissions)
LIM = poverty intensity
Gini = Gini coefficient
UR = risk from unemployment
ILL = risk from financial illness
SPP = risk from single parenthood poverty
OLD = risk from poverty in old age

References

Burkhauser, R. V., T. M. Smeeding and J. Merz, "Relative Inequality and Poverty in Germany and the United States Using Alternative Equivalence Scales," *The Review of Income and Wealth*, 42(4), 381–400, 1996.

Clark, A. and A. Oswald, "Unhappiness and Unemployment," *The Economic Journal*, 104(424), 648–59, 1994.
Cobb, C., T. Halstead, and J. Rowe, *The Genuine Progress Indicator*: *Summary of Data and Methodology*, Redefining Progress, San Francisco, 1995.
Coulombe, S., "The Canada–U.S. Productivity Growth Paradox," Industry Canada, Ottawa, Working Paper Number 12, March 2000.
Dawson, J. C. (ed.), *Flow-of-Funds Analysis*, M.E. Sharpe, Armonk, 1996.
Di Tella, R., R. J. MacCulloch, and A. J. Oswald, "The Macroeconomics of Happiness," Mimeo, October 2001.
Fankhauser, S., "Evaluating the Social Costs of Greenhouse Gas Emissions," *Energy Journal*, 15, 157–84, 1995.
Gervais, G., "The Size of the Underground Economy in Canada," *Studies in National Accounting*, Catalogue Number 13–603-MPE, No. 2, Statistics Canada, 1994.
Hagerty, M., R. A. Cummins, A. L. Ferris, K. Land, A. C. Michalos, M. Peterson, A. Sharpe, J. Sirgy, and J. Vogel, "Quality of Life Indexes for National Policy: Review and Agenda for Research," *Social Indicators Research*, 1–96, 2001.
Kendrick, J. W. (ed.), *The New System of National Accounts*, Kluwer Academic Publishers, Boston, 1996.
Keuning, S., "A Powerful Link Between Economic Theory and Practice: National Accounting," *The Review of Income and Wealth*, 44(3), 437–46, 1998.
Land, K., "Social Indicators", in E. F. Borgatta and R. V. Montgomery (eds), *Encyclopedia of Sociology*, revised edition, MacMillan, New York, 2000.
Murphy, K. and R. Topel, "The Economic Value of Medical Research," in K. Murphy and R. H. Topel (eds), *Exceptional Returns*, University of Chicago Press, Chicago, 2002.
Nordhaus, W., "The Health of Nations: The Contribution of Improved Health to Living Standards," in K. M. Murphy and R. H. Topel (eds) *Exceptional Returns*, University of Chicago Press, Chicago, 2002.
Nordhaus, W. and J. Tobin, "Is Growth Obsolete?" *Economic Growth*, Fiftieth Anniversary Colloquium V, National Bureau of Economic Research, New York, 1972.
Osberg, L., "The Measurement of Economic Welfare," in D. Laidler (Coordinator), *Approaches to Economic Well-Being*, The Royal Commission on the Economic Union and Development Prospects for Canada (MacDonald Commission), Vol. 26, University of Toronto Press, Toronto, 1985.
———, "Economic Insecurity,' Social Policy Research Centre, Discussion Paper No. 88, University of New South Wales, Sydney, Australia, 1998.
———, "Long Run Trends in Income Inequality in the USA, UK, Sweden, Germany and Canada—A Birth Cohort View," forthcoming in *Eastern Economic Journal*, 2002.
Osberg, L. and A. Sharpe, "An Index of Economic Well-Being for Canada," paper presented at the CSLS Conference on the State of Living Standards and Quality of Life in Canada, Ottawa, Ontario (paper posted at www.csls.ca under conferences), October 30–31, 1998, also Research Paper R-99-3E, Applied Research Branch, Human Resources Development Canada, December 1998.
———, "The Index of Economic Well-being: An Overview," *Indicators: The Journal of Social Health*, Spring, 24–62, 2002.
Osberg, L. and K. Xu, "International Comparisons of Poverty Intensity: Index Decomposition and Bootstrap Inference," *Journal of Human Resources*, 35(1), Winter, 51–81, 2000.
Phipps, S. and T. I. Garner, "Are Equivalence Scales the same for the United States and Canada?" *The Review of Income and Wealth*, 40(1), 1–18, 1994.
United Nations in Collaboration with Eurostat, International Monetary Fund, Organization for Economic Co-operation and Development, and World Bank, *System of National Accounts 1993*, Series F, No. 2, Rev. 4, Joint Publication by Eurostat, IMF, OECD, UN and the World Bank, New York, 1993.
United Nations Development Programme, *Human Development Report, 2001*, Oxford University Press, New York, 2001.
Usher, D., *The Measurement of Economic Growth*, Basil Blackwell, Oxford, 1980.
Wolfson, M., "Health-Adjusted Life Expectancy," *Health Reports*, 8(1), Summer, 41–5, 1996.
World Bank, "Expanding the Measure of Wealth: Indicators of Environmentally Sustainable Development," *Environmentally Sustainable Development Studies and Monographs*, Series No. 17, World Bank, Washington, DC, 1997.