Human Well-being and Economic Well-being:
What Values Are Implicit in Current Indices?

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Abstract

This paper develops an Index of Economic Well-being (IEWB) for the United States, the United Kingdom, Canada, Australia, Germany, Norway and Sweden for the period 1980 to 2001 which recognizes four components:
> Current effective per capita consumption flows;
> Net societal accumulation of stocks of productive resources;
> Income distribution;
> Economic security.

Since the Human Development Index uses GDP per capita to measure "command over resources", which implicitly makes the strong value judgment that inequality and insecurity do not matter, the paper demonstrates that a better measure of "command over resources" has a significant effect on the trend and level of the HDI – particularly for the United States, which slips to last place among the countries examined.

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An Overview of the Index of Economic Well-being

Has the well-being of society increased or decreased in recent years?

Is well-being greater in some places than in others?

The focus of this paper is the measurement of the economic component of societal well-being – with special emphasis on the sensitivity of measures of aggregate "command over resources" to the omission or inclusion of measures of income distribution and economic security. The paper is divided into three main parts and several appendices. The first appendix is especially long because it summarizes the practical details of how we estimate the four key components of our Index of Economic Well-being (IEWB) – consumption flows, stocks of wealth, equality, and security. These data are used in part two of the main text, which presents preliminary estimates of the overall index and its components for the United States, the United Kingdom, Germany, Canada, Australia, Norway and Sweden from 1980 to 2001.[2] Part three compares trends in the Index and its components to trends in GDP per capita and the HDI. Part four examines

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[1] Paper presented at WIDER Conference on Inequality, Poverty and Human Well-being in Helsinki, 30-31 May 2003 and at the CSLS session on Indexes of Economic and Social Well-being at the annual meeting of the Canadian Economics Association, Carleton University, Ottawa, Ontario, May 30-June 1, 2003. This paper is a significant revision and extension of work that has been previously presented at a number of conferences (e.g. 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, August 31, 2000, Cracow, Poland) and published in several journals (e.g. Osberg and Sharpe 2002a,b; 2003) We would like to thank the discussants at those meetings and the anonymous referees for their extensive comments. Julia Salzman, Dimitry Kabelyan, Olivier Guilbaud and Lynn Lethbridge did outstanding work as research assistants and deserve much of the credit for all our work. Remaining errors are our responsibility. All data underlying the estimates presented in this paper are freely accessible from the website of the Centre for the Study of Living Standards (www.csls.ca) under "Projects" – Index of Economic Well-being.

[2] These countries are selected because they 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. We note that maintaining international comparability of estimates has meant that some data used in other papers of ours (e.g. Osberg and Sharpe, 1998, 1999, 2002c), and only available for Canada and the United States, have not been used in this paper. This implies that the estimates in this paper for Canada and the United States are not identical to those in these other papers.

how estimates of the HDI would differ if the IEWB were used to calculate the "economic" component of the HDI.

A frequent refrain in the "social indicators" literature is the (true) statement that there is more to "well-being" than economics, but it is also recognized that a key component of overall well-being is economic well-being or "access to economic resources". Although there are good grounds for thinking that national income accounting measures may not necessarily be a good guide to popular perceptions of trends in economic well-being,[3] GDP per capita is probably the single most often mentioned criterion of economic progress. GDP per capita is also one of the three main components of the UNDP's Human Development Index (HDI), whose objective is to indicate the capability of people "to lead a long and healthy life, to acquire knowledge and to have access to resources needed for a decent standard of living" (UNDP, 1990:10).[4]

This paper asks if it is possible to find a better measure of "access to economic resources", and whether that makes a difference to measures of societal well-being, such as the HDI. In focusing on the economic aspects of well-being we do not intend to downgrade the importance of non-economic issues. Instead, we are motivated by the idea that a better measure of economic well-being is needed if economic and "social" trends are to be combined into an index with larger ambitions. Our work is thus in the spirit of the *Measure of Economic Welfare* (MEW) developed by William Nordhaus and James Tobin (1972) three decades ago.

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[3] The paper (Osberg, 1985) that originated our research was motivated by Solow's observation that in 1980 Ronald Reagan asked the American people a seemingly simple question: "Are you better off today than you were four years ago?" Although U.S. real GDP per capita was, in 1980, some 8.8 per cent higher than in 1976, his audiences typically answered "No!"

[4] The HDI (UNDP, 2001) is a composite index with three equally weighted components: health, education, and income. All are scaled to a common range (see Appendix 4 below). 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 GDP per capita expressed in terms of purchasing power. Because the developers of the HDI believe there are diminishing returns to additional income, the logarithm of per capita GDP is used. In practice, this means that differences in average income among developing countries matter much more than income differences among high income countries. For the countries examined in this paper, GDP per capita is in a range where it makes little difference, in practice, whether one uses GDP or ln (GDP) – see Appendix 4.

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. Although clearly important for many purposes, this omits consideration of many issues (for example, leisure time, longevity of life, asset stock levels) which are important to the command over resources of individuals. 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* because it has so often been used as such, the onus is clearly on the critics to show that alternative measures to GDP per capita are possible, plausible and make some difference. In developing 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 – this paper (like the *Genuine Progress Indicator*[5]) attempts to construct better measures of effective consumption and societal accumulation, for example by including consideration of trends in leisure time and the environment.

However, an important point of difference with other indices is that we argue that "society's well-being" cannot be summarized in a single, *objective* number (like the average altitude of a country). It is more accurate, in our view, to think of each individual in society as making a subjective evaluation of objective data in coming to a personal conclusion about society's well-being. Well-being has multiple dimensions and individuals differ (and have the moral right to differ) in their subjective valuation of the relative importance of each dimension of well-being.[6] But because all adults are

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[5] The Genuine Progress Indicator (GPI) produced by the think tank Redefining Progress (Cobb, Halstead, and Rowe, 1995) is closely related to the Index of Sustainable Economic Welfare (ISEW). 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; and 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 has a strong downward bias because it treats the (ever increasing) stock of environmental losses as a subtraction from current well-being flows. See Hagerty et al. (2001) for an evaluation of the GPI and a large number of other quality of life indexes.

[6] In the same vein, Sen (1999:81) has written: "There is thus a strong methodological case for emphasizing the need to assign explicitly evaluative weights to different components of quality of life (or of well-being)

occasionally called upon, in a democracy, to exercise choices (e.g. in voting) on issues that affect the collectivity (and some individuals, such as civil servants, make such decisions on a daily basis), citizens have reason to ask questions of the form: "Would public policy X make 'society' better off?" Presumably, self-interest plays some role in all our choices, but unless self-interest is the sole criterion,[7] an index of society's well-being is useful in helping individuals answer such questions.

Although conceptually there may be no way to measure some of the different dimensions of well-being in directly comparable units, as a practical matter citizens are frequently called upon to choose between policies that favor one or the other.[8] Hence, individuals often have to come to a summative decision – i.e. have a way of "adding it all up" – across domains that are conceptually dissimilar. From this perspective, the purpose of index construction should be to assist individuals – e.g. as voters in elections and as bureaucrats in policy making – in thinking systematically about public policy,[9] *without* necessarily presuming that all individuals have the same values.

Our hypothesis is that indices of social well-being can best help individuals to come to reasonable answers about social choices if information is presented in a way that highlights the objective trends in major dimensions of well-being and thereby helps individuals to come to summative judgments – but also respects differences in values. Although it may not be possible to define an *objective* index of societal well-being, individuals still have the problem (indeed, the moral responsibility) of coming to a *subjective* evaluation of social states, and they need organized, objective data if they are to do it in a reasonable way.[10]

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and then to place the chosen weights for open public discussion and critical scrutiny. In any choice of criteria for evaluative purposes, there would not only be use of value judgments, but also, quite often, use of some judgments on which full agreement would not exist. This is inescapable in a social-choice exercise of this kind."

[7] Formally, if one thinks of individuals as choosing to vote for the public policy alternative that maximizes some index I = $\forall_1$ (own utility) + $\forall_2$ (society's well-being), then a measure of social well-being is useful unless $\forall_2 = 0$ for all persons, always.

[8] For example, although "knowledge" and "health" are both important to individuals, there is no comparable way to measure them directly – but, nonetheless, citizens have to decide how much to spend on hospitals or on schools.

[9] Since individuals must, in any event, make some decisions the presumption is that better information will produce better decisions.

[10] Of course, even if each individual has their own personal subjective evaluation of societal outcomes, the distribution of such evaluations among others is an objective fact that is often of interest – but for each

There is both a logic and a practical rationale to our identification of four components. The logic of our architecture is that it recognizes both trends in average outcomes and in the diversity of outcomes, both now and in the future, as Table 1 illustrates.

When GDP per capita (or an alternative per capita income flow variable, such as the personal income or the GPI) is used as a summative index of well-being, the analyst implicitly is stopping in the first quadrant – assuming that the experience of a representative agent can summarize the well-being of society and that the measured income flow optimally weights consumption and savings, so that one need not explicitly distinguish between present consumption flows and the accumulation of asset stocks which will enable future consumption flows.

Table 1 - Dimensions of Economic Well-being or Command over Resources		
Concept	Present	Future
"Typical Citizen" or "Representative Agent"	Average Flow of Current Income	Aggregate Accumulation of Productive Stocks
Heterogeneity of Experiences of all Citizens	Distribution of Potential Consumption – Income Inequality and Poverty	Insecurity of Future Incomes

However, if society is composed of diverse individuals living in an uncertain world who typically "live in the present, anticipating the future", each individual's estimate of societal economic well-being will depend on the proportion of national income saved for the future. GDP is a measure of the aggregate market income of a society that does not reveal the savings rate, and there is little reason to believe that the

person, the questions of "what do I think is important?" and "what do others (e.g. the median citizen/voter) think to be important?" are interesting for very different reasons.

national savings rate is automatically optimal. Indeed, if citizens have differing rates of time preference, any given savings rate will only be "optimal" from some persons' points of view. Hence, a better estimate of the well-being of society should allow analysts to distinguish between current consumption and the accumulation of productive assets, and thereby enable citizens to apply their differing values.

As well, individuals are justifiably concerned about the degree to which they and others will share in prosperity – there is a long tradition in economics that "social welfare" depends on both average incomes and the degree of inequality and poverty in the distribution of incomes. If the future is uncertain, and complete insurance is unobtainable, individuals will also care about the degree to which their personal economic future is secure.[11]

These four components therefore have a logical rationale and a manageable number of headings. If the objective of index construction is to assist public policy discussion, one must recognize that when too many categories have to be considered simultaneously, discussion can easily be overwhelmed by complexity. We therefore do not adopt the strategy of simply presenting a large battery of indicators.[12] However, because 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 – we 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.[13] An additional reason to distinguish the underlying components of economic well-being is that 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. We specify *explicit* weights to the components of well-being, and test the sensitivity of aggregate trends to

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[11] Risk-averse individuals can gain in certainty equivalent income from the availability of insurance, even if expected income falls. However, for a discussion of the distinction between "risk" and "insecurity" see Osberg (1998).

[12] The "dashboard" strategy of multiple indicators can be seen in operation at http://esl.jrc.it/dc/.

[13] Current versions of the GPI and early versions of the HDI (see Anand and Sen: 2000;94) weight average "income" by changes in the Gini index. This presumes a common valuation of economic equality among all citizens (which suggests the puzzle – if everyone has the same preferences for equality why does the political system not generate it).

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.

The paper's basic hypothesis – that a society's economic well-being depends on total consumption and accumulation, and on the individual inequality and insecurity that surround the distribution of macroeconomic aggregates – is consistent with a variety of theoretical perspectives. We, therefore, avoid a specific, formal model.[14] Appendix 1 describes the details of the calculation of the four components or dimensions of economic well-being:

- [1] effective per capita consumption flows – which includes consumption of marketed goods and services, government services, and adjustment of effective per capita consumption flows for household production, changing household economies of scale, leisure and life expectancy.

- [2] net societal accumulation of stocks of productive resources – which includes net accumulation of tangible capital, housing stocks, 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.

- [3] income distribution – the intensity of poverty (incidence and depth) and the inequality of income.

- [4] economic security from job loss and unemployment, illness, family breakup and poverty in old age.

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

Each dimension of economic well-being is itself an aggregation of many underlying trends, on which the existing data 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 that is rigorously standardized across countries. However, using GDP per capita as a measure of "command over resources" would implicitly:

(1) assume that the aggregate share of income devoted to accumulation (including the public capital stock, human capital, research and development and the value of unpriced environmental assets) is automatically optimal, and

(2) set the weight of income distribution and economic insecurity to zero, by ignoring entirely their influence.

Neither assumption seems justifiable, and neither is innocuous.

Estimates of Economic Well-being Over Time and Across Countries

The trend and level of any index are determined by the choice of variables that are included in the index, the trends and levels of those variables, and the weights they receive. Since we want to ensure that individuals with different values/preferences regarding the components of economic well-being can still find our methodology useful, we identify separately the four main dimensions of average current consumption, asset accumulation/sustainability, inequality/poverty and insecurity. With a simple spreadsheet, it is easy to conduct sensitivity analyses of the impact on comparative levels of well-being of different weighting of these dimensions.[15] However, for discussion purposes,

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[15] An Excel spreadsheet with the required data and programs is available on request from the authors to enable readers to experiment with the implications of their own preferences. If such sensitivity analysis produces the same rankings of policy options, it is useful information to the policy process to know that differences in individual values do *not* matter to policy choices. If sensitivity analysis sometimes produces changes in policy rankings, it is useful to know *how much* one has to weight a particular dimension of well-being (e.g. inequality) if policy rankings are to be reversed.

we have to start somewhere and our "base" weighting gives each component an equal weight of 0.25. Each component is scaled linearly to the [0,1] interval (see Appendix 4).

We recognize that our methodology makes strong demands of the data and we are acutely conscious that the data sources available to us are far from what we would like. There is no escaping the fact that paying attention to more of the dimensions of economic well-being means that we need better data. As a practical matter, our attempt to incorporate income distribution and insecurity means that only a few affluent nations with well-developed statistical systems can be examined now. These tend to be countries that also have more developed "welfare states", and one can plausibly argue that the basic objective of the welfare state has been to reduce economic insecurity and economic inequality. As a consequence, although we are arguing for the importance of considering inequality and insecurity in assessing economic well-being, the sample of nations that we use in this paper is arguably the group of nations in the world within which there is the least inequality and insecurity. Even though the prevalence of poverty and the precariousness of economic life, and its impact on economic well-being, are undoubtedly far greater in many of the world's poorer nations, we do not now have the data to monitor it.[16]

Even so, restricting ourselves to internationally comparable data series has meant that we have neglected issues (such as the decline in unemployment insurance coverage in Canada) that are important for some countries. Our reliance on interpolation between the data points available in the Luxembourg Income Study also implies that we cannot detect short period fluctuations in the distribution and security components of our index. However, we have a general expectation that statistical data will improve over time (the increase in recent years in high quality micro-data from household surveys in poor nations is quite remarkable). Hence, our hope is that it will be possible in future to consider a wider range of nations. We also hope that enough data remains to give a preliminary indication now of trends in economic well-being from a broader perspective than that provided by GDP accounting.

Charts 1 to 4 present for four illustrative countries (the United States, United

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[16] Note also that the objective grounds of economic insecurity (e.g. crop failure or unemployment) will

Kingdom, Norway and Canada) the four components of economic well-being and a "base" weighting, which assigns equal weight to each component, of the aggregate index. For each country, we compare trends in the "base" index with trends in GDP per capita and in the Human Development Index. Each of the four components of economic well-being is assigned an indexed value which represents the relative position of that country, in that year, on the range from Maximum (feasible value) to Minimum (feasible value), where both maximum and minimum are set at the actual extremes of the values observed in all countries and all years of the present study, plus (or minus) 10 per cent of the actual observed range. Charts 1 to 4 show the level in each year of each component of economic well-being (i.e. consumption, accumulation, distribution and economic security) as well as the level of the aggregate Index of Economic Well-being when each component receives equal weight.

To facilitate comparisons, we present for each country the Human Development Index and we also apply the Linear Scaling methodology to ln(GDP per capita) and present that variable as an index $\frac{\text{Value-Min}}{\text{Max-Min}}$. To keep all our comparisons on a common footing, for both the HDI and GDP per capita we use the [Max-Min] range defined by data from the 7 countries for which we construct the Index of Economic Well-being.

Chart 1 looks at the United States from 1980 to 2001, with dashed lines marking the level of aggregate indices (the HDI, GDP and the IEWB) and solid lines representing the components of the IEWB (consumption, accumulation, equality and economic security). It is notable that the United States ranks highest on the scaled index value of GDP per capita, whose trend tracks the HDI fairly closely, but the U.S. Index of Economic Well-being shows a lower level and a flatter trend over the period. In the ranges of values observed among the seven countries examined here, the relative position of the United States in consumption, wealth stocks, equality and security differs considerably. Average consumption and aggregate wealth are comparatively high, with a strong upward trend for consumption. However, compared to the other six countries examined here, the United States sits low in the range of observed equality and security, with a downward trend over time. As a consequence, when all four components are

vary in relative importance as economic development progresses.

weighted equally in the IEWB, relatively poor attainment in the observed ranges of equality and security offsets the high level and upward trend of average consumption and aggregate wealth – with the result that the aggregate Index of Economic Well-being is quite flat until about 1994, and only grew appreciably in the latter 1990s.

Chart 2 examines the United Kingdom. The same strong upward trend in both the HDI and GDP per capita indices is observed (plus a notable jump in the HDI due to improved educational attainment after 1992). However, over the 1980 to 2001 time period the United Kingdom experienced much sharper changes in several of the components of economic well-being than did the United States. Equality declined steeply in the 1980s[17] (albeit from a higher base than in the United States) while average effective consumption rose considerably (from a relatively low base). Hence, as the ongoing British public debate on the legacy of the Thatcher years also indicates, one's perception of how it all adds up for Britain depends heavily on one's values - how strongly one emphasizes the gains in mean consumption, compared to the losses in equality over this period. If these trends are equally weighted, the overall trend in the IEWB is fairly flat. But the United Kingdom is a prime example of the fact that when underlying trends in the components of the economic well-being diverge, the weights assigned to those components matter.[18] In particular, assigning a zero weight to trends in inequality, as use of GDP per capita implicitly does, matters a great deal to the evaluation of social well-being.

By contrast to the United Kingdom and the United States, Chart 3 illustrates Norway's relatively high and fairly stable score in the international range of equality and security. Strong upward trends in average consumption and aggregate wealth stocks in Norway, combined with the lack of a strong trend in equality and security, implied that the equally weighted Index of Economic Well-being had a high level and a rising trend.

Canada is for the most part an intermediate case, as shown in Chart 4. Like Norway, Canada shows a high level of security that is relatively stable over time.[19] The

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[17] Atkinson (2002:12) has remarked on the "sheer magnitude of the rise" in the UK Gini coefficient from 1984 to 1990.

[18] We note that it is also useful to know when the relative valuation of components does not matter much – i.e. when consumption, accumulation, equality and security all have similar trends (e.g. during a business cycle downturn).

[19] As mentioned above, and as will be discussed in more detail in Appendix 1, the security component

equality component of the IEWB exceeds that in the United States in every year examined, but falls short of Norway's performance. Equality has shown a slight downward trend throughout the 1990s in Canada, in part due to broad fiscal retrenchment involving cuts to social spending in the first half of that decade. A very low level and only moderate growth over time in wealth[20] accumulation offsets a high level and strong growth, particularly in the latter 1990s, in consumption flows. This has meant that the IEWB shows a lower level and much flatter trend than GDP per capita. Note that GDP per capita shows a more cyclical trend in Canada than in the other countries considered, due in part to a larger importance of primary industries in the total economy. The IEWB's cyclicality is much attenuated and slightly lags that of GDP per capita, implying that the high levels of security, and to a lesser extent equality, perhaps serve to smooth economic well-being over the business cycle.[21]

Charts 5 and 6 are included to illustrate how the perception of comparative trends in "command over resources" is altered when one looks only at GDP per capita (Chart 5) or the equally weighted Index of Economic Well-being (Chart 6). Note that although both charts express the current year's outcome relative to the initial 1980 base, the vertical scale is compressed in Chart 6. As Osberg (2003) and many others have noted, the comparisons across nations of the trend in GDP *per capita* are greatly influenced by the stark differences in working hours trends – particularly the differences between declining average hours in Europe and rising hours in the United States. As well, trends in inequality and insecurity within countries imply that within nations, the cumulative

presented here for Canada does not reflect the large cuts to the unemployment/employment insurance program in the 1990s. In previous work on the IEWB for Canada and the United States (see Osberg and Sharpe, 1998, 1999, 2002c), the risk imposed by unemployment was in part calculated using the ratios of those receiving unemployment insurance to total unemployment, and unemployment insurance benefits to average earnings. Both of these ratios have seen significant declines in the 1990s in Canada, but data for OECD countries besides Canada and the United States do not appear available. Instead the present work has had to rely on a gross replacement rate series from the OECD, which does not reflect the cuts to the unemployment insurance program in Canada.

[20] Canada's low level of wealth as measured here appears to reflect data comparability issues in estimates of fixed capital stocks. This as well is briefly addressed in Appendix 1, and Coulombe (2000) discusses some implications of using different depreciation rates across countries. Also note that it has not been possible to include natural resources in the present calculation of wealth flows due again to data limitations. These two points help to explain the discrepancy between the present findings and those of the World Bank (1997), which gave Canada a top ranking in terms of wealth.

[21] The IEWB estimates presented here are based on a scaling methodology, discussed in detail in Appendix 4. A more detailed discussion of these estimates for Canada and the United States will be provided in a forthcoming CSLS report.

increase in GDP per capita is in all instances substantially greater than the increase in the IEWB.

In Chart 7, the level of the IEWB for each of the seven countries, in each year from 1980 to 2001, is compared. However, should one compare *trends* over time or the *level* of "command over resources" at a point in time? Since countries are starting from very different levels of each variable, it may be more informative to consider change over time, as in Chart 6, rather than the level at any given time, as in Chart 7. Arguably, public policy cannot do much now to affect the initial endowment of nations,[22] but public policy can affect how well that endowment is used – which would imply that it is the change over time, not the level, of economic well-being which reveals whether a nation is doing "well" or "poorly" in its policy decisions. However, it is clear that the annual country rankings of the level of the HDI have attracted a great deal of media and public interest. In this paper, we therefore swallow our continuing concerns regarding the international similarity of statistical sources and present comparisons of both the trend over time and cross-country levels of economic well-being.

In some instances, both the level comparisons of Chart 7 and the change comparisons of Chart 6 tell a common story. Norway has both the highest 2001 level of the IEWB and the largest positive change from 1980 to 2001 because it started in 1980 with a high level of equality and security (which was largely maintained) and had strong upward trends in consumption and accumulation. Norway therefore ends up with top ranking, in both Chart 6 (growth of economic well-being) and Chart 7 (level of economic well-being).

By contrast, because the United States had downward trends in equality and security, in Chart 6 the "base" equally weighted IEWB shows essentially no improvement from 1980 to 1994. Only in the latter 1990s does one see growth in the IEWB for the United States, due to strong growth in consumption and accumulation from 1995 to 2001. Over the period 1980 to 2001 as a whole, *growth* in the IEWB in the United States was clearly outpaced by that in Norway, fairly similar to that in Germany, Canada, and Australia, and superior to growth in the United Kingdom, and Sweden. From

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[22] For example, Canada will always be the colder, rockier part of North America, with an unavoidable impact on agricultural productivity and heating bills.

a *growth* perspective, Sweden does least well of the seven countries compared, with relatively small consumption gains to offset a slight decline in economic security.

However, if the concern is with the *level* of economic well-being, country rankings change. The high base from which inequality and insecurity started in the United States is sufficient to place that country in bottom rank in the level of IEWB comparisons of Chart 7, for every year before 1996.

The choice between a comparison of levels (Chart 7) and a comparison of changes (Chart 6) is very important for perceptions. For example, Canada does not do badly in *growth* of well-being (Chart 6) but Canada started from an initial position of relatively high inequality and insecurity, and in terms of *level* of economic well-being, Chart 7 indicates that Canada ends up in 2001 in the same relative position as in 1980 – second last. From a *growth* perspective, Sweden did least well of the seven countries compared (Chart 6), and by 2001, the level of the IEWB in Sweden had been surpassed by Norway and by Germany, but the influence of Sweden's initial position was strong enough that it had slipped only to third in the *level* rankings.

The common element in Chart 6 is that for all countries, consideration of accumulation, inequality/poverty and economic insecurity reduces the measured rate of growth of economic well-being, compared to the use of the GDP per capita index. In general, the more heavily current average consumption is emphasized, the closer our index approaches 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 some countries, the change in the perception of trends in well-being is striking. In the United States, from 1980 to 2001 GDP per capita increased by approximately 0.425 points (where the range of GDP per capita is represented as a [0,1] interval), but our overall "base" Index of Economic Well-being is much flatter, with a total increase of 0.135 points over the period. In the United Kingdom, the increase in per capita GDP was similar to that of the United States (0.419 points), but the Index of Economic Well-being, equally weighted (which gives equal emphasis to economic inequality and insecurity) shows an increase of only 0.081 points. Both the United States and the United Kingdom have 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 (see Osberg 1999). As well, increases in money income in the United States have been partially obtained at the cost of substantial increases in working hours. Hence, this is a reasonable finding.

How Much Does Measurement of "Economic" Aspects of Well-being Matter for Broader Measures of Well-being?

How much do different measures of "command over resources" affect a broader concept of societal well-being, such as the Human Development Index? Charts 8 and 9 are presented in order to illustrate the level and trend of the HDI under two assumptions:

(a) that GDP per capita is an appropriate measure of "command over resources"[23] (Chart 8) – as in the HDI as published by the UNDP. For present purposes one can call this the HDI-GDP; and

(b) that the equally weighted IEWB is the appropriate measure of "command over resources (Chart 9) – which can be called HDI-IEWB.

In thinking about both the HDI-GDP and the HDI-IEWB, we are interested in which index of *economic* well-being is the best indicator of command over resources *as part of a larger index of well-being*. We understand the inclusion of education and life expectancy in the Human Development Index to be motivated by the idea that life in itself is valuable, and that education is valuable partly because it increases the human capability to lead a life of understanding and meaning – i.e. greater knowledge is in itself an aspect of a good life (see Anand and Sen, 2000).

On this basis, both life expectancy and education are included as separate arguments in the HDI index of well-being, even though aspects of both are also part of GDP per capita and the IEWB. Measured GDP,

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[23] In the HDI calculation of Chart 8 we apply the Linear Scaling Technique to ln (GDP per capita) to convert it to an index value and combine that with the indices of life expectancy and schooling. To enable comparability with Chart 9 we use the range (plus 20%) of observed GDP per capita among the seven countries examined here, rather than the observed worldwide range of GDP (as in the official UNDP calculation of the HDI). Implicitly, this choice of range increases the relative magnitude of inter-country differences in GDP among these seven countries, and is part of the reason why Australia and Sweden rise to the top of Chart 8, although they ranked below (but very close to) Canada and Norway in the official UNDP calculations. Another small methodological difference is that since there is no difference among our sample of countries in literacy rate, cross country differences in the education component of the HDI in this sample are driven by differences in the combined gross enrolment rate. The prevalence of adult education in the sampled countries means that total enrolment can plausibly exceed the size of the youth population, so we do not truncate the reported enrolment rate (unlike the UNDP). Since the IEWB is already an index,

for example, includes both the expenditure of resources on schooling and the increment to money income produced by education. The IEWB includes the stock of assets that will produce "command over resources" in future years – hence it includes estimates of the dollar value of "human capital" in the stock of education. However, because the HDI also considers the contributions of education and life expectancy to well-being over and above their contribution to more "command over resources" – i.e. more consumption over more years – neither the HDI-GDP or HDI-IEWB is "double-counting" the contributions of education and life expectancy to well-being. Instead, the HDI aims at measuring "human development", *part* of which involves greater command over resources.

In Chart 8 the estimates of HDI using GDP show little difference between Canada, Norway, the United States, and the United Kingdom, reflecting the close similarity of the gross school enrolment rates and the limited ability of GDP per capita and life expectancy to differentiate among them. However, among these four countries, the type, level and extent of welfare state policies to reduce inequality and insecurity are quite dissimilar, with Norway and the United States at the extremes and the United Kingdom and Canada as intermediate cases. Chart 9 illustrates the fact that when the HDI incorporates an index such as the IEWB that can reflect differences in inequality and insecurity, the HDI-IEWB is more able to differentiate among the affluent nations of the world. In 2001, the range between the top and bottom countries for the HDI-GDP was 0.214 while the range for the GDP-IEWB was a third larger at 0.283.

Using the HDI-IEWB, the ranking of countries in 2001 is clear – Sweden (0.821) dominates Australia and Norway (which are fairly close, at 0.768 and 0.741 respectively) at the top of the rankings. Next in line comes the United Kingdom (at 0.684) whose greater equality enables it to pull ahead of Canada (0.634), despite having lower GDP per capita. Germany follows Canada very closely with a score of 0.626. Finally, if one weights equally the equality and security of economic life, as well as accounting more exactly for average effective personal consumption and asset accumulation, the much greater inequality and insecurity of American life outbalance its higher GDP per capita, putting it dead last in 2001 among the nations examined here, with an HDI-IEWB of 0.5375.

Notably, comparisons between specific pairs of countries often change when one uses the HDI-IEWB rather than the HDI-GDP. Using the HDI-GDP, one would rank the United States marginally ahead of the United Kingdom (0.674 compared to 0.670) in 2001 while

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Chart 9 averages it directly with the indices of life expectancy and schooling.

according to the HDI-IEWB, the United Kingdom (0.684) clearly dominates the United States (0.535). Using the HDI-GDP, Canada and Norway are estimated to have very much the same level of well-being, but using the HDI-IEWB, Norway clearly dominates Canada.

Conclusion

This paper has been about *how* we should calculate an index of well-being, but it is also useful to consider *why* such an index should be constructed. The motivation for the research reported in this paper is the idea that a better index of well-being may help citizens to organize their perceptions of social and economic outcomes and thereby help them make better political and public policy decisions, *according to their own valuations of outcomes.* We think that affecting public policy is the whole point of constructing an index of society's well-being. After all, if people only cared about their personal well-being, and only made decisions about their own lives, then one could assume that individuals can be trusted to calculate what is in their own self-interest – and there would be no point to calculating an index of *society's* well-being. It is because individuals exercise choices (e.g. in voting) on issues that affect the collectivity that they have reason to ask questions of the form: "Is 'society' better off?"

The purpose of an index of a nation's well-being is therefore to help citizens think systematically about public policy, on the presumption that better information will produce better decisions. Communicability is therefore key – the social payoff to construction of an index occurs when it is actually used in social decision-making, and actually improves those decisions. In this respect, the measurement of economic and social well-being differs fundamentally from measurement in some other domains, such as the natural sciences. Public communicability is of little concern to measurement issues (such as the mass of sub-atomic particles) which are intermediate steps in the work of elite researchers with the skills (e.g. the mathematics training) and the time to digest highly abstract and complex measures – but the whole point of constructing an index of societal well-being is lost if it is only used by specialist researchers.

Hence, "Keep it Simple" is a useful slogan in index construction, and the constraint of use in the public debate means that it is crucial for an index of well-being to have an intuitive justification that can be easily communicated. We think that there is an

intuitive appeal to identifying the dimensions of current consumption, asset accumulation/sustainability, equality and economic security – and we hope that our presentation has been "simple enough" to be communicable (while still complex enough to be accurate).

We believe that one can easily justify the idea that citizens are "better off" economically when consumption is sustainable, when total income is more equitably shared and when individuals have more security in their economic lives.[24] If this were not so, it would be hard to understand why modern states devote so many resources to reducing economic inequality and economic insecurity – but it is also clear that nations differ substantially in these efforts. We therefore think that the Index of Economic Well-being has a better claim to indicating the "command over resources" of a nation's citizens than GDP per capita, which is blind to the savings rate and to inequality and insecurity. As this paper has demonstrated, the issue of how economic well-being can best be measured makes a significant difference to country rankings of total well-being, such as the Human Development Index.

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[24] R.H. Tawney argued that "Contrasts of economic security, involving, as they do, that, while some groups can organize their lives on a settled plan with a reasonable confidence that the plan will be carried out, others live from year to year, week to week, or even day to day, are even more fundamental than contrasts of income."(1964:147) There is a good deal of evidence – not least from the studies of the determinants of self-reported happiness available at http://www.eur.nl/fsw/research/happiness/ - concluding that satisfying long-term personal relationships in a supportive community are crucial to personal well-being. As a consequence, it is arguable that insecurity and inequality are much more important to personal well-being than the average level of consumption.

Chart 1:
Index of Economic Well-Being and Components, HDI and GDP per Capita Index in United States, 1980-2001
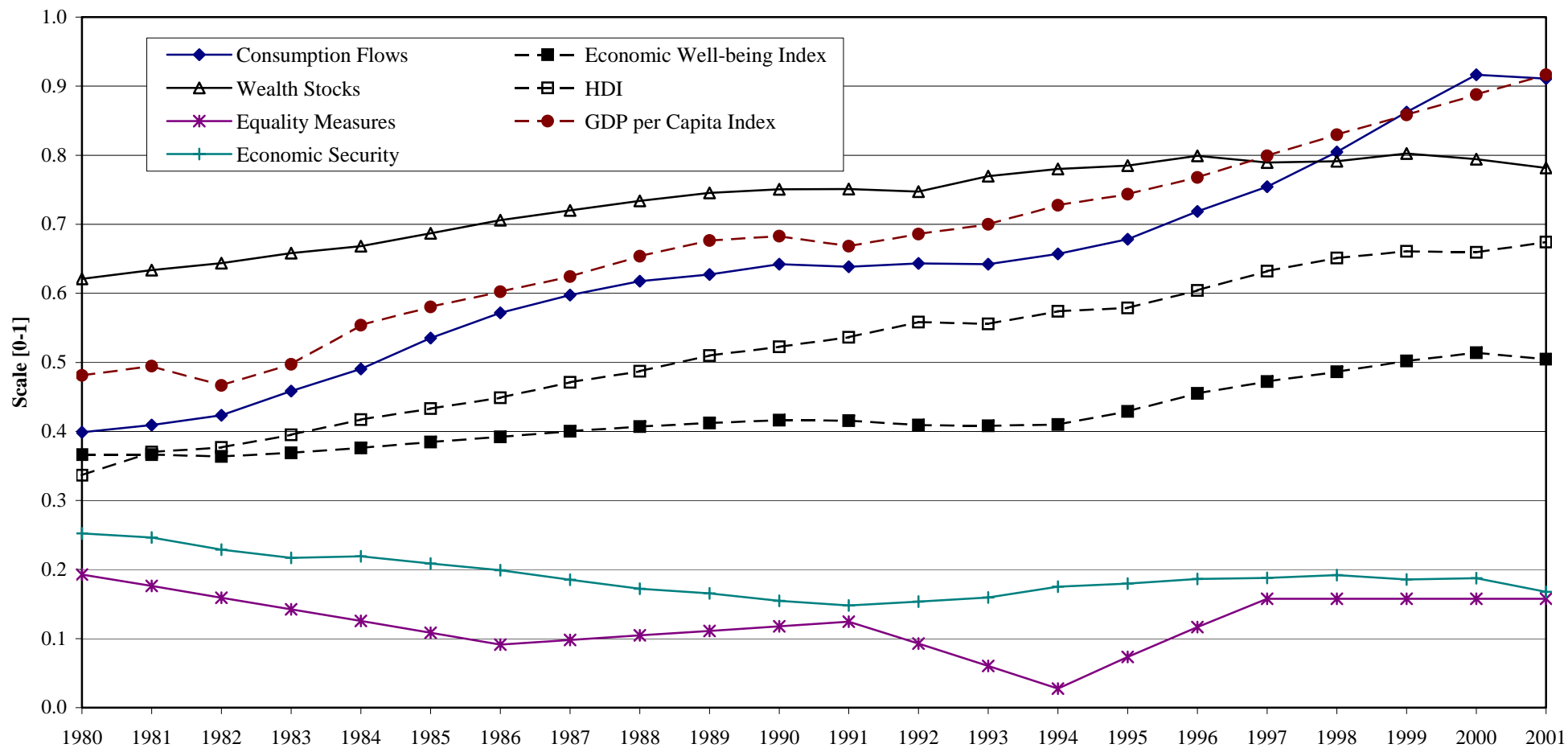
Chart 2:
Index of Economic Well-Being and Components, HDI and GDP per Capita Index in United Kingdom, 1980-2001
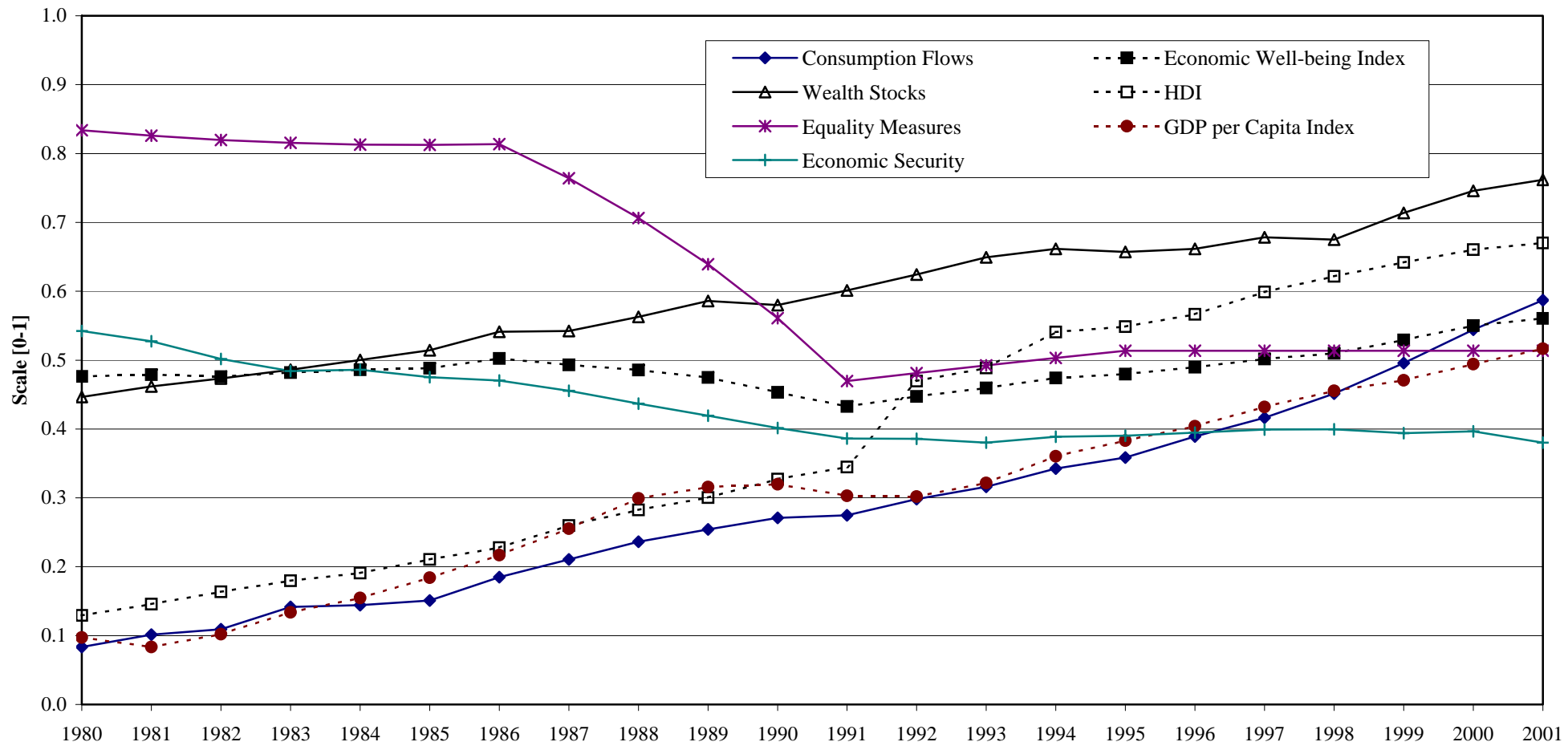
Chart 3:
Index of Economic Well Being and Components, HDI and GDP per Capita Index in Norway, 1980-2001
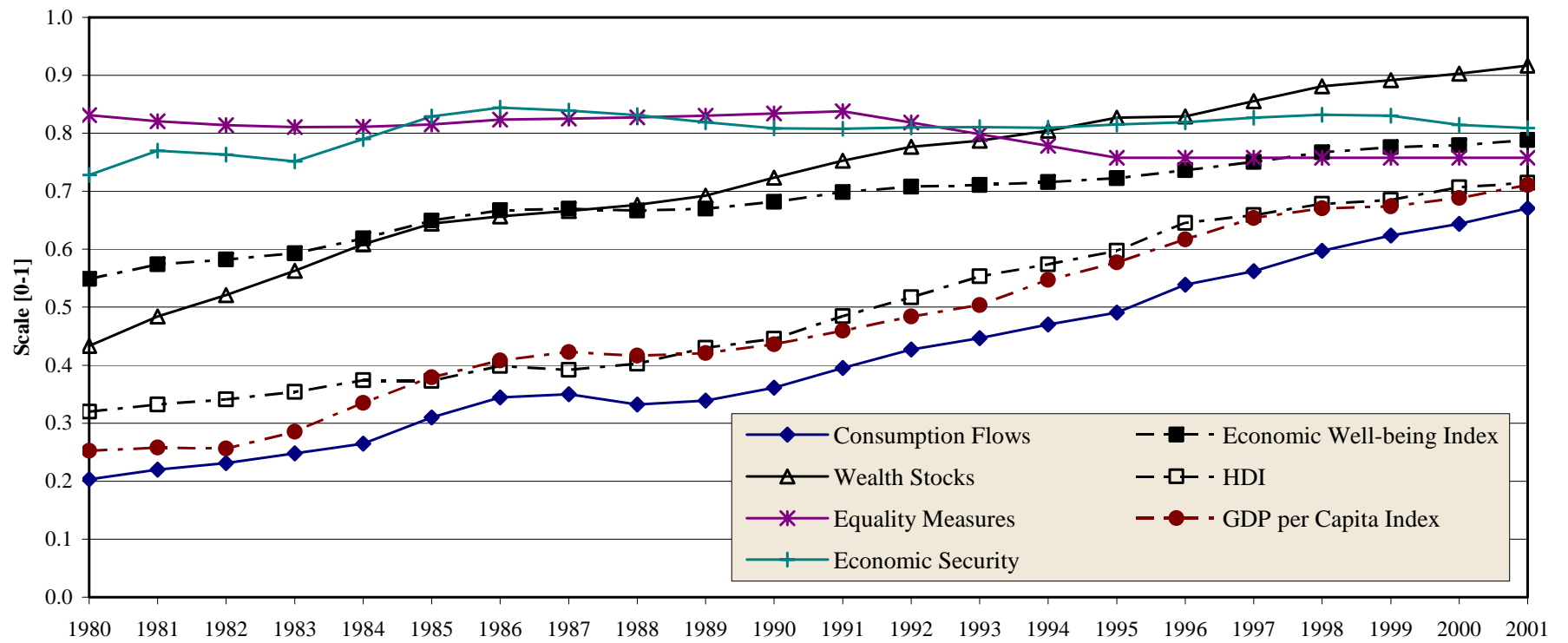
Chart 4:
Index of Economic Well-being and Components, HDI and Scaled GDP per Capita Index in Canada,
1980-2001
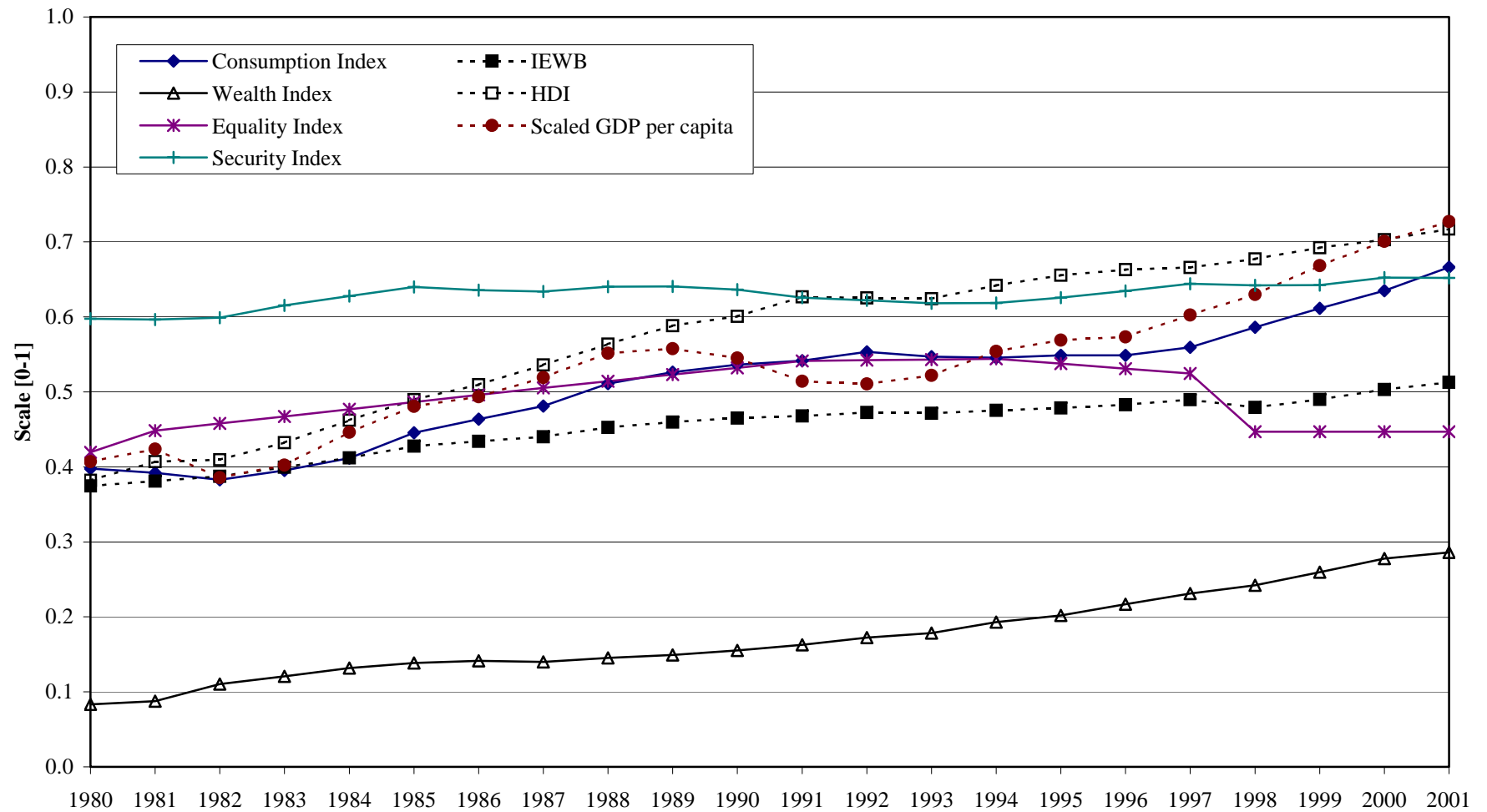
Chart 5:
Indexes of GDP per Capita Absolute Changes Relative to the 1980 Index Score for Selected OECD Countries (using natural logarithms), 1980-2001
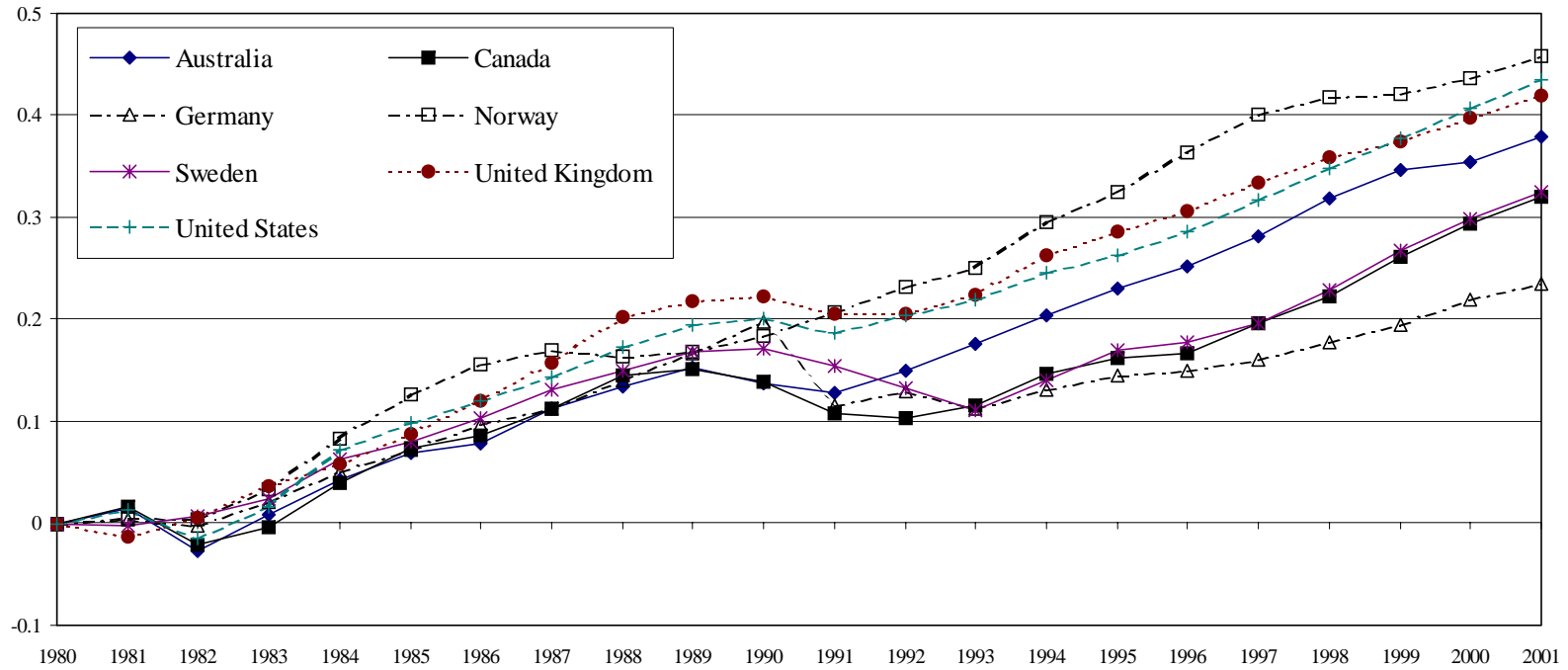
Chart 6:
Index of Economic Well Being Absolute Changes Relative to 1980 - Equal Weighting 1980-2001
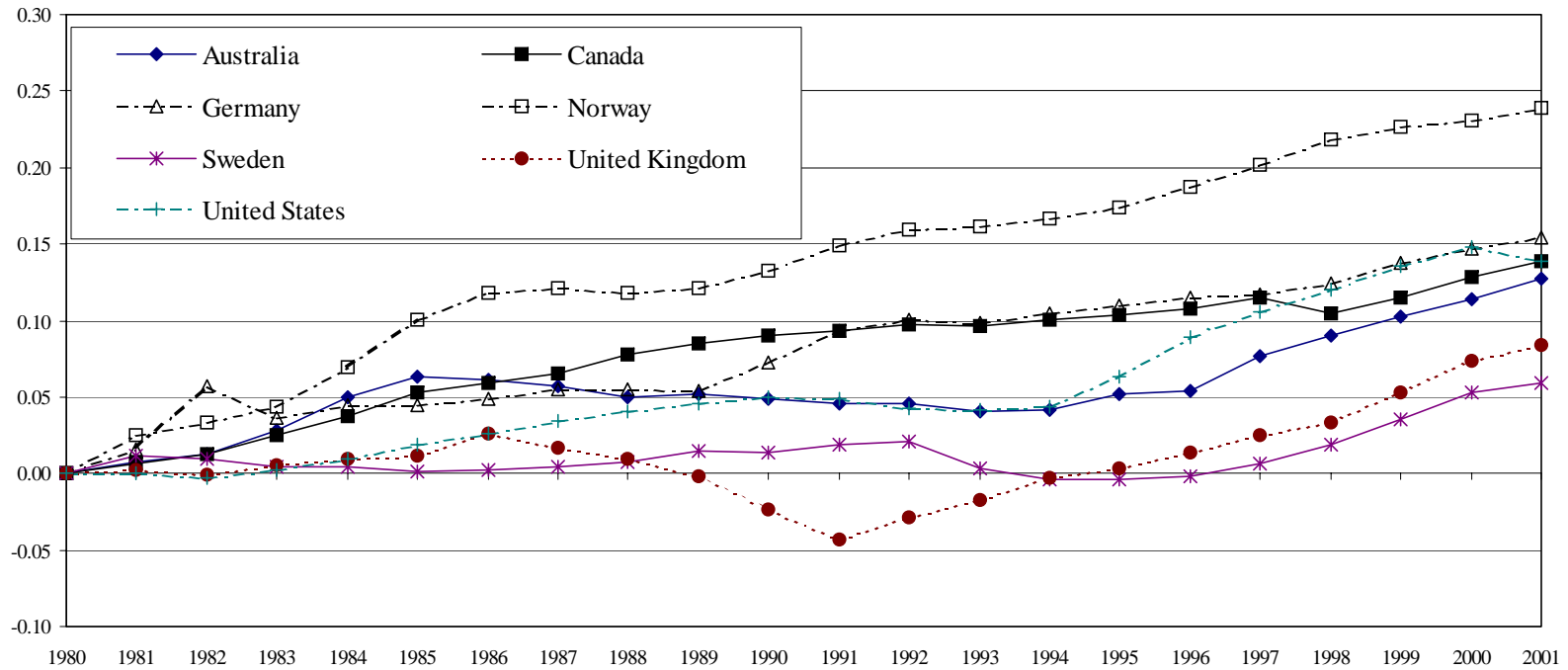
Chart 7:
Index of Economic Well Being Scores for Selected OECD Countries, Equal Weighting, 1980-2001

Chart 8: Human Development Index using GDP per Capita, 1980-2001

Chart 9:
Human Development Index using the Index of Economic Well Being, 1980-2001

Appendix 1 – Constructing the Components of the Index of Economic Well-being (IEWB)

Average Consumption Flows

The easiest part of current consumption to measure is purchased consumer goods and services. Data on aggregate real personal consumption per capita expressed in national currency units, and in constant prices, are availab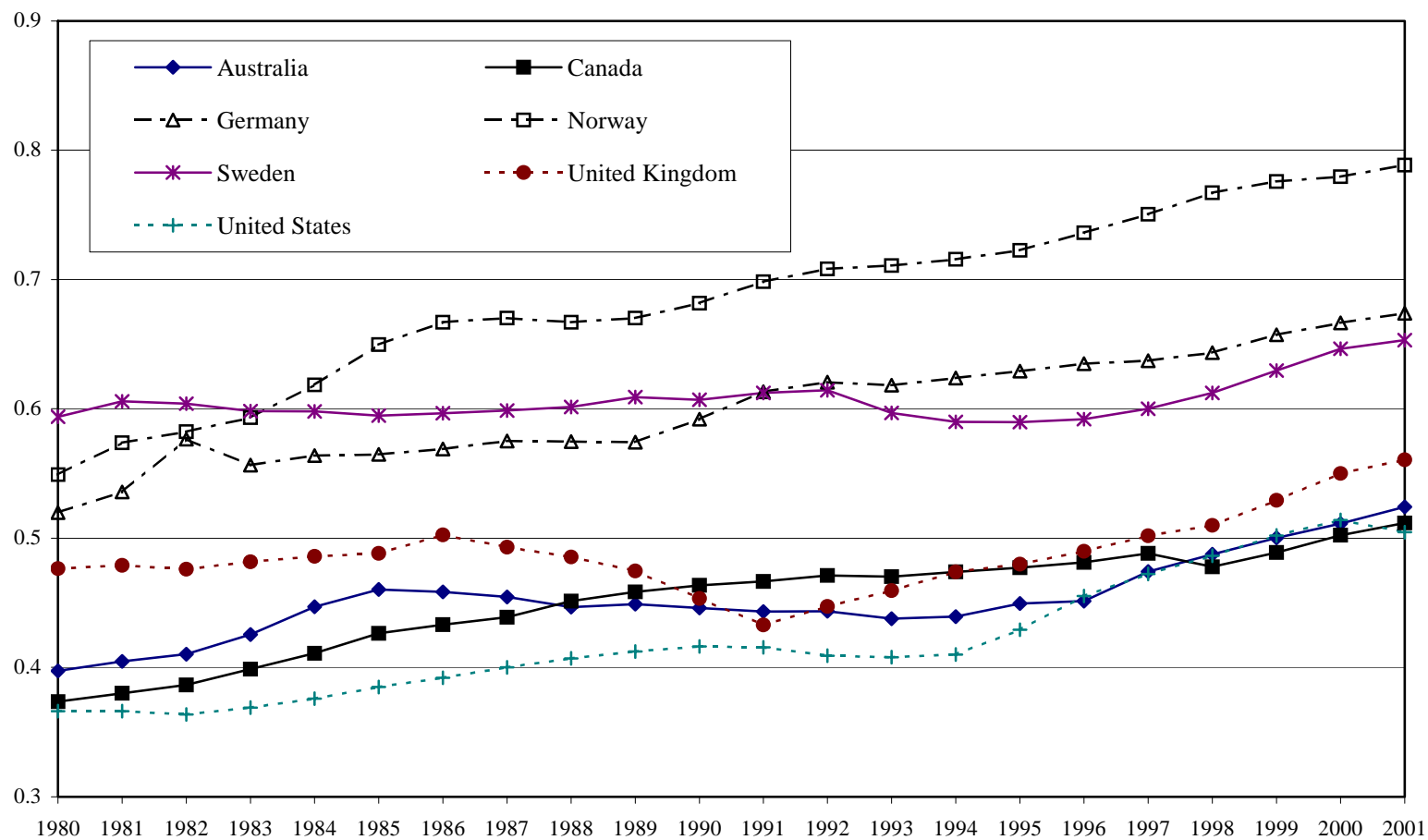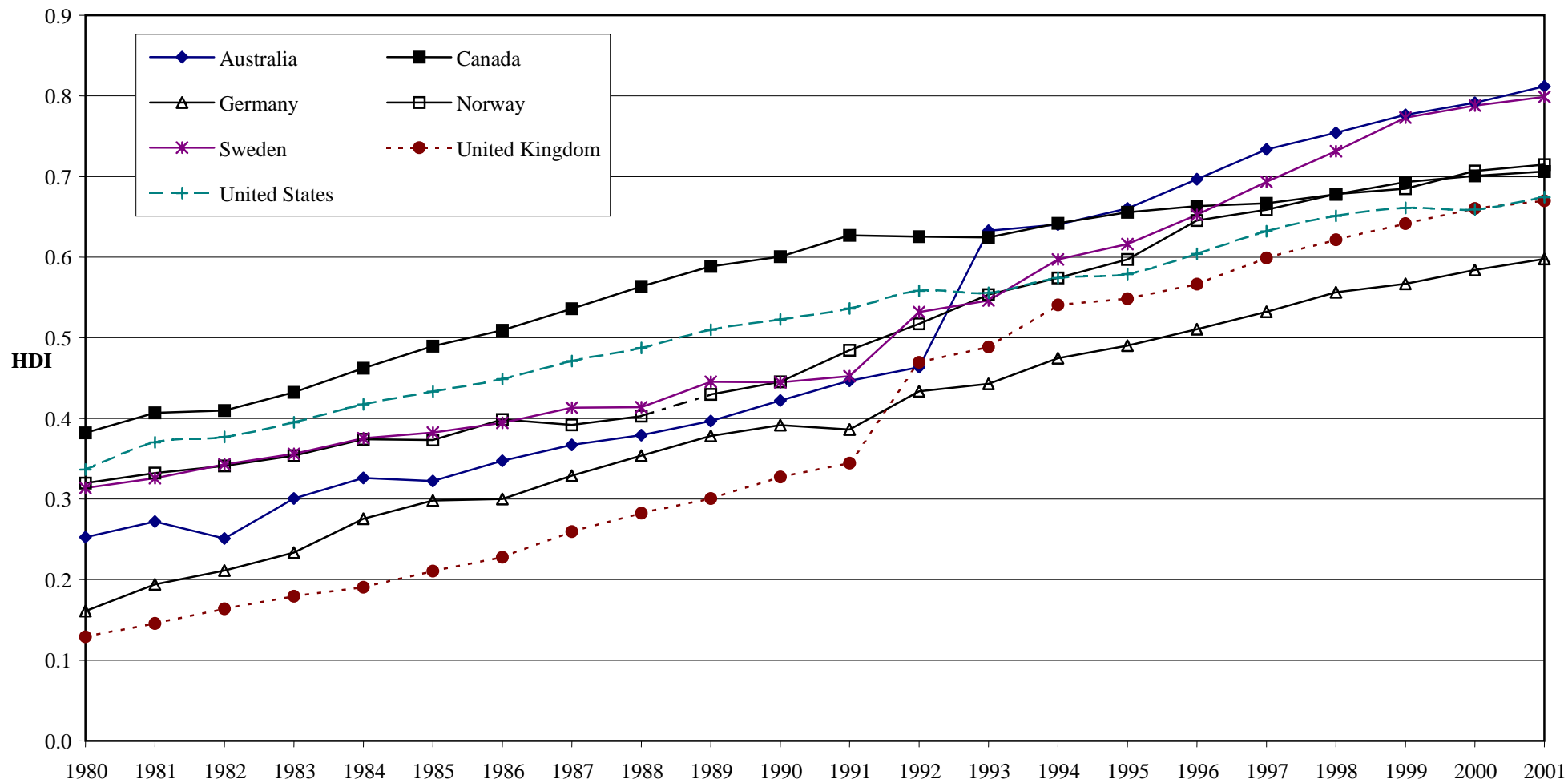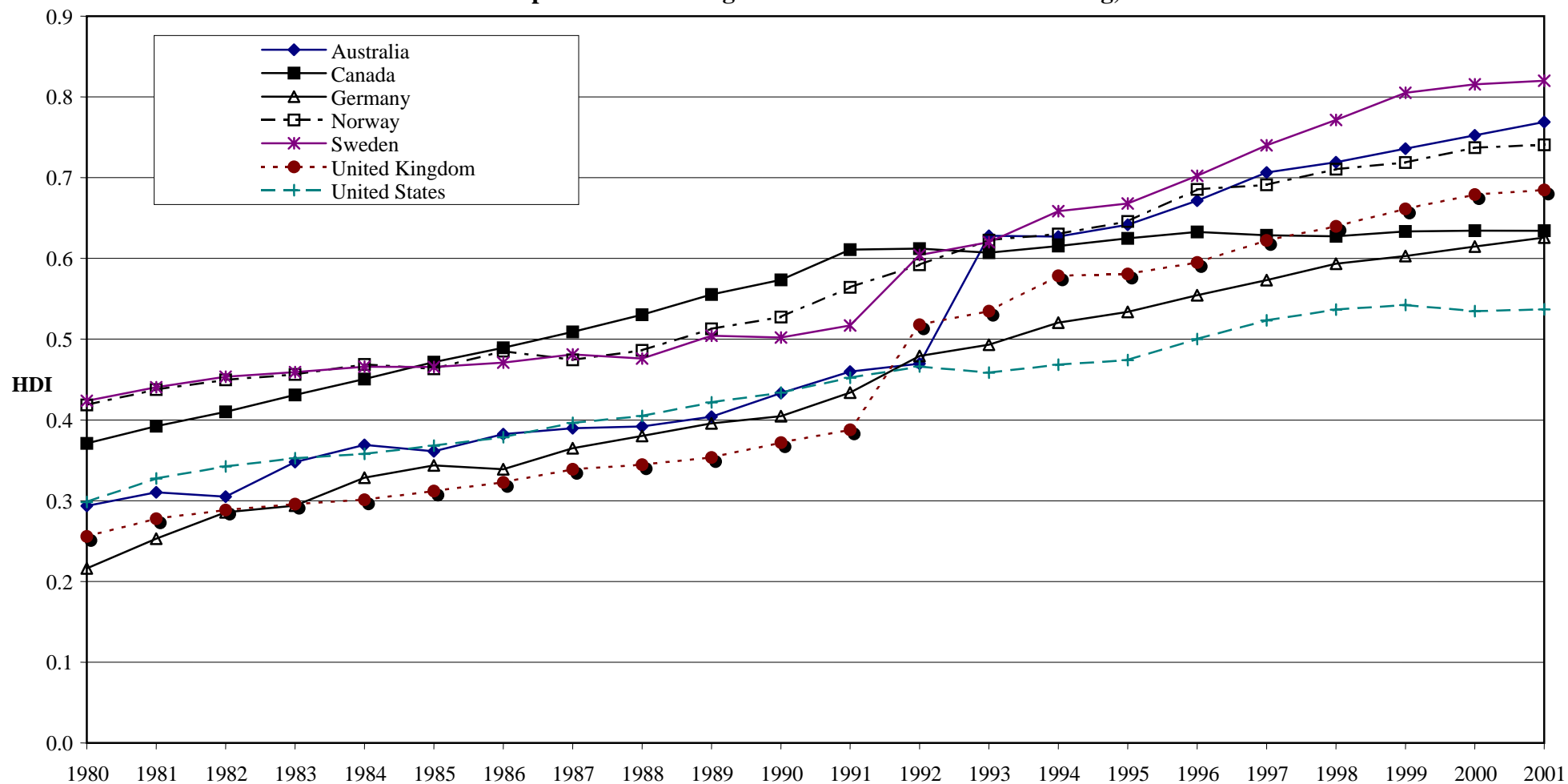le from the OECD National Accounts publication. All countries experienced increases in real per capita marketed personal consumption over the 1980 to 2001 period, but there were large variations in the increase, ranging from a high of 68.1 per cent in the United Kingdom to a low of 24.9 per cent in Sweden. The increases in the other countries were: Norway (53.0 per cent), United States (51.1 per cent), Australia (47.5 per cent) Germany (40.3 per cent), and Canada (30.2 per cent).

However, a more accurate measure of trends in effective consumption flows would include changes in leisure, household size, regrettables, the underground economy and life expectancy.

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 per cent 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 in such costs do not correspond to greater utility for consumers. In our papers estimating the index of economic well-being for Canada and the United States (e.g. Osberg and Sharpe 1998, 1999, 2002c), estimates for regrettable expenditures were subtracted from personal consumption. However, such data were unavailable for other countries, and since there was little *trend* in the amount of such expenditures in North America, this 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. Presumably people care both about how much they consume per year, and how many years they get to consume it. If one wants to measure the "command over resources" of people now alive, the economic value of consumption during these extra years of life should be included in the total consumption flows of individuals (Usher, 1980).

However, if life itself is valuable, then one has a reason for including life expectancy as an argument in an index of well-being that is quite distinct from the "more consumption (over more years)" rationale. Average life expectancy is one of the three components of the Human Development Index, quite independently of the consumption level of individuals during extra years of life.

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 workplace risk, 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.[25] To obtain an estimate of the average impact on "command over

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[25]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 1990-1992 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

resources" of decreased mortality, we adjust per capita consumption flows in each year upward by the percentage increase in average life expectancy relative to the base year (1980).[26]

To ensure comparability of consumption per capita estimates across countries given international differences in life expectancy, the estimates of life expectancy in the United States are used as a benchmark and estimates for other countries adjusted by the ratio of that country's life expectancy to the US estimate. Consumption is thus adjusted upward in countries with higher life expectancy than the United States and downward in countries with lower life expectancy. Implicitly this means that we are valuing extra years of life differently in different countries and at different times, because the current average level of consumption differs across countries and over time. This is appropriate in a measure of *economic* well-being or *command over resources,* but one must stress that economics is only part of a broader conception of well-being. It would be inappropriate (ethically and socially) in a summative index of overall "well-being" to imply that a life in a poor country is worth less than a life in a rich country. However, it is accurate to say that consumption (and economic well-being) during a lifetime is greater in a rich country.

Data on life expectancy are taken from the OECD Health Data CD-ROM. Between 1980 and 1999 (1999 is the last year for which data is available for all seven countries), 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: Norway (3.4 per cent), the United States (4.1 per cent), Canada (4.6 per cent), Sweden (4.9 per cent), United Kingdom (5.7 per cent), Australia (5.9 per cent), and Germany (6.6 per cent). In terms of life expectancy in 1999, Sweden had the higher level at 79.5 years, followed by Australia (79.0), Canada (79.0), Norway (78.4), Germany (77.7), the United Kingdom (77.4), and in last place, the United States (76.7).

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greater or lower than life expectancy over time.

[26] Implicitly, this procedure assumes the higher values that 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. Some recent research suggests we may be 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.

The old saying "Two can live as cheaply as one" is 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.[27] 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); United Kingdom, 2.55 (1986); and the United States, 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 (1981= 100), which is used to adjust personal consumption per capita. Australia had the largest downward adjustment in 1999 relative to 1980, (4.1 per cent).

To ensure comparability of effective consumption per capita estimates across countries given international differences in average household size, we use household size in the United States in 1980 as the benchmark – i.e. the estimates of equivalent household size (the square root of household size) for other countries adjusted by the ratio of that country's equivalent household size to the 1980 U.S. estimate. Per capita consumption is thus adjusted upward in counties with larger household size than the United States in 1980 and downward in countries with smaller household size.

A major defect of GDP as a measure of economic 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. For example, in 1980 average working hours per adult (ages 15-64) were 1294.1 in the United States and 1161.2 in Germany. By 2001, working hours per adult had risen by 113 hours in the United States (to 1406.6) while falling by 119 hours in Germany (to 1042.2). These differences in working hours –

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

the Germany/U.S. differential is equivalent to about 7.0 hours per adult per week – are now large enough to have a significant impact on a measure of economic well-being.

In order to value these differences, we adjust consumption for differences in actual hours worked for person of working age relative to the benchmark of the United States 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. 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 (assuming that the unemployed would have wanted the average hours of work of the employed).[28]

Between 1980 and 2001 four countries experienced increases in working time, while three experienced decreases.[29] By 2001, working hours per adult (15-64) in the United States were 113 hours above their 1980 level of 1294 hours. Over the same period, working hours per working age person also increased in Australia (64 hours), Canada (54) and Sweden (30), but declined in Germany (-119), the United Kingdom (-17), and in Norway (-33). Compared to a 1980 U.S. base, our imputation for changing non-working time based on the unemployment adjustment was, by 2001, worth $1026 per capita in Norway (1995 US dollars), $201 for Sweden, $76 for the UK, -$415 for Canada, -$554 for Australia and -$958 for the United States.

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

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[28]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.

[29] 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 that 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.

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 expenditures differs markedly among OECD countries. In 2001, it ranged from a high of 33.3 per cent in Sweden to a low of 17.1 per cent in the United States. Norway (29.1 per cent), United Kingdom (21.1 per cent), Canada (25.4 per cent), Germany (25.3 per cent) and Australia (22.9 per cent) 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 per capita consumption is defined as the sum of personal consumption (adjusted for changes in average household size and longevity of life), government services, and the adjusted relative value of leisure. Between 1980 and 2001 the increase in real per capita total consumption flows was 24.7 per cent in Sweden, but much higher in the United Kingdom (64.7 per cent), Germany (55.1 per cent) and Norway (52.1 per cent). Australia (47.8 per cent), the United States (46.8 per cent) and Canada (32.2 per cent) were intermediate cases.

Accumulation, Sustainability and the Intergenerational Bequest

If we think of "economic well-being" in the sense of "command over resources", then both present and future command over resources are relevant to current economic well-being. The economic well-being of the current generation depends on both their present and future lifetime levels of consumption. As well, 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. Both the future consumption of the current generation and the well-being of future generations depend on the accumulation 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 among persons of claims on aggregate consumption flows at the individual level. If one is willing to assume that the aggregate savings rate, over all

types of assets (public or private, priced or non-market) is always and everywhere optimal, then the division of current income between consumption and savings can be ignored (as is implicit in, for example, use of GDP per capita as a measure of "command over resources"). We are not willing to make that assumption because (1) individuals may have different value judgments/preferences for their own future income and the income of future generations, which implies differing criteria of "optimality" and (2) given the empirical importance of assets that are not priced in the market (e.g. environmental assets), have substantial externalities (e.g. education or research and development) or are heavily influenced by public policy decisions (all assets), it is implausible to believe that optimality emerges automatically.

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 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.[30] Between 1980 and 2001, the increase in the fixed capital stock, on a per capita basis, was notably less in the United States (31.2 per cent), and Australia (31.1 per cent) than in the United Kingdom (48.3 per cent), Germany (45.3 per cent), Norway (42.0 per cent), Canada (36.2 per cent) and Sweden (34.2 per cent).

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.[31] Although school retention and participation in post-secondary education have increased dramatically in many countries over the last three decades, human capital is

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[30] See Coulombe (2000) who notes that the average depreciation rate assumed for Canada's business sector capital stock over the 1961-97 period was 10 per cent compared to 4.4 per cent in the United States, which implies a substantially and artificially low relative estimate of the current capital stock.

[31] Wolfe and Haveman (2001:245) conclude that in estimating the non-market effects of schooling "a conservative estimate of the value of non-labor market influences is of the same order of magnitude as estimates of the annual, marketed, earnings-based effects."

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 United States) to all countries.

Since we are interested in an index of *economic* well-being, we want to know the stock of assets that will produce "command over resources" in future years – hence estimating the dollar value of "human capital" in the stock of education is appropriate, as part of the Index of Economic Well-being. However, education also has a deeper role to play. In considering education as a separate, independent component of the "Human Development Index", the UNDP recognizes a broader concept of the role of education. If education were only valuable as "human capital", then it would be double-counting for the HDI to include both education and GDP per capita, since GDP already includes both the expenditure of resources on schooling and the increment to money income produced by education. However, if education is also valuable because it increases the human capability to lead a life of understanding and meaning, in which greater knowledge is in itself an aspect of a good life (see Anand and Sen, 2000), then it is appropriate to consider its contribution to well-being over and above its contribution to "command over resources". Hence, we do not consider it "double-counting" to include separately the dollar value of the human capital stock of education as a productive asset and an index of education as part of "human development".

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 per cent on the declining

balance is assumed. Between 1980 and 2001, the per capita real business enterprise R&D stock increased proportionately quite rapidly in Australia and Canada – but from a relatively small base. The United States started with the greatest absolute stock of R & D investment but the absolute size of the increase in R & D capital was the highest in Sweden ($2,043). This was much larger than in Norway ($719), Australia ($588), Canada ($862), and the United Kingdom ($398).[32] Only the United States comes close at $1,451.

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), United States ($16,500), Sweden ($14,590), United Kingdom ($4,940). Because of the lack 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 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

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[32] The R&D investment series starts in 1960 so that the stock of R&D in 1960 is equal to the R&D investment that year and the series has a base of zero in 1959.

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 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.

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 the 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 their costs. These costs can then be subtracted from the stock of wealth to obtain an environmentally adjusted stock of wealth.[33] 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 global 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 2000 were 23,444 millions of metric tons. Based on the $20 U.S. per ton cost of CO_2 emissions, the world social cost of CO_2 emissions was $468,880 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 (worth, for example, -$339 in Canada in 2001).

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[33] 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

As the estimates of the physical capital stock, the R&D capital stock, human capital, 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 1980-2001 period, estimates for the five components of the wealth stock included in this paper indicate per capita real wealth stocks increased by 15.7 per cent in the United States, much less than Norway's 58.1 per cent. Sweden (29.2 per cent), the United Kingdom (37.3 per cent), Australia (37.1 per cent), Canada (42.1 per cent), and Germany (36.1 per cent) were intermediate cases.

Income Distribution – Inequality and Poverty

Would economic well-being remain the same if a society in which everyone has $500 income became one in which 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.[34] The idea that the "Social Welfare" generated by a given aggregate "command over resources" 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.

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

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countries.

[34] 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.

(1-β) 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 measure was largest (hence income inequality greatest) in the United States (0.387) and lowest in Norway (0.222). 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 intensity depend on changes in the poverty rate and the average poverty gap ratio. [35]

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 17.9 per cent in the United States and 17.5 per cent in Australia to 13.2 per cent in the United Kingdom, 12.5 per cent in Canada, 9.2 per cent in Norway, and 8.7 per cent in Sweden. There was much less variation across countries in the average poverty gap ratio: Sweden (36.6 per cent), United States (33.6 per cent), Canada (31.9 per cent), Norway (28.5 per cent), United Kingdom (28.5 per cent), and Australia (27.7 per cent).

The overall index of distribution is a weighted average of the indices of poverty intensity for all units or households and the Gini coefficient, with the former weighted at 0.75 and the latter at 0.25. In each case, we use a Linear Scaling Technique to linearly scale variables to a uniform range.[36] 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

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[35] See Osberg and Xu (2000).

[36] See Appendix 4 for a discussion. Note that this represents a change in our methodology from earlier papers in which indices of poverty or inequality were multiplied by -1 in order to reflect the convention that increases are desirable.

improved, as more complete data series become available.

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, if the human situation is one of "living in the present, anticipating the future", then uncertainty about what the future holds will decrease the current economic well-being of risk averse individuals. Although people try to avoid risk through social and private insurance, 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 that included (for example) the percentage of the population who have credible guarantees of employment continuity and adequate 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][37]

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[37]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.

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 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 EI coverage rate for certain countries such as Canada in the 1990s. We standardize the range of this variable (and the other insecurity variables discussed in this section) using the Linear Scaling Technique (see Appendix 4).

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") produces greater or less anxiety. Again, our focus is on "command over resources" – the economic losses associated with illness. However, data limitations force us to ignore trends in the risk of loss of earnings.[38] Instead, we focus on the risk of health care costs,

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[38] 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

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 per capita (excluding medical insurance premiums and net of insurance reimbursement for medical expenses), which ranged from a high of US $2,204 in the United States to a low of $273 in the United Kingdom in 1998 (the last year for which data are available for all 7 countries).

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)[39] * (the average poverty gap ratio among single female parent families).[40] 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

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.

[39] However, RATE= INCIDENCE x AVERAGE DURATION. Since the poverty rate among single parents is equal to the conditional probability that a single parent will enter poverty and the average duration of a poverty spell, we implicitly account jointly for the duration of poverty spells and for their likelihood. Inadequacy of data precludes examination of household dissolution among co-habiting couples.

[40] This procedure effectively ignores single male parents, which can be justified on the grounds that males comprise a fairly small fraction of the single parent population in all the nations considered here, and their

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 1997 (or the most recent year before 1997 for which data are available) was 4.19 per thousand inhabitants in the United States – significantly higher than in the United Kingdom (2.91), Australia (2.86), Canada (2.25), Sweden (2.37), Germany (2.29), and Norway (2.11).

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 per cent (1997) in the United States to a low of 2.8 per cent (1992) in Sweden – in between were Canada, 43.3 per cent (1998); Australia, 40.7 per cent (1994); Germany, 40.0 per cent (1994); the United Kingdom, 13.8 per cent (1986); and Norway, 11.3 per cent (1995). The average poverty gap ratio for single female parents in the same year was: Norway (41.6 per cent), United States (39.8 per cent), Canada (29.6 per cent), Australia (24.5 per cent), and the United Kingdom (23.6 per cent).

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 per cent (1994) in Australia to the United States, 24.4 per cent (1997); Norway, 11.7 per cent (1995); Canada, 6.3 per cent (1998); Sweden (6.0 per cent 1992); and the United Kingdom, 5.4 per cent (1986). The average poverty gap ratio for the elderly in the same years ranged from a low of 9.3 per cent in Norway to a high of 28.3 per cent in the United States. Australia (27.6 per cent), Canada (14.7 per cent), Sweden (12.7 per cent), and the United Kingdom (11.7 per cent) 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 or elderly poverty risk and costs of unemployment are negative for economic well-being, we use the linearly scaled variable $\frac{\text{Max-Value}}{\text{Max-Min}}$.

income loss on divorce is considerably less than that of women.

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 2001 were the following: unemployment (0.2763), illness (0.4127), single parenthood (0.2142), and old age (0.0968).

Appendix 2 – Sources for Charts

The sources for the Charts in the text are given below. All Tables referred to as sources below can be found in the Index of Economic Well- being MS EXCEL database file, posted for free download at www.csls.ca under Index of Economic Well-being.

Charts 1 to 4 use data from the following Tables:

1. Sources for Consumption Component:

   Personal Consumption - Appendix Table A2
   Government Final Consumption Expenditures - Appendix Table A4
   Population in Appendix Table A1
   Adjusted Relative Cost of Leisure per capita - Appendix Table A5
   Life Expectancy - Appendix Table A3
   Average Family Size – Table 2

2. Sources for Stocks of Wealth Component:

   Total Net Stock of Fixed Capital - Appendix Table A6
   Stock of Total Business Enterprise Expenditures on R&D - Appendix Table A8
   Net International investment position - Appendix Table A9
   Green house gas Emission cost per capita - Appendix Table A10
   Human Capital - Appendix Table A25
   Total Population - Appendix Table A1.

3. Sources for Economic Equality Component:

   GINI coefficient, Poverty Rates and Poverty Gaps – Table 4

4. Sources for Economic Security Component:

   Employment Rate - Appendix Table A11
   Replacement Rates - Appendix Table A22
   Medical Care Expenses, % of Disposable income - Appendix Tables A12 and A13
   Poverty Rates and Gaps for Single Women with children– Table 7
   Divorce Rate – Table 7
   Elderly Poverty Rates and Gaps – Table 8
   Weight for women and children at risk – Table 9a
   Weight for old age poverty – Appendix Tables A15 and A1
   Weight for risk of unemployment – Appendix Tables A17 and A1

5. Source for Index of Economic Well-being:

   IEWB – Table 10

6. Source for Index of Human Development Index:

    GDP per capita – Table 12
    Life Expectancy – Table 13
    Combined gross enrolment rate - 14

7. Source for GDP per Capita Index:

    GDP per capita Index – Table 12

Chart 5 uses data from Table 12 (GDP per capita)

Charts 6 and 7 use data from Table 10 (Index of Economic Well-being)

Charts 8 and 9 use data from Table 15 (Human Development Index)

Appendix 3 – Constructing the Human Development Index

Unfortunately, the HDI is not available as a time series as the focus is on cross-country comparisons and rankings. Consequently, it was necessary to apply the HDI methodology to time series of the HDI variables to construct HDI estimates. These estimates may vary from official HDI estimates because of use of more recent data as well as data revisions. In addition, the HDI in this paper is based on a scaling procedure that includes values for only seven countries, unlike the much greater range of values used in the official HDI. In addition, the literacy variable sub-component of the education variable is not used in the HDI constructed for this paper as it assumes the same value (99 per cent) for all seven countries for all years. Finally, our scaling methodology for the gross combined enrollment rate differs somewhat from the UNDP methodology.

The HDI was constructed using:

1. Ln(GDP per capita):

Source: OECD Health Data CD-ROM, 2002 edition
Note: The values for 2001 are based on the growth rate from 1995-2000.

2. Life Expectancy:

Source: OECD Health Data CD-ROM, 2002 edition
Note: Data for 2001 (and 2000 for Canada, Germany, the United Kingdom and the United States) are assumed equal to the 2000 (or 1999) values.

3. Combined Gross Enrolment Rate:

Source: UNESCO Institute for Statistics website:
http://portal.unesco.org/uis/ev.php?URL_ID=2867&URL_DO=DO_TOPIC&URL_SECTION=201.

Notes: The Combined Gross Enrolment Rate is equal to the number of pupils enrolled in the given level of education, regardless of age, expressed as a percentage of the population in the relevant official age-group. The tertiary school age group is the five year age group following the secondary school leaving age. Data for 1999, 2000, and 2001 refer to school years 98/99, 99/00, and 00/01.

Appendix 4 – Scaling and Methodological Issues

Figure A1

The Non-Linear (log) Functional Form of the Value of GDP per Capita in the HDI vs. The linear functional form
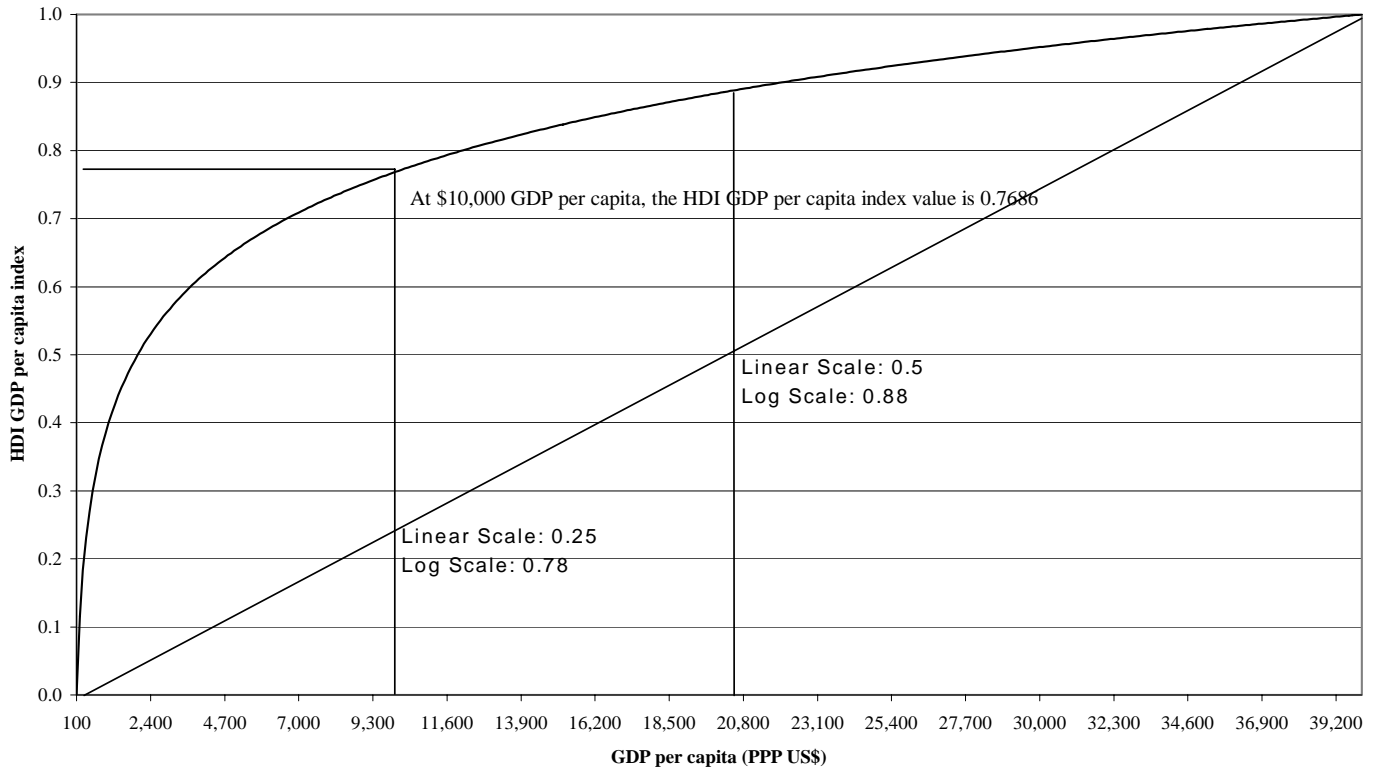
HDI GDP per capita index = (log(GDP per capita)-log(100))/(log(40,000)-log(100)).
Source: Human Development Report 2001, p. 240, United Nations.

Figure A1 is taken from Salzman (2003) who notes that *over the range of actual GDP per capita of these seven countries* there is little difference between an index based on GDP per capita and ln (GDP per capita) since ln (GDP) is approximately linear over these income values. She also emphasizes, when the range of variables which enter an index differs, that those differences in range will implicitly weight the relative importance of variables, and she summarizes the Linear Scaling Technique as follows:

"Linear Scaling Technique (LST) is a technique used to standardize the range of a variable. To do this, an estimate is made for the high and low values which represent the

possible range of a variable for all time periods and for all countries, and denoted Min and Max, respectively. The data is then scaled according to these values. If a variable increase corresponds to an increase in overall welfare, the variable, VALUE, is scaled according to the formula $\frac{\text{Value-Min}}{\text{Max-Min}}$. In this case, we see that increases in the VALUE correspond to increases in scaled VALUE. Notice that if the Min is equal to zero, the formula above reduces to VALUE/Max.

If, in contrast, an increase in VALUE corresponds to decrease in overall welfare, the VALUE is scaled according to the complementary formula $\frac{\text{Max-Value}}{\text{Max-Min}}$. In this case, we see that increases in the VALUE correspond to decreases in the scaled VALUE. In both cases, the range of values is 0-1, and 0 corresponds to the lowest level of welfare, and 1 corresponds to the highest. Note that this formula reduces to (Max-Value)/Max when Min is set to 0. This technique is used to scale all variables in many indices, including the following: the Human Development Index produced by the UNDP, the Index of Social Health produced by Human Resources Development Canada, the Index of Economic Freedom developed by the Heritage Institute and Economic Freedom produced by the Cato Institute."

Our earlier papers did not use the Linear Scaling methodology (although David Longworth of the Bank of Canada suggested this technique to us some years ago) but this paper represents a change in our methodology, which will use the LST in the future.

Appendix 5 – Components and Variables of the Index of Economic Well-being

Weights in brackets are for the "equal weighting" version of the Index

<u>Basic Component</u>	<u>Sub-components</u>
Consumption Flows (0.25)	Real total consumption (NCU per capita)
	Real current government spending on goods and services excluding debt service (NCU per capita)
	Adjustment for changes in working time and household economies of scale
Stocks of Wealth (0.25)	real capital stock (including housing) (NCU per capita)
	Real R&D stock (NCU per capita)
	Real stock of human capital (NCU per capita)
	Real stock of natural resources (NCU per capita)
	Real net foreign debt (NCU per capita)
	Real social cost of environmental degradation (CO_2 emissions) (NCU per capita)
Equality (0.25)	Poverty intensity
	Income inequality (Gini coefficient)
Security (0.25)	Risk from unemployment
	Risk to financial security from illness
	Risk from single parenthood poverty
	Risk from poverty in old age

The formula for the overall index follows:

IEWB= 0.25[C+G+UP+WT]+ 0.25[K+ R&D+HC+NC+-D-ED]+0.25[(0.75)(LIM)+(0.25)Gini]+ 0.25[(0.2772)UR+(0.4066)ILL+(0.2072)SPP+ (0.1090)OLD]

where

IEWB= index of economic well-being

C= real per capita adjusted personal consumption

G= real per capita current government spending excluding debt charges

WT= working time

UP= real value of per capita unpaid labour

K= real per capita capital stock (including housing)

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

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 for after tax income

UR= risk from unemployment

ILL= risk to financial security from illness

SPP= risk from single parenthood poverty

OLD= risk from poverty in old age

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