

Proposed Framework on Human Capital Indicators

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Abstract

This paper proposes a framework for tracking the economic sustainability of the education and health components of human capital. It is positioned in light of the framework written by Statistics Canada. Within this framework it proposes the two most appropriate summary human capital indicators in the education area are average educational attainment and literacy levels. This is largely based on international testing methods. In the health area health-adjusted life expectancy and self-reported health status are proposed.

The question of monetisation is also examined. While average educational attainment can be expressed in monetary terms, the valuation of the other three indicators is much more difficult, although theoretically plausible.

While the paper does reveal that the development of estimates of these four summary indicators of human capital to track economic sustainability is feasible it notes that the sustainability of human capital represents considerably less of a challenge than the sustainability of certain ecosystems. The more important challenge in the human capital area relate to Canada's ability to improve the quality of our human resources, relative to our competitors, than to sustain them at the existing level.

Overview

Human Capital and Link to Economic Sustainability

The framework document produced by Statistics Canada employs a capital approach to economic sustainability. As noted in the document, “the essence of sustainability is that we wish economic production to continue for the benefit of the future.” To do this, the means of production, that is capital, must be maintained intact over time since capital embodies all that is necessary to create the flows of services and materials for economic production today and in the future.

In my view, this sustainability of capital perspective can be easily extended to human capital, both in terms of education and health. Human capital can be thought of as the labour analogue to produced capital. The concept of human capital can be described as the capabilities or capacities, both innate and derived or accumulated, embodied in the working age population that allow it to work productively with other forms of capital to sustain economic production. The term human capital has traditionally applied to education broadly defined and includes the knowledge and skills that the working age population (or more narrowly the labour force) accumulates through formal educational attainment, training, and experience.

Without these skills, the population could not successfully harness the produced capital and natural resources to successfully engage in economic production. Although less likely than the collapse of a natural resource stock or an ecosystem, one can imagine a scenario where the education and training system deteriorates to such a point where the knowledge and skills base no longer allows for the reproduction of a workforce that can maintain the absolute level of economic production. Under such a scenario, economic sustainability in an absolute sense¹ is impeded by the failure to renew the educational capital of the workforce.

The concept of human capital can also be applied to the health of the working population (or labour force). Just as investments in the education and training system increase the stock of human capital in the education area, investments in the health system can increase the stock of capital in the health area. Again, unless healthy, the population cannot harness the produced capital and natural resources to successfully engage in economic production. One can imagine a scenario where the health of the working population deteriorates to such a point where the absolute level of economic production cannot be maintained because of absenteeism and forced retirements caused by health problems. Under such a scenario, economic sustainability is jeopardized.

Work Assessing Trends in Human Capital

Through international comparisons, countries are able to recognize strengths and weaknesses in their education and health systems and to assess to what extent differences in experience are unique or reflect differences observed elsewhere. The Organization For Economic Co-operation and Development (OECD) has done considerable work in this area which demonstrates that governments are paying increasing attention to international comparative analysis in searching for effective education and health policies that enhance

1 While economic sustainability is generally thought of in an absolute sense, one might also think of it in a relative sense, where sustainability is defined as the state of keeping up on a variety of economic indicators with other countries. Take a case where a country falls behind its comparators in terms of real income despite the lack of any absolute decline in the standard of living or any other key sustainability variable. One might consider such a country not to be economically sustainable, particularly if the emergence of these gaps with other countries leads to a migration of people and capital from the lagging to the more dynamic country. Under this relative definition, there are similarities between the concepts of economic sustainability and competitiveness. In this discussion, however, economic sustainability will only be used in the absolute sense.

individuals' social and economic prospects; to provide incentives for greater efficiency in schooling; and to help to mobilize resources in order to meet rising demands for education and health (2000:5).

The OECD has made a major effort in recent years to strengthen the collection and reporting of comparative statistics in the field of education. Since the early 1990s it has set out to identify and measure a range of educational outcomes, initially through the International Adult Literacy Surveys conducted by the OECD and Statistics Canada in 1994-97, and more recently through the Program for International Student Assessment (PISA). This latter survey represents an instrument to compare the quality of outcomes produced by school systems, rather than just the numbers of people processed (educational participation) or internal effectiveness (curriculum-based tests).

One example, which illustrates an assessment of trends in education, is the recent OECD (2000a) study *Investing in Education: Analysis of the 1999 World Education Indicators*. This document represents the first report of the World Education Indicators pilot program that began in 1997. It sheds light on the comparative performance of education systems, with an analysis that extends to the financial and human resources invested in education, how education and learning systems operate and evolve, and to the returns to educational investment².

The OECD has also made major efforts in recent years to strengthen the collection and reporting of comparative statistics in the field of health and the assessment of health systems. Further to this, the OECD produces a CD-ROM on health data containing 1200 health indicators across 29 countries for the period 1960-99. They have also recently developed a manual of the System of Health Accounts (OECDc, 2000) that provides a set of comprehensive, consistent and flexible accounts to meet to needs of government and private-sector analysts and policy makers. These accounts constitute a common framework for enhancing the comparability of data over time and across countries and suggest links with non-monetary indicators. An occasional paper has also been released (Hurst and Jee-Hughes, 2001) that compares and contrasts the key indicators of performance of health systems in selected OECD countries.

The World Bank has also done work in assessing the health of the world's population. For example, a recent study entitled *Measuring Countries Performance on Health: Selected Indicators for 115 Countries* (World Bank, 1999) provides comprehensive data on health to assess trends in most countries in the world.

Considerable work has also been done in Canada, particularly in recent years, to assess the health and education components of human capital. In terms of health, the most important sources of information and analysis are Statistics Canada and the Canadian Institute for Health Information (CIHI). The joint flagship publication of these two organizations, *Health Care in Canada: a First Annual Report, 2000* (Cat. 82-222), provides a comprehensive assessment of the changing face of Canada's health system. A detailed source for data on the health system is Statistics Canada's 1999 publication *The Statistical Report on the Health of Canadians* (Cat. 82-570).

Statistics Canada produces on a regular basis two additional publications that are very useful for the assessment of trends in the health area. The first, *Health Indicators* (cat. 82-221), provides information for all health regions on the overall health status of the region's population, how this status compares to other regions

2 The report assesses the education system of 16 countries under the headings of managing the growth of educational participation and mobilizing resources and encouraging efficiency. Under the former heading are studied patterns of demand and potential to respond, progression and completion, and school types and participation. Under the latter heading are analyzed investment in education, and trade-offs and investment choices in the classroom.

in the province and country and how it is changing over time; the major non-medical determinants of health in the region; the health services received by the region's residents; and the characteristics of the community or the health system that provide useful contextual information. The quarterly periodical *Health Reports* (cat. 82-003) provides analysis of different aspects of health trends and determinants in Canada. Many of the articles are based on data from the National Population Health Survey, a key source of information on the health status of Canadians.

The Centre for Education Statistics (Statistics Canada, 1997) is also the major source for information and analysis on Canada's education system. The Centre's publication *Education Indicators in Canada 1999* (cat. 81-582) provides a comprehensive set of statistical measures or indicators describing the education systems in Canada in terms of students, teachers, finances and outcomes. The Centre has also published the *Education Quarterly Review* (cat. 81-003) since 1994, which provides: analytical articles in the areas of accessibility; alternatives forms of education delivery; education data sources; education funding; the relationship between education and the labour market; student flows, mobility and transitions; student participation and performance; teacher issues; and technology and learning.

Statistics Canada, working with the OECD and Human Resources Development Canada, has pioneered the international assessment of literacy through the International Adult Literacy Survey (IALS). The publication *Literacy in the information age: final report of the International Adult Literacy Survey* (cat. 89-571) provides the world's first reliable and comparable estimates of the levels and distribution of literacy skills in the adult population drawn from 20 countries over the first three cycles of data collection from the IALS. A monograph series based on the IALS data authored by literacy scholars in Canada and the United States also exists. One study of particular note is *Benchmarking Adult Literacy in North America: An International Comparative Study* (Tuijnman, 2001). Other studies have dealt with the disparity between literacy in Canada between francophones and anglophones (Corbeil, 2000); schooling literacy and individual earnings (Osberg, 2000); health and literacy among seniors (Roberts and Fawcett, 1998); inequalities in literacy skills among youth; literacy utilization in the workplace; employee training; and literacy and economic security.

Potential Indicators

The Centre for the Study of Living Standards (CSLS, 2000) prepared a discussion paper for the National Round Table on the Environment and the Economy in which a framework for organizing indicators of human capital in the areas of health and education was proposed.

A key distinction in the paper was made between outcome and input indicators. Both types of indicators are in turn divided into summary and specific indicators. Sustainability was defined when the outcome indicators (or a composite index of the indicators) remain constant or improve over time, with unsustainability defined as deterioration in outcome indicators. Weak sustainability requires only constancy or improvement in summary outcome indicators while strong sustainability requires constancy or improvement in all summary and specific outcome indicators. The paper also provided a list of both summary and specific outcome and input indicators.

This paper goes beyond this by proposing an approach to human capital indicators consistent with the ESDI Initiative framework's overall goal of tracking economic sustainability. Specifically, it proposes two summary indicators be adopted to track the sustainability of human capital in the education area and two in the health area.

Indicators of Human Capital in the Education Area

In the education area, it is suggested that the average educational attainment of the working age population (or labour force) be adopted as the first summary indicator of the sustainability of human capital in the education area. Additional years of education normally produce more knowledgeable and skilled workers; a situation where average educational attainment is declining is not consistent with the sustainability of human capital. It is true that years of education has certain characteristics of an input indicator rather than an outcome indicator of human capital and that the effectiveness of a certain number of years of schooling may vary across countries and over time due to differences or changes in educational quality. However the problems associated with adopting an input indicator such as educational attainment as a proxy for sustainable human capital are much less severe than would be the case if a true input indicator such as educational expenditures was adopted.

The advantages of the use of years of average education attainment as an indicator of trends in human capital sustainability include its transparency; its wide availability over space in Canada from the national level to census tracts as well as internationally for almost all countries and over time for many decades; and its accessibility from a large number of sources, including censuses, household surveys, and administrative records. As already noted, one disadvantage of average educational attainment, as an indicator of human capital sustainability is the possibility of declining quality of educational credentials. A high school diploma in 2001 may or may not represent the acquisition of as much knowledge as it did 50 years ago.

The second proposed indicator of human capital in the education area is the standardized test results for literacy and numeracy such as the International Adult Literacy surveys pioneered by Statistics Canada and the OECD. A decline in the test scores of the working population (or labour force) would indicate a fall in the average quality of human capital and hence an unsustainable situation.

The advantage of literacy tests is that they represent a true outcome indicator of human capital quality over both time and space. Disadvantages include the lack of historical data for Canada; the small number of countries for which comparable data are available; the limited possibilities for disaggregation of the population because of small sample size; and the high cost of obtaining the data.

Indicators of Human Capital in the Health Area

The first indicator proposed as a proxy for the sustainability of human capital in the health area is the Health-Adjusted Life Expectancy (HALE) of the total population (calculation of a HALE for only the working age population or labour force poses statistical problems). A decline in the HALE would be an indication that the size of the current population may not be sustainable.

The HALE is a classic summary indicator. Its greatest strength is that it captures the impact on the population of all the determinants of health. One disadvantage is that unlike life expectancy, it is relatively difficult to calculate, as it requires detailed data on health status to make the disability or health adjustment. Therefore it may not be available for long time periods and on a consistent basis for a large number of countries. However, as trends in the HALE appear similar to that of overall life expectancy, for periods and countries where the HALE is not available, overall life expectancy may possibly be used as an approximation. Data on overall life expectancy are available for almost all countries for long time periods.

The second indicator proposed to track the sustainability of health component of human capital is self-reported overall health status. Like the HALE, a decline in health status of the working age population of

labour force indicates deterioration in the ability of this population to engage in economic production and hence represents a decline in human capital and a trend toward unsustainability.

Self-reported health status is an outcome indicator. Research shows that it is an excellent indicator of the true health status of individuals. The proportion of the population who rate their health as very good or good approximates the proportion who in fact have few health problems. One disadvantage of self-reported health status is that this information requires health surveys of the population so there may be limitations on the availability of comparable data over time and across space.

Key Issues

Aggregation and Monetization

There are two key issues in the field of indicators research related to aggregation and monetization. The first issue stems from whether or not the indicators selected as most appropriate be aggregated or rolled up into one composite indicator index or left as a set of indicators? Second, if a composite indicator or index is to be constructed, should the aggregation be made in terms of a common numeraire such as monetary units or should the indicators be aggregated through a weighting procedure?³

In terms of the first issue, the great advantage of the composite indicator or index approach is that it produces a bottom line that can capture public attention. In addition, since no information is lost through the aggregation procedure, one can easily identify the variables that are driving the index since any policy response to trends in the index most focus on specific variables.

In terms of the second issue there are advantages and disadvantages of both approaches. The major advantage of the monetary unit approach to aggregation, in addition to its transparency, is that under competitive conditions the valuation (whether market or imputed) placed on the various variables in theory corresponds to the valuation society places on them. The major disadvantage of this approach is that for many variables there is no market value and it is difficult to impute a monetary value. The problem is particularly severe for the appropriate valuation of ecosystems.

The major advantage of the weighting approach to aggregating a set of indicators into an index is its simplicity. The major disadvantage can be the subjective nature of the weighting scheme, which may reflect the biases of the constructors of the index. This problem can be overcome by developing a set of weights that reflect societal values and preferences through surveys.

It is in theory possible to impute monetary values on the four indicators proposed in this paper to track the economic sustainability of human capital in the education and health areas. However, it is not clear that it is necessarily appropriate to do so because of the conceptual and data problems associated with estimating these values.

The monetary value of the average educational attainment of the working age population (or labour force) can be estimated from either a supply-side cost of production approach or a demand-side future earnings approach. In terms of the first approach, the total cost of educating the population at this point in time is

³ This is not necessarily an either/or decision as an index can combine the two approaches, aggregating certain variables with dollars and using weights for others. This is the approach adopted by the Index of Economic Well-being developed by Osberg and Sharpe (1998).

derived from the current average cost of a year of education at the various levels of education and the distribution of the population among the various levels of educational attainment.⁴ In terms of the second approach, the value of human capital attributable to formal educational attainment can be calculated by estimating the stream of future earnings of the population arising from that education and calculating the present value of this earnings stream with a discount rate.

The monetary value of the literacy level of the working age population (or labour force) is conceptually more difficult to calculate than the monetary value of human capital accumulated through formal education. Certainly, the cost-of production approach cannot be used. If earning data are available for the various literacy levels, then the demand-side future earnings approach may be used.

It is difficult to place a total value on Health-Adjusted Life Expectancy (HALE) just as it is difficult to place a value on life. It is easier to put a value on changes in the HALE. By the use of contingent valuation techniques or other methodologies, one can value how much people would be willing to pay for an additional year of healthy living. Equally, these techniques can be used to value changes in self-reported health status.

Substitutability

A key issue in the sustainability debate for natural capital is the substitutability among the various components of natural capital. For example, weak sustainability is defined as a state where the monetary value of total stock of natural capital is maintained. The exhaustion of certain types of natural resources can be offset by the discovery of other resources, as all natural resources are substitutes for one another in generating income. Strong sustainability is defined as a state where the value of all components of natural capital is maintained.

The weak sustainability framework based on substitutability is appropriate for natural resources as they are in fact substitutable. None are essential for sustainability. The strong sustainability approach is more relevant for the ecosystem component of natural capital as many ecosystems may be essential for the continuation of life as we know it on this planet. There are no substitutes for such ecosystems to ensure sustainability.

The concept of substitutability is not particularly relevant to the four indicators of human capital suggested in this paper. First, human capital will always be essential for economic production and cannot be replaced by natural and produced capital. Second, the four indicators proposed are summary or aggregate indicators of human capital so substitution in the production process is not possible as it may be for more disaggregated components of human capital (e.g. labour of different skill levels).

Population Covered by the Indicators

An issue in the development of indicators of economic sustainability is what population is the appropriate reference. If it is the overall sustainability of the planet, then the total population is the relevant group. If the sustainability of economic production is the issue, then one may want to restrict the coverage of the indicators to the working age population (either the 15 and over or the 15-64 definitions) or the labour force (which excludes persons not looking for work),⁵ as it is this population that is engaged in economic production.

4 See Osberg and Sharpe (1998) for application of this methodology to estimate the value of human capital in Canada for the 1971-96 period.

5 One problem with a focus on the labour force is that many persons of working age move in and out of the labour force both during the year and over their life cycle. Annual estimates of the labour force thus underestimate the number of persons in the labour force over the course of the year.

It is unlikely that this choice of the reference population will have a significant effect on trends in economic sustainability for human capital indicators in the education area. It may be relevant for human capital in the health area as the trends in the health status of the 25-64 population may vary from those for the 65 and over population.

Conclusion

The measurement issues associated with the four indicators of human capital in the education and health areas suggested in this paper, particularly when estimated in non-monetary terms, are in my view much less severe than the issues associated with the capital represented by ecosystems. Consequently, the development of estimates of these four summary indicators for Canada and other countries in order to track the economic sustainability for human capital is a feasible exercise.

In my view, the absolute sustainability of human capital, including both the education and health components, represents considerably less of a challenge than the sustainability of certain ecosystems. It is unlikely in Canada (although certainly within the realm of possibility) that the educational attainment and literacy level of the workforce could decline or that the life expectancy of the population could fall. It is possible that the health status of the working population could decline, but whether such a development would seriously threaten economic production seems unlikely given the sedentary nature of most jobs.

The challenges in the human capital area relate more to Canada's ability to improve the quality of our human resources, relative to our competitors, than to sustain them at the existing level

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