
Does Annual Real Gross Domestic Product per Capita Overstate or Understate the Growth of Individual Welfare over the Past Two Centuries?

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The decrease in the death rate, and the attendant increase in life expectancy—more than doubling—during the last two centuries in the richer countries, and in the twentieth century in the poorer countries, is [*sic*] the most stupendous feat in human history.

—Julian Simon, introduction to *The State of Humanity* (26)

Angus Maddison's (2001) historical estimates of annual real gross domestic product (GDP) per capita show that nearly all the economic growth in annual real GDP per capita that has ever occurred in the world occurred after 1820. Maddison's estimate of 1820 real GDP per capita of \$667 at 1990 prices and others' estimates that the real output per capita at which humanity can survive is approximately \$250 per year at 1990 prices imply that average world real GDP per capita little more than doubled during the first several hundred thousand years of

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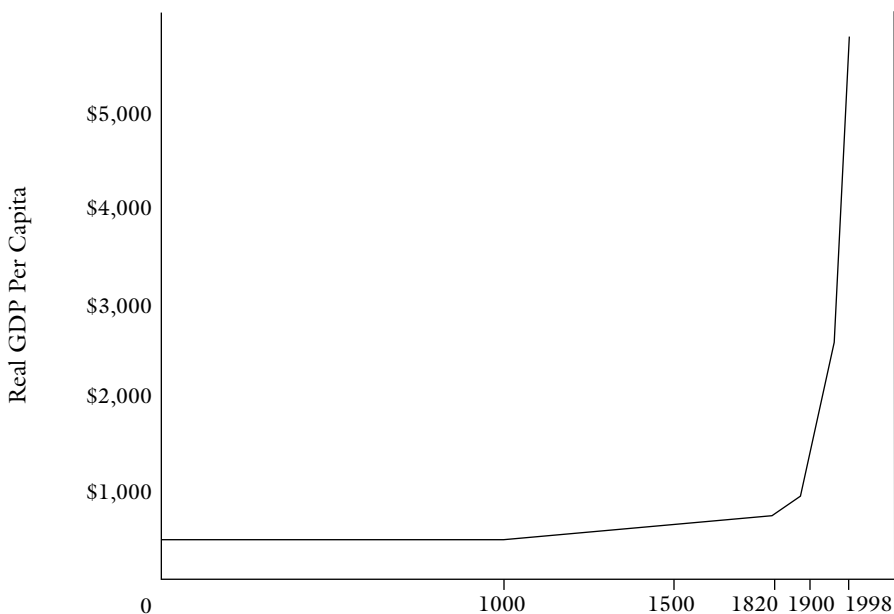
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human existence.¹ During the past two hundred years, the world's average real GDP per capita has increased nearly ninefold. In the more developed countries, the growth of annual GDP per capita has been much greater. Figure 1 illustrates the recent explosion of the world's average annual real GDP per capita.

The accuracy of the stunning picture of recent economic growth shown in figure 1 depends on whether annual real GDP per capita correctly reflects human welfare and economic growth. Many economists have accepted real GDP per capita as a reasonable proxy for human welfare. For example, Simon Kuznets explicitly defined economic growth as “a sustained increase in per capita or per worker product” (1966, 1), and Douglass C. North and Robert Thomas wrote that economic growth “implies that the total income of society must increase more rapidly than population” (1973, 1). However, although few people deny that Maddison's carefully researched historical data indicate what happened to annual real GDP per capita over the past two hundred years, some authors have objected to using real GDP per capita to measure human welfare.

A common theme in the economic development literature has been that the growth in average annual real GDP per capita overstates the improvement in human welfare.² Some economists have suggested alternative measures of economic growth

Figure 1
Annual Real GDP per Capital: 0–1998



Source: Based on data from Maddison 2001.

1. See Pritchett 1997 for a justification of the \$250 subsistence-income estimate.

2. See, for example, the discussions of the well-known Human Development Index (HDI) published annually by the United Nations Development Program (UNDP). See also Usher 1980 and Meier 1976, 12–18. GDP-based growth measures continue to receive criticism; see, for example, Briscoe 2001. Van den Berg 2001 describes the many alternative measures of economic growth.

that focus on health, education, political rights, and many other conditions that are equated with the quality of life. Julian Simon (1995a) and others have pointed out that virtually all measures of human welfare have improved greatly over the past two hundred years, in which case the general impression given by figure 1 is not misleading.³ However, because most of the other measures have not improved by as great a multiple as real GDP per capita, the perception remains that the growth in annual GDP per capita overstates the improvements in human welfare during the past two centuries.

In this article, I argue that the various alternative measures of human welfare do not remedy a serious fundamental shortcoming of annual real GDP per capita as an indicator of human welfare, which is that it fails to measure the *lifetime* welfare of *individuals*. The many alternative measures of human welfare that have been proposed are, like GDP, also annual flows or point-in-time stocks, none of which tells us anything about individuals' lifetime welfare. A simple measure of average individual lifetime welfare fortunately can be constructed easily from readily available data. This measure indicates that the recent growth of individual welfare actually has exceeded the growth indicated by annual real GDP per capita.

Alternative Measures of Human Welfare

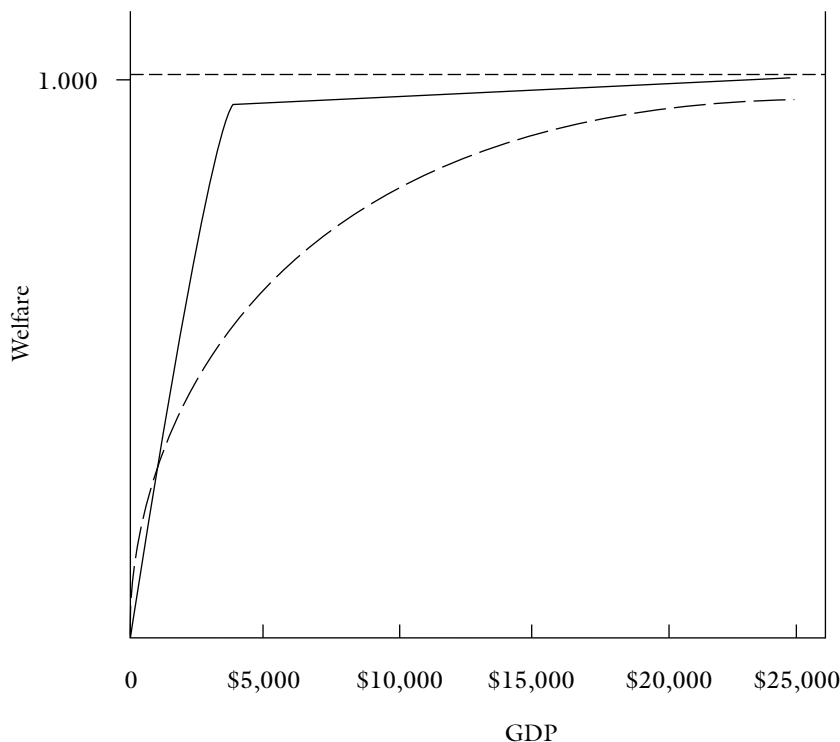
Economists have suggested many alternative measures of human welfare, including life expectancy, infant mortality rate, caloric intake, access to safe water, adult literacy rate, school enrollment, the distribution of income, hospital beds per capita, and a long list of other similar measures of the "quality of life." One especially popular approach to improving on GDP measures of growth has been to use a weighted average of several alternative measures of human welfare. Typical of this approach is the well-known Human Development Index (HDI) published annually by the United Nations Development Program (UNDP). The HDI is a weighted average of real GDP per capita, a measure of health, and a measure of education.

Representing many development economists' belief that the welfare effect of marginal income declines as income per capita rises, the HDI decreases the weight of real GDP per capita relative to the other measures as real output per capita rises. In fact, until recently, increases in real output per capita carried weight in the HDI only for low levels of annual output per capita.⁴ Specifically, before 1999, the relationship between annual real GDP per capita and human welfare that the UNDP assumed was the one depicted by the solid "kinked" line in figure 2. Thus, increases in GDP per capita up to the world average of about \$5,000 had a strong effect on the value of the overall HDI index because, as the solid line in figure 2 shows, in that range small increases in GDP per capita were assumed to bring large increases in human welfare. After the world's average GDP per capita of \$5,000 was reached, however, further increases in output

3. See, for example, the many papers included in Simon 1995b.

4. The methods used to calculate the HDI are described in the "Technical Note" in the UNDP 1999, 159–60.

Figure 2
Welfare and GDP: UNDP



were assumed to matter only slightly for human welfare, and hence further growth of output per capita was deemed to be of little importance. This approach meant that the great differences in real output per capita between Japan and a middle-income country such as Mexico made almost no difference for the two countries' relative HDI indices. The idea behind this approach was that people have certain “basic needs,” and once these needs are satisfied, further increases in consumption will be largely superfluous.⁵

Beginning with the 1999 HDI, a more “curved” relationship between income and welfare was assumed, at the urging of Sudhir Anand and Amartya Sen (1999). Sen writes: “we have excellent reasons for wanting more income or wealth. This is not because income and wealth are desirable for their own sake, but because, typically, they are admirable general-purpose means for having more freedom to lead the kind of lives we have reason to value. . . . The usefulness of wealth lies in the things that it allows us to do—the substantive freedoms it helps us to achieve” (1999, 14). In other words, economic growth increases positive economic freedom, and that increase has real welfare implications. As a result of such reasoning, the 1999 HDI was modified so that the

5. Ideology may also have inspired the UNDP's procedure: the UNDP has often emphasized distribution over absolute growth in the belief that people with “below average” incomes are justified in aspiring to higher incomes, but those with high incomes engage in only superfluous consumption.

relationship between real GDP per capita and individual welfare was assumed to be the one shown by the dashed curve in figure 2 (UNDP 1999). Note, however, that although the revision of the HDI accepts that welfare always is related positively to real GDP per capita, the HDI still does not assume a constant one-to-one relationship.

Apart from the possibility that welfare gains from GDP growth might be non-linear, the growth of annual real GDP per capita may exaggerate improvements in human welfare for other reasons. A well-known shortcoming of GDP is that it counts only legal market transactions, omitting household production, illegal or “underground” production, and leisure despite their effects on human welfare. The omission of household and underground activity, for example, causes the growth in official GDP to overstate true growth in production if the unrecorded economic activity shrinks as a percentage of total economic activity. As Scott Fuess and I (Fuess and Van den Berg 1996, 1998) found for the United States and Mexico, this development probably has occurred in many economies as women increasingly have entered the formal labor market and have substituted paid work for previously unvalued but *valuable* housework. GDP may also overstate real growth in output because it does not account for the depletion of nonrenewable resources. Martin Weitzman (1999) has estimated the cost of resource depletion in order to derive net domestic product (NDP), and he has found that the annual depletion of the world’s major minerals is equivalent to approximately 1 percent of real GDP per year.

Growth of Real GDP per Capita May *Understate* Improvements in Human Welfare

Not all evidence supports the belief that the estimated growth of annual real GDP per capita overstates the growth of human welfare. Michael Boskin and others (1996) contend that the U.S. government’s consumer price index consistently has overstated annual inflation by approximately one percentage point because it has not accounted adequately for quality improvements or product substitution.⁶ If inflation has been overstated, then the growth rate of annual real GDP per capita has been *understated* by one percentage point per year, and the growth of material wealth since 1900 has been more than double what GDP per capita indicates.

Annual real GDP per capita also ignores the fact that economic growth usually increases not just the quantity of output but also the *variety* of output. Increased variety, all other things being equal, enhances welfare (Federal Reserve Bank of Dallas 1999). Because GDP is a measure of aggregate output, it makes no difference for GDP whether you eat the same \$5.75 lunch consisting of a hamburger, french fries, and a Coca-Cola every day of the week or whether you eat the \$5.75 hamburger dish only on Monday, and you then eat a \$4.50 Mexican taco platter on Tuesday, a \$4.00

6. The findings of Boskin and others 1996 are summarized conveniently in Boskin and others 1998.

spaghetti dish on Wednesday, a \$5.00 Chinese meal on Thursday, and a \$9.50 Japanese sushi lunch on Friday. The value of the five lunches is \$28.75 in either case, and GDP will be the same in either case. For most people, however, the variety of five different meals is preferable to eating the same hamburger platter every day of the week.

The preceding discussion suggests that we are not yet close to a consensus on whether annual real GDP per capita overstates the improvement in human welfare over the past two centuries. The discussion, however, does bring out a more subtle and more important point, which is that economists and statisticians have missed a critical weakness of annual real GDP per capita and of all the alternative measures that have been proposed, despite all their efforts to improve the measurement of economic growth. Annual output or any other measure used to calculate welfare at some point in time cannot capture welfare as individuals experience it over the course of a lifetime.

How Should We Measure the Growth of Individual Welfare?

Real GDP per capita is an aggregate value measured over some arbitrary brief period and divided by the number of people alive at that time. Individuals live for more than one year, however, and their personal welfare depends on a lifetime's consumption of goods and services. In this regard, none of the popular alternative proxies for human welfare is any more appropriate than real GDP per capita. For example, measures such as literacy, years of schooling, political freedom, clean air, or the number of hospital beds are also either annual flows or point-in-time quantities, not lifetime totals.

It is easy to show that the current practice of using annual real GDP per capita to measure human welfare gives us a hopelessly inaccurate measurement of individual welfare. Suppose that two countries have the identical annual real GDP per capita of \$10,000. Suppose, also, that in one country everyone lives to the age of eighty, but in the second country people live only to the age of thirty. In which country are individuals better off? To suppose that these two countries provide their residents with the same levels of welfare would be unreasonable. The human welfare that interests economists cannot be captured by a collective measure of average real GDP or by the average of any of the popular alternative measures of welfare, quantified over some brief period or at some point in time.

Individuals judge their welfare by the quality of life *and* by the length of time that they can experience a particular quality of life. Therefore, a measure of an economy's capacity to satisfy human wants must take into account not only *how much* people have at some moment or period of time, but also *how long* the economy can keep people alive and able to experience the annual flows of goods and services that the economy produces. An acceptable measure of human welfare must be a lifetime measure.

A better measure of individual human welfare would be the average annual GDP per capita *times* the average life expectancy that the economy provides its citizens. The same point applies to the many alternative welfare measures based on point-in-time

quantities or on annual flows. If education is deemed to be a better measure of human welfare, the effect of education on human welfare depends on how long people live to benefit from their education. If health or economic freedom is an important yardstick with which to measure human welfare, we must adjust these measures for the length of a lifetime that the average person experiences health or economic freedom.

If an economy provides the conditions under which individuals can live longer, that provision in itself increases individual welfare. If the economy can both keep people alive longer *and* provide more goods, better health, and more education, then the welfare of individuals is enhanced further. Some of the different measures of economic growth—such as life expectancy, real income per capita, or even weighted averages of variables that reflect quality of life—are in many cases not alternatives but *multiplicatives*.

Expected Individual Lifetime Welfare

The most direct approach to deriving a measure of lifetime individual welfare, for which data are readily available, is to calculate the product of annual real GDP per capita and life expectancy at birth. Life expectancy in a given year is the average age to which a group of newborns would live if the members of that group remained subject to the age-specific death rates prevailing in their year of birth. Annual real GDP per capita, of course, indicates the value of goods and services that the economy is capable of providing the average person in a given year. Hence, the product of the two measures indicates the economy's capacity in a certain year (1) to provide material welfare and (2) to sustain an individual life. Frank Lichtenberg (1998) introduced just such a measure, which he denotes as $Y_L = (Y_A)(E)$, where Y_L is expected lifetime GDP per capita, Y_A is average annual GDP per capita, and E is life expectancy. Lichtenberg introduced this measure as part of his study to estimate the value of pharmaceutical innovation.⁷ This measure can be used for studies of economic growth, human welfare, and overall economic performance because the data needed to calculate it are readily available. In the remainder of this article, I refer to this multiplicative measure as the *expected individual lifetime welfare* (EILW).

Using Maddison's (2001) data, the Indian economy in 1998 had the capacity to provide the average person with \$1,746 worth of goods and services each year and to keep the person alive to enjoy that amount of consumption for sixty years. Thus, Indian EILW was equal to \$104,760. In the United States in 1998, the economy provided on average \$27,331 worth of goods and services under conditions that would let people live, on average, for seventy-seven years. Thus, U.S. EILW in 1998 was \$2,104,487. Although the U.S. real GDP per capita is a little less than sixteen times as great as that of India, its measure of expected lifetime welfare per capita is more than twenty times as great. The average American gets to enjoy the (higher) income

7. Van den Berg 2001 calculates a historical series of Lichtenberg's measure for India, Mexico, Spain, Russia, and the United States, based on data from Maddison 1995.

seventeen years longer than the average Indian gets to enjoy the (lower) income. Thus, the average American is relatively better off than either GDP per capita or life expectancy by itself indicates.

Lifetime Welfare Should Not Be Discounted

Almost thirty years ago, Dan Usher (1973) suggested the use of discounted lifetime earnings as a measure of individual welfare. More recently, William Nordhaus (2002) and Kevin Murphy and Robert Topel (1999) have used the discounted flow of lifetime consumption to measure the gains in human welfare from improved health.⁸ We are indebted to Usher for introducing the idea of using a lifetime measure as a proxy for national welfare, but his discounting procedure is not appropriate for measuring the economy's capacity to provide a lifetime of welfare-enhancing output.⁹ It is worth a brief digression to point out why discounting is not appropriate, given economists' natural tendency to discount lifetime flows of income.

By discounting the future flow of income, present income would be valued more highly than income that arrives later in life. There is no obvious reason to weight one year more highly than any other in calculating lifetime welfare.¹⁰ There is substantial evidence that at any single point in time, people value the present most highly and discount both the future and the past. This discounting of both the present and the past implies a well-known time inconsistency problem: later in life people are likely to regret what they did earlier in life.¹¹ Older people will wish they had studied harder, saved more, drunk less, and so forth when they were young. The importance of this observation is that in calculating lifetime welfare it is necessary to measure a person's evaluation of welfare at each period of a person's life, not from the perspective of one point in time as in the case of discounted lifetime income per capita.

Figure 3 illustrates a series of hypothetical discounted views of lifetime income at different ages in an individual's life. Individuals discount both the past and the future. They of course may discount the past differently than they discount the future, and they may discount the past and future differently at different ages. The curves may not be symmetrical in both directions from their peaks. The peaks may differ in height for different years of individuals' lives; for example, children may view a given level of

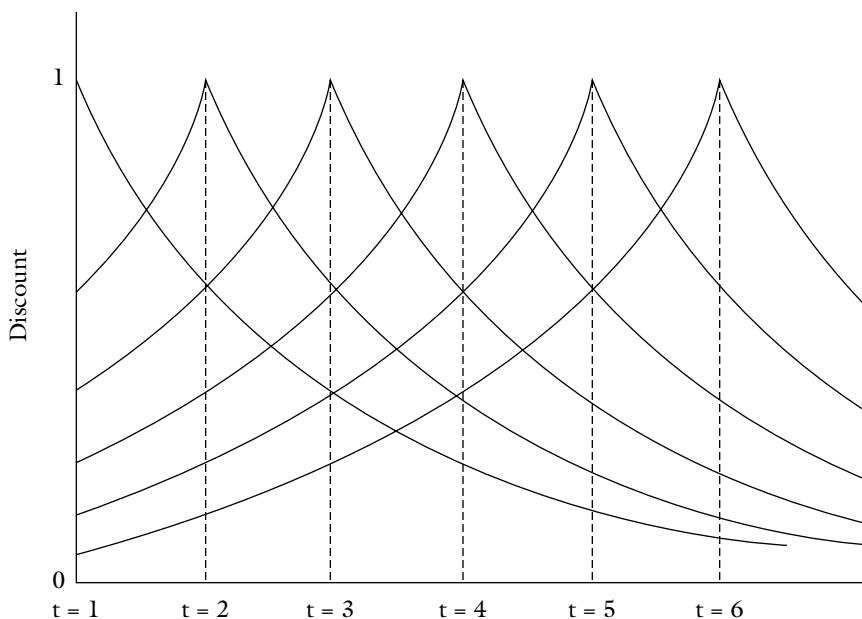
8. The papers by Lichtenberg (1998), Murphy and Topel (1999), and Nordhaus (2002) will be published by the University of Chicago Press in a forthcoming volume edited by Murphy and Topel. Murphy and Topel's research is summarized in Murphy and Topel 2000.

9. Usher (1980) uses a similar approach.

10. Carryover from the welfare of previous years or anticipation of the welfare to be experienced in future years may augment or diminish the welfare experienced in any given year, but that possibility does not imply that future welfare necessarily must be discounted and converted to a present welfare value.

11. For a discussion of bidirectional discounting and the time inconsistency problem that it creates, see Caplin and Leahy 2000.

Figure 3
Discounting the Future and the Past



material welfare differently than adults. Hence, the shapes of the curves in figure 3 should be seen as illustrative only. What is clear, however, is that lifetime welfare is the sum of the welfare values enjoyed in each year or at each point in time, which is shown by the peaks of the curves. As an approximation, it is clearly more accurate to treat lifetime income as a sum of equal peaks, given by average annual real income per capita, as Lichtenberg suggests, than as a series of continually decreasing discounted future income flows, as Usher has proposed.

Growth of Expected Individual Lifetime Welfare Since 1820

Table 1 presents measures of EILW for a group of countries for which both real GDP per capita and life expectancy data are available from 1820 to the present. The table makes it clear that our understanding of economic growth changes substantially when we measure it by EILW. The EILW data specifically show that the growth of human welfare has been much greater than the rate of growth calculated using just real GDP per capita. In *all* countries, EILW growth was faster than the growth of real GDP per capita. In China, for example, EILW growth was positive between 1900 and 1950 even though real GDP per capita shrank. In India, EILW grew nearly twice as fast as real GDP per capita. Only in the case of Russia from 1950 to 1998 did EILW growth differ little from the growth of real GDP per capita—Russia and its predecessor, the USSR, experienced virtually no improvement in life expectancy over this period.

Table 1
Expected Lifetime Welfare Per Capita: Levels and Annual Growth Rates for 1820–1998

Levels:	Annual Real GDP per Capita (in dollars)			Years of Life Expectancy at Birth			EILW (in dollars)				
	1820	1900	1998	1820	1900	1998	1820	1900	1998		
France	1,230	2,849	5,270	37	47	65	78	45,510	133,903	342,550	1,525,524
Germany	1,058	3,134	3,881	41	47	67	77	43,378	147,298	260,027	1,370,523
Italy	1,117	1,746	3,502	30	43	66	78	33,510	75,078	231,132	1,385,202
Netherlands	1,821	3,533	5,996	32	52	72	78	58,272	183,716	431,712	1,577,472
Spain	1,063	2,040	2,397	28	35	62	78	29,764	71,400	148,614	1,109,706
Sweden	1,198	2,561	6,738	39	56	70	79	46,772	143,416	471,660	1,476,115
United Kingdom	1,707	4,593	6,907	40	50	69	77	68,280	229,650	476,583	1,440,978
United States	1,257	4,096	9,561	39	47	68	77	49,023	192,512	650,148	2,104,487
Japan	669	1,135	1,926	34	44	61	81	22,746	49,940	117,486	1,653,453
Russia	689	1,023	2,834	28	32	65	67	19,292	32,736	184,210	260,831
Brazil	740	704	1,672	27	36	45	67	19,980	25,344	75,260	365,753
Mexico	760	1,157	2,365	—	33	50	72	—	38,181	118,250	479,160
China	600	540	439	—	24	41	71	—	12,960	17,999	221,307
India	531	625	619	21	24	32	60	11,151	15,000	19,808	104,760
World	667	1,263	2,114	26	31	49	66	17,342	39,153	103,586	376,794

Table 1 (continued)

	Annual Growth Rates:			Years of Life Expectancy at Birth			EILW		
	Real GDP Per Capita			1820-1900			1820-1900		
	1820-1900	1900-50	1950-98	1820-1900	1900-50	1950-98	1820-1900	1900-50	1950-98
France	1.06%	1.24%	2.77%	0.30%	0.65%	0.37%	1.36%	2.17%	1.90%
Germany	1.37	0.43	3.22	0.17	0.71	0.28	1.54	1.14	3.52
Italy	0.56	1.40	3.44	0.45	0.86	0.34	1.01	2.31	3.80
Netherlands	0.83	1.06	2.57	0.61	0.65	0.16	1.45	1.72	2.74
Spain	0.82	0.32	3.78	0.28	1.15	0.48	1.10	1.48	4.28
Sweden	0.95	1.95	2.15	0.45	0.45	0.25	1.41	2.41	2.41
United Kingdom	1.24	0.82	2.10	0.28	0.65	0.22	1.53	1.47	2.33
United States	1.49	1.71	2.21	0.23	0.74	0.25	1.72	2.46	2.48
Japan	0.66	1.06	5.04	0.32	0.66	0.58	0.99	1.73	5.66
Russia	0.50	2.05	0.66	0.17	1.42	0.06	0.66	3.52	0.73
Brazil	0.06	1.75	2.50	0.36	0.45	0.82	0.30	2.20	3.35
Mexico	0.53	1.44	2.18	—	0.83	0.76	—	2.29	2.96
China	0.13	0.41	4.17	—	1.08	1.13	—	0.66	5.37
India	0.20	0.00	2.18	0.17	0.58	1.29	0.37	0.56	3.53
World	0.80	1.04	2.09	0.22	0.92	0.61	1.02	1.96	2.73

Sources: Maddison 2001 table 1-5a, table B-21. Because Maddison 2001 does not have real GDP per capita for 1900, I used Angus Maddison 1995, table D, which, in most cases, corresponds perfectly or very closely to Maddison 2001; the few differences were not judged to be significant.

The more rapid growth of EILW means that the growth of annual real GDP per capita understates the growth of lifetime material welfare. Even if the relationship between output and human welfare is nonlinear, human welfare still might have increased *more* rapidly than the growth of annual real GDP per capita indicates.

Convergence and Divergence of National Welfare Levels

Because the EILW permits a more accurate depiction of individual welfare, it can also help us get a better answer to the question of whether individual welfare is becoming more or less equal among the countries of the world. The rate of absolute convergence of real income per capita across countries or regions can be found by estimating the regression equation

$$\ln(y_{t+n}) - \ln(y_t) = a + b \ln(y_t),$$

in which y_t is real income per capita in year t . If the coefficient b is negative, we can conclude that real incomes per capita converged over the period from year t to year $t + n$. The *speed of convergence* is equal to $\beta = -\ln(1 + b)/n$, and the often-reported *half-life*, t^* , of the absolute income gap is the solution to $e^{-\beta t^*} = 0.5$, or $t^* = -\ln(0.5)/\beta$. Table 2 presents regression estimates and, where the regression coefficients were negative, the speed of convergence for both real GDP per capita and the EILW for the countries included in table 1.

Table 2 makes it clear that average individual welfare across countries diverged sharply during the 1800s. It makes little difference whether annual real GDP per capita or the EILW is used to compare welfare across countries. The coefficients from regressing subsequent growth on the initial levels of annual real GDP per capita and the EILW are positive and nearly identical for the period 1820–1900.

In the twentieth century, there are substantial differences between what real GDP per capita and the EILW show about the convergence of average individual welfare. For the period 1900–1950, the regression coefficients for both annual real GDP per capita and the EILW are still positive, but they are much smaller than for the nineteenth century. Note also that the coefficient for the EILW is considerably smaller than in the regression equation relating the growth and initial levels of annual real GDP per capita. Thus, individual welfare appears to have diverged less rapidly during the first half of the twentieth century than data for annual real GDP per capita indicate.

During the second half of the twentieth century, the relatively more rapid convergence of the EILW, compared to annual real GDP per capita, indicates that individual welfare probably converged more rapidly than comparisons of real GDP per capita suggest. The half-life of the differences in welfare across the sample of countries is approximately only 100 years in the case of the EILW, but it is approximately 160 years for annual real GDP per capita.

Table 2
Convergence of Human Welfare for Twelve Countries: 1820–1998

	<i>1820–1900</i>	<i>1900–1950</i>	<i>1950–1998</i>
Real Per Capital GDP			
Regression coefficient:	0.65800	0.13160	0.18756
Speed of Convergence:	0.00632	0.00247	0.00433
EILW:			
Regression coefficient:	0.63230	0.08720	0.27650
Speed of Convergence:	0.00612	0.00167	0.00674

Some Qualifications and Extensions

The growth of EILW may still understate the gains in human welfare brought about by increases in life expectancy. GDP does not account for leisure. Therefore, EILW, which is simply annual real GDP per capita multiplied by life expectancy, also does not take into account this other source of individual welfare. Given that work hours tend to decline and leisure tends to increase as income per capita rises, the growth of EILW will tend to understate the growth in actual individual welfare. Robinson (1995), Nordhaus (2002), and Murphy and Topel (1999) effectively account for leisure as well as for material wealth by using estimates of the “value of life” to arrive at their measures of lifetime welfare for people currently living in the United States.¹² Their estimates of average lifetime welfare for the United States greatly exceed the much simpler EILW measure presented in this article. The much more complex methods they used do not readily lend themselves to making comparisons across countries and over long periods, as the simple EILW so conveniently lets us do. However, their much higher values of lifetime welfare suggest that the EILW measure’s omission of the value of leisure most likely causes it still to underestimate the true growth of individual welfare over the past two hundred years.

Another reason why EILW likely still understates individual welfare gains over the past two hundred years is that it does not account for the fact that not only has the average age increased, but the standard deviation of age at death has declined. According to Lichtenberg, “People tend to live longer than they used to, and there is also less uncertainty about the age of death. . . . If people are risk averse, they are made better off by the reduction in the variance, as well as by the increase in the mean, of the age of death” (1998, 2–3). This same point was also made some years ago by the demographer Massimo Livi-Bacci (1997), who described the reductions in

12. For a review of the literature on estimating the value of life, see Viscusi 1993.

infant mortality and the remedies for the many diseases that randomly attacked people of all ages as adding “order” to life and permitting people to more effectively plan and organize their lives.

It is not difficult to imagine multiplicative adjustments for other economic and social conditions that enhance or diminish the accuracy of real GDP per capita as a measure of human welfare. For example, real GDP per capita might be multiplied by a factor representing positive economic freedom, which, as suggested by Amartya Sen (1999a, 1999b), improves as the economy increases its productive capacity. Certainly the freedom to choose where one works and what one consumes is worth at least some small percentage of national income. On the other hand, dictatorships, discrimination, threats to personal safety, and the lack of protection of personal property diminish the real value of measured real GDP per capita. In this sense, Latin America’s well-documented “lost decade” of the 1980s may not have been so “lost,” given that life expectancy improved, access to education increased, and democracy replaced dictatorships in nearly all of the region’s countries.

Some extensions and refinements of EILW are worth pursuing in the future. For example, the Disability Adjusted Life Expectancy (DALE) data just published by the World Health Organization (WHO) are certainly a better means of measuring a person’s lifetime welfare than simple life expectancy (WHO 2000). These new estimates of how long people can be expected to live in good health and to be able to enjoy fully their material wealth, their education, and their lifestyles unfortunately exist only for one year. Therefore, growth rates incorporating this measure cannot be calculated yet.

The issue of which measures best reflect human welfare remains to be settled, of course. Any future improvements in the way we calculate GDP would also make EILW a more accurate measure of lifetime welfare as well. However, the measures we use to represent individual welfare will improve our understanding of individual welfare only if they reflect lifetime welfare.

Summary and Implications

The appropriate way to measure human welfare, in line with economists’ focus on individual human welfare, is to quantify the economy’s capacity to provide the average individual with a lifetime of welfare. This focus demands that our measures of economic performance reflect not just the average annual or some other point-in-time level of welfare, but also how long the economy can keep the average person alive to experience that level of welfare. Julian Simon’s statement in the epigraph to this article suggests that the actual improvement in individual welfare has been much greater than the customary measure of annual real GDP per capita shows. The long-running debate about how to measure economic growth and human welfare really has missed the mark by focusing on which annual flows or instantaneous stocks of output and other “quality of life” variables best represent the growth of human welfare. It is surprising that development economists have never questioned using

annual measures of human welfare, which completely ignore the “stupendous” increase in longevity.

Perhaps the seemingly difficult task of compiling measures of lifetime welfare has discouraged researchers from abandoning their annual and point-in-time stock measures. The difficulties in generating historical series for a large number of countries using Nordhaus’s (2002) and Murphy and Topel’s (1999) methods seem to support the impression that lifetime welfare measures are more theoretical than practical. This impression, however, is wrong. A multiplicative measure, EILW—for which data are readily available—captures lifetime welfare at least as well as GDP captures annual welfare. EILW has grown more rapidly than conventional measures such as real GDP per capita. Given the “stupendous” increases in life expectancy, as well as the general improvements in nearly all alternative measures of human welfare, lifetime measures of welfare that reflect both the quality of life and the length of life confirm the general impression given by Maddison’s estimates of real GDP per capita—namely, that individual welfare has grown enormously over the past two hundred years. In fact, lifetime measures of welfare reveal that the improvement in individual welfare may have been *understated*, not overstated, by the growth of annual real GDP per capita.

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