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A stock-taking report on measuring human capital**Measuring Human Capital: leading initiatives and challenges ahead****Note prepared by the Organisation for Economic Co-operation and Development and an expert group chaired by New Zealand***Summary*

The document is an extract from the stock-taking report on measuring human capital. It presents the purposes of human capital measurement, an overview of the leading initiatives and activities, the main issues and challenges ahead, and recommendations for further work.

The Organisation for Economic Co-operation and Development and an expert group chaired by New Zealand prepared the Report at the request of the Conference of European Statisticians as a follow up to the seminar on human capital measurement in June 2011. The Bureau reviewed the Report in November 2012. The Bureau supported the proposed recommendations for further work and decided to submit the report to the 2013 plenary session of the Conference.

The full text of the Report has been sent to all members of the Conference for electronic consultation. Subject to positive outcome of the consultation, the Report will be submitted to the 2013 plenary session of the Conference of European Statisticians for endorsement.

I. Purposes of human capital measurement

1. Measuring the stock of human capital can serve many purposes, i.e. to better understand what drives economic growth, to assess the long-term sustainability of a country's development path, and to measure the output and productivity performance of the educational sector. While all these perspectives emphasise the importance of measuring the total stock of human capital, more recent discussions on 'beyond Gross Domestic Product (GDP)' has led to growing attention being paid to the distribution of human capital across households and individuals, and on the non-monetary benefits stemming from it. Each of these perspectives is described below.

A. Growth accounting and productivity analysis

2. The modern concept of human capital has its origin in efforts by economists to explain the 'puzzle' of economic growth based on conventional production functions, i.e. the large size of the residual not explained by either economic/produced capital or labour inputs. Investment in human capital – through education, training and work experience enhances the quality the quantity of labour inputs, and may thus explain a large part of this residual (Schultz, 1961).¹ More recently, further research on economic growth, represented by the so-called "new growth" models (e.g. Lucas, 1988; Romer, 1990a; Barro and Sala-i-Martin, 1995), has argued that investment in human capital does not just improve labour quality at a point in time, but can also lead to technological progress and innovation, i.e. positive "externalities" that increase the productivity of other factors.

3. Following this line of argument, many empirical studies have tried to expound the positive relationship between human capital and economic growth. However, due in large part to measurement errors, earlier findings on the impact of human capital on economic growth were rather mixed. More recently, improved data on educational attainment have led to more robust estimates of the impact of human capital on economic growth (e.g. Arnold *et al.*, 2007; Sianesi and Van Reenen, 2003), suggesting a sizable impact of human capital accumulation on economic growth. This evidence, while based on physical proxies of the human capital stocks, suggest that better measures of the stock of human capital could significantly improve our understanding of the drivers of economic growth.

B. Sustainability assessment

4. Maximizing current income and consumption in a context of limited resources will not assure the sustainability of a country's development path. Sustainable development, in its inter-generational dimension, is usually understood as requiring that an unchanged stock of total capital (including human capital) per capita to be passed on to the next generation (United Nations Economic Commission for Europe (UNECE), 2009).

5. To produce meaningful measures of the total capital stock of each country, measures of each of its components are needed. Further, these measures should (when assuming that

¹ Within the standard growth accounting framework, such as the ones recommend by Schreyer, 2001 and applied in the European Union (EU) Capital, Labour, Energy, Materials and Services (KLEMS) project (O'Mahony and Timmer, 2009), incorporating the quality of labour inputs into a production function may significantly reduce the unexplained residual (i.e. multifactor productivity growth (MFP)), which is, in fact, simply a measure of our "ignorance".

different capital stocks can be substituted for each other in the production process) be expressed in common metric, so as to allow gauging whether, for example, increases in economic capital more than offset declines in the stock of oil reserves. Because of its role in economic accounting, the metric typically used to measure the different types of capital is that of 'money'. Devising a robust methodology for the monetary valuation of the stock of human capital is especially important as a number of studies have suggested that human capital, measured in this way, is by far the most important component of the total capital stock in most advanced economies (e.g. Greaker et al, 2005; Gu and Wong, 2008; World Bank, 2006, 2011).

6. Not only the total stock of human capital but also its evolution over time provides important information for monitoring sustainability. For instance, better measures of changes in human capital due to demographical factors such as population ageing, may provide an early warning of the risk that the accumulation of human capital may not be sustainable over time. This would allow pre-emptive policies aimed at encouraging alternative forms of investments, to offset the decline of total capital stock due to ageing.

C. Measuring the production and productivity performance of the education sector

7. Education is a key driver of human capital investment. When considered as a 'sector', education accounts for around 6% of the Organisation for Economic Co-operation and Development (OECD) GDP. A large part of educational expenditures come from public sources, and this share has been growing in recent years. On average, OECD countries devoted to education around 13% of their total public expenditures in 2008, a share that has been rising in most countries since 1995 (OECD, 2011a). To justify the allocation of such a large part of public funds to education, rather than to other objectives, requires a better understanding the productivity performance of the education sector.

8. The value of the economic production of the education sector is conventionally measured based on the costs of the market inputs that are used in this sector. These costs include teachers' wages and salaries, the consumption of fixed capital (e.g. due to the use of school buildings), household expenditures for school fees and educational material, etc. This input-based approach is, however, inadequate for productivity analysis since it ignores changes in the efficiency with which various inputs are used in production. To support an analysis of the productivity of the education sector, output-based measures of its economic production are called for.

9. Several approaches may be used to derive an output-based estimate of the volume of production in the education sector (e.g. Schreyer, 2010; Gu and Wong, 2010a). When the production of the educational sector is conceived as the annual addition to the stock of human capital, a productivity measure for the sector could be established by comparing changes in the volume of inputs and changes in the volume of outputs. Separate measures of the two elements are therefore required.

10. Besides better understanding the productivity of the educational sector, detailed information such as how the education sector is financed, how its resources are allocated, how its different outputs (i.e. graduates with different levels of educational attainment) are 'produced' and then employed in different industries and occupations are of vital importance for education-related policies. To that end, education satellite accounts, sometimes extended to human capital accounts, have been used by some countries.

D. Broader measures of people's well-being and societal progress

11. Recent reflections on the limits of GDP as a welfare measure (e.g. Stiglitz et al., 2009; OECD, 2011; and various EU initiatives²) have underscored that people's material conditions (i.e. their economic well-being) is determined not only by current income and consumption but also by the assets they own – e.g. housing property, financial assets but also, importantly, human capital. All these assets generate income streams over their lifetime and provide a buffer against sudden shocks. This individual perspective suggests that, beyond looking at the total stock of a country's human capital, measures of how this capital is distributed are also important.

12. The distribution of human capital matters both in itself and for its influence on other aspects. Empirical evidence shows that countries characterised by a more equal distribution of human capital also experience greater income equality (e.g. Alesina and Rodrik, 1992; OECD and Statistics Canada, 2000). Recent OECD analysis of the factors shaping income inequalities in industrialised countries has shown that, over the past two decades, the trend to higher educational attainment has been one of the most important elements counteracting the increase in earnings dispersion (OECD, 2011b).

13. Further, the concept of people's well-being stretches beyond its material side, to encompass a variety of non-monetary dimensions which, together, define people's quality of life. This broader perspective has implications for the measurement of human capital as it highlights that, in addition to its economic returns, investment in human capital can generate other benefits that will improve individuals' well-being. These 'non-economic benefits can include the improved health conditions that are generally associated to higher education and which may enhance not just an individual's productivity and earnings but also his/her subjective well-being (Dolan et al, 2008). Furthermore, these non-economic benefits are not restricted to individuals, but can extend to the society at large. For example, education may lead to better-informed citizens, more tolerant of social and cultural diversity and more willing to actively take part in a modern democratic society.

14. While some of these non-economic benefits of education are captured through the monetary measures of human capital that are reviewed in this paper (e.g. the longer life-expectancy of more educated individuals), this is not the case for most other benefits. Moreover, the formation of human capital itself may be impacted by activities that enhance health conditions as well as family and community well-being. This, again, has also implications for human capital measurement.

II. Overview of the leading initiatives and activities

A. Country experiences

15. Acknowledging the importance of human capital, many countries have conducted national studies trying to measure it. Most of these studies are or have been undertaken by individual researchers. While, in some cases, these studies have been conducted by statisticians working within national statistical offices, the estimates produced generally have the status of research outputs rather than official statistics.

² For more information on this initiative and a later European Commission Communication on "GDP and Beyond - Measuring progress in a changing world", please visit the following links: <http://www.beyond-gdp.eu/> and <http://www.eubusiness.com/topics/finance/beyond-gdp>.

16. This section provides an overview of national studies conducted either as part of the research activities of national statistical offices (NSOs), or by independent researchers. This overview is based on the results of a questionnaire on national practices in measuring human capital sent to Conference of European Statistician (CES) member countries. The focus of this section is on the purpose, concept, methodology, and data sources used for measuring human capital in different countries. Drawing on the results from this questionnaire, this section also presents selected findings from national studies based on both the cost-based and the income-based approach.

1. Results of the Conference of European Statisticians questionnaire on measuring human capital

17. Overall, out of the 70 CES countries contacted, 46 answered the questionnaire, with 17 providing detailed answers. These include, among OECD countries, Austria, Canada, Finland, France, Germany, Israel, Italy, the Netherlands, New Zealand, Norway, Poland, Slovenia, the United Kingdom and the United States; and, among CES non-OECD countries, Liechtenstein, Romania and Ukraine. Highlights from countries responses include the following:

(a) Most NSOs indicated that the purpose of measuring human capital is multiple, implying that measures of human capital are undertaken to address various issues. In general, countries selecting “Measuring well-being and social progress” as one purpose of their measurement initiative also referred to the OECD definition of human capital outlined in section III A. However, many NSOs referred to definitions of human capital that have narrower scope, tending to focus on the economic/ dimension;

(b) Data sources used by NSOs to measure the stock of human capital are diverse, but almost all are available within the statistical system of each country. Many of the existing human capital estimates are in the form of research results but some NSOs published these estimates in their statistical publications and a few qualify these measures as ‘official statistics’. Many NSOs reported measuring human capital on a regular basis, most of them annually;

(c) Only a few NSOs report that they plan to construct satellite accounts for human capital in general and for educational sector in particular. Likewise, few report having considered the possibility and potential implications of incorporating measures of the stock of human capital into the system of national accounts (SNA);

(d) Most NSOs report relying on multiple human capital measures, with physical indicators and monetary measures most often applied. Among those NSOs reporting that they rely on only one type of measure, most of them declared relying on monetary measures.

(e) As for the specific physical indicators used, many NSOs report that they rely on conventional indicators drawn from education statistics. Very few NSOs report undertaking their own collection of indicators of the quality of education and skills, such as those undertaken as part of the OECD Programme on International Student Assessment (PISA) and Programme for the International Assessment of Adult Competencies (PIAAC);

(f) Among the monetary measures, the income-based approach is predominant over the cost-based and the indirect/residual approaches. Most NSOs answering the questionnaire report that they rely on only one approach, while just a few indicated using multiple approaches. The main reason provided for relying on the residual approach is its simplicity;

(g) The main reason indicated by NSOs for choosing the cost-based approach is data availability, applicability in the SNA, and the fact that they it does not require making

assumption about the future, while the main challenges are the issues related to data availability. Some NSOs reported including in their estimates not just the costs incurred by educational institutions, but also expenditures by firms and private households. Conversely, no NSOs indicated having ever included non-market costs in their estimates of the human capital stock based on the cost-based approach;

(h) The main reason reported by NSOs for using the income-based approach is that it is regarded as being consistent with economic theory and with the way in which other assets (such as natural resources) are measured in the SNA. This approach is also considered to be well established and widely employed, and to be suitable for constructing a full-fledged human capital account with volumes, values and prices as basic elements. Issues related to the methodology and data availability, rather than the concept itself, are regarded as the main challenge for applying this approach. Partly due to data limitations, almost all NSOs having used the income-based approach limited their estimates to people of working age and to market activities.

18. As several NSOs appear to have developed monetary measures of the stock of human capital, the next section presents some examples for the cost-based and the income-based approaches.

2. Representative studies using the cost-based approach

19. The cost-based approach to measuring human capital is similar to that conventionally applied to measuring economic capital. As in the case of economic capital, the perpetual inventory method measures the stock of human capital as the accumulated value of all the expenditures concurring to its formation, which are considered as human capital investment.

20. The most well-known application of the cost-based approach is that provided by Kendrick (1976) for the United States. Kendrick's estimates are more inclusive than most other applications of this approach, as they include the cost of child rearing, spending on education and other expenditures considered as having educational value. In addition to these expenditures, Kendrick also includes the opportunity cost of student time, i.e. earnings forgone by students when studying. Following the same approach, Eisner (1978, 1985, 1988, 1989) estimated the value of the stock of human capital in the United States through a number of modifications to the US national income accounts. Both Eisner and Kendrick included in their estimates of human capital formation the opportunity cost of students' time while in school, as well as the actual costs of education undertaken by both households (e.g. costs for tuition and educational materials) and governments (e.g. costs for salaries and investments of educational institutions). However, unlike Kendrick, Eisner excluded the costs of child-rearing from the investment in human capital.

21. As discussed in Section III. B, applying the cost-based approach requires confronting several challenges. One is how to distinguish between consumption and investment expenditures. Kendrick included in human capital investments all household expenditures related to child rearing up to the age of 14, as well as half of household expenditures on health and safety, while considering the other half as consumption. Another challenge in implementing this approach is how to choose the depreciation rates when constructing the stock of human capital. Because of a lack of empirical evidence, Kendrick used for this purpose a modified double declining-balance method, while Eisner used straight-line depreciation.

22. The cost-based approach to measuring the stock of human capital was also applied in Germany (Ewerhart, 2001, 2003), while the Netherlands used this approach to measure firm-specific human capital (Rooijen-Horsten et al, 2007, 2008). Finally, within the framework of the SNA, the cost-based approach was used by the Finnish NSO to measure

the human capital in an empirical analysis of the relation between human capital and economic growth in Finland (Kokkinen, 2008, 2010). Statistics Canada also plans to apply the cost-based approach, together with the income-based approach already used, and to reconcile the estimates from the two approaches.

3. Representative studies using the income-based approach

23. One of the main conclusions from the questionnaire responses is that several countries are currently applying variants of the income-based approach. The income-based approach has been used for measuring human capital at least since the 1960s (e.g. Weisbrod, 1961). However, it was the seminal work by Jorgenson and Fraumeni (1989, 1992a, 1992b) that spawned interests in measuring human capital by applying the lifetime income approach (also called the Jorgenson-Fraumeni method).

24. The lifetime income approach measures the stock value of the human capital embodied in individuals as the discounted present value of the expected future labour incomes that could be generated over the lifetime of the people currently living. By bringing together the influence of a broad range of factors (demography, mortality, educational attainment and labour market aspects), this approach allows comparing the relative importance of these factors and drawing useful policy implications from the estimates.

25. Table 1 presents a list of national studies that have applied this approach to measuring human capital. This list is meant to highlight the broad range of countries (11) for which these estimates exist, rather than being exhaustive of the full range of studies based on this approach.

Table 1

An overview of selected national studies applying income-based approach

<i>Examples of national studies</i>	<i>Country</i>	<i>Motivation</i>	<i>Time range</i>	<i>Main data sources</i>	<i>Population covered</i>	<i>Market/N on-market activities</i>
Jorgenson and Fraumeni (1989, 1992a, 1992b)	United States	New systems of national accounts, Output of education sector	1948-1984, 1947-1987	Rich data based on decades of research	Age 0-75	Both
Ahlroth, et al. (1997)	Sweden	Output of education sector	1967, 1973, 1980, 1990	Level of living surveys	Age 0-75	Both
Ervik, et al (2003)	Norway	Output of higher education sector	1995	Register data	Age 20-64	Market only
Wei (2004, 2008)	Australia	Incorporating human capital into the SNA (Stock/Flow)	1981-2001	Census data	Age 18 (25)-65, labour force/whole population	Market only
Le, et al (2006)	New Zealand	Measuring human capital (Stock)	1981-2001	Census data	Age 18-64	Market only
Gu and Wong (2008)	Canada	Human capital contribution to national	1970-2007	Census /labour force survey	Age 15-74	Market only

		wealth account				
Liu and Greaker (2009)	Norway	Measuring human capital (Stock)	2006	Register data	Age 15(16)-67(74), labour force/ whole population	Market only
Christian (2010, 2012)	United States	Measuring human capital (Stock/Investment)	1994-2009	Rich data	Age 0-80	Both
Coremberg (2010)	Argentina	Measuring human capital (Stock)/Output of education sector	1997, 2001, 2004	Household permanent survey	Age 15-65	Market only
Li, et al. (2010)	China	Measuring human capital (Stock)	1985-2007	Household survey/Health and nutrition survey	Urban/rural, Age 0-60 (55 for female)	Market only
Jones and Chiripanhura (2010)	United Kingdom	Measuring human capital (Stock)	2001-2009	Labour force survey	Age 16-64	Market only

26. Data availability varies across national studies. For many countries, the data needed for applying the income-based approach are compiled by the researcher, with many assumptions made during the data construction process. In part due to this, and differently from the studies by Jorgenson and Fraumeni, most of the national studies listed in Table 1 focused on people of working age (typically based on exogenous age thresholds, e.g. 16 and 65) and on market activities. These limitations reflect a pragmatic way to sidestep a number of conceptual and data issues that arise when applying the full Jorgenson-Fraumeni approach. Incorporating non-market activities into human capital estimates remain controversial and focusing on working age population is more relevant for measuring a country's productive capacity (Wei, 2004; Gu and Wong, 2008; Greaker and Liu, 2008). Methodological modifications of the Jorgenson-Fraumeni methodology were also made in some of national studies. For example, to smooth the business cycle effects that affects the Jorgenson-Fraumeni approach (which relies exclusively on current cross-sectional information), Wei (2008) applied a cohort-based estimation to simulate future earnings.³

27. These national studies suggest that the estimated value of the stock of human capital is substantially larger than that of economic capital, even when measures of the former are restricted to market activities. Measures of the stock of human capital based on the income-based approach tend also to exceed those based on the cost-based approach, a pattern that may reflect the fact that the former approach implicitly attributes the impact of in-work training and work experiences to formal education. When considering the whole output of the education sector as human capital investment, the value of such investment is also high compared to the gross fixed capital formation traditionally considered in the SNA.

³ For more detailed discussions on the technical issues, besides the conceptual, methodological and data issues, in national studies that applied the lifetime income approach to measuring human capital, see Liu (2012).

Considering educational expenditures as investment rather than consumption would significantly change our appreciation of the extent of capital formation in any given year.

28. Estimates of the value of the human capital stock based on the life-time income approach are sensitive to choices on key parameters employed in this approach, namely the real annual growth of labour income that is assumed to prevail in the future, and the rate used to discount future earnings. Growth rates of the human capital stock as well as its distribution across different groups of people are however less sensitive to the choice of these parameters. Despite many challenges, attempts have also been made to construct flow and stock values of human capital in a systematic way by applying this approach (Wei, 2008, Gu and Wong, 2010b).

B. International initiatives

29. Developing comparable measures of human capital has been pursued by several researchers and international organisations. One example of the research in this field is represented by the work by Barro and Lee (1993, 1996, 2001, 2010) to construct an international dataset of educational attainment, school years and schooling quality as proxies for human capital, based on census and survey information compiled by the United Nations Educational, Scientific and Cultural Organization (UNESCO) and other sources.

30. Among international organizations, developing comparable measures of human capital has been one of the priorities of the OECD. Much OECD work in this field has aimed at developing a better understanding of how teaching and learning outcomes can be improved in the classroom, and helping policy makers to learn from each other's successes and failures. A large range of physical indicators are published in the OECD flagship publication *Education at a Glance*. Recently, the Programme for International Student Assessment (PISA) has attracted much attention in the international arena. The OECD also has a long tradition in the field of measuring human capital beyond formal education. Earlier works include the investigation of further education and training and of its impacts on the job market (e.g. OECD, 1994). To deepen the understanding of the determinants of learning, attempts have been made to develop a framework for rethinking human capital information and decision-making; based on this framework, the OECD has analysed obstacles to measurement, and suggested methods for improvement (OECD, 1996).

31. In response to the growing interest in human capital, an OECD report in 1998 proposed an initial set of indicators of human capital investment based on existing data. The report identified areas where significant gaps in internationally comparable data existed, and the cost of development of data collection for new measures and performance indicators (OECD, 1998). Building on the 1998 report, a later report (OECD, 2001) extended the OECD definition of human capital with a view to: i), describe the latest evidence on investment in human capital and its impact on economic growth and well-being; ii) clarify the more novel concept of social capital; and iii) identify the roles of human and social capital in realising sustainable economic and social development. This report was an input to the OECD projects on economic growth and sustainable development (OECD, 2001).⁴

32. Since then, the OECD work on human capital has continued along two lines:

⁴ To communicate the findings from OECD research to a wider audience, one book of the OECD Insights series summarised the work on human capital undertaken by the OECD in the message that "how what you know shapes your life" (Keeley, 2007).

(a) To extend the measurement of students' competences in schools (PISA) to those of adults (PIAAC). In 2011, the PIAAC was launched with first results expected to become available in 2013. The PIAAC programme also links with the previous OECD work on the International Adult Literacy Survey (IALS);

(b) To identify the common methodology and data requirements for building human capital accounts. In cooperation with a number of national statistical agencies, a project was launched in 2009 by the OECD Statistics Directorate to build monetary estimates of human capital for international and inter-temporal comparisons. Results from this project, summarised in Liu (2011), show the feasibility of applying the lifetime income approach to measuring human capital for comparative analysis, based on data that are currently available within the OECD statistics system.⁵

33. Beyond the OECD, many other activities on measuring human capital in the international arena have taken place. These include the following:

(a) The UNECE/OECD/Eurostat Working Group on Statistics for Sustainable Development has worked to develop a broad conceptual framework for measuring sustainable development with the concept of capital at its core, and to identify a small set of indicators that might be used for international comparisons (UNECE, 2009). The forthcoming report of a new UNECE/OECD/Eurostat Task Force on measuring sustainable development will include a specific section on human capital measurement;

(b) The United Nations Development Programme (UNDP) Human Development Index (HDI), which aims to illustrate the state of development of a society, is a composite index that combines measures of average achievements in a country in three basic dimensions of human development, i.e. health, education and knowledge, and standards of living. The 2012 Human Development Report includes two measures of education and knowledge, namely school attainment, expressed in terms of the number of years of schooling, and school-life expectancy;⁶

(c) The EU KLEMS project has constructed a database (the EU KLEMS Growth and Productivity Accounts) for empirical research of economic growth. Although the primary aim of the EU KLEMS database is to generate comparative information on productivity trends, the data collected are also useful in other contexts. Thanks to its extensive country and industry coverage, potential applications of the database vary widely;

(d) The World Bank developed comprehensive wealth accounts, which include estimates of human capital, for more than 120 countries, to answer the question "Where is the Wealth of Nations?" (World Bank, 2006). Beyond the snapshot of national wealth at a point in time, the World Bank extended the accounting of wealth over the decade from 1995 to 2005 and provided the first inter-temporal assessment of global, regional, and country performance in building comprehensive wealth and achieving sustainable development (World Bank, 2011);

⁵ Other relevant streams of recent OECD work on human capital are the 'Social Outcomes of Learning project', the OECD Skills Strategy; work on intangible assets undertaken as part of the OECD work on New Sources of Growth; and the OECD Better Life Initiative. For more on these streams of work see the information on the following websites:

http://www.oecd.org/document/9/0,3746,en_2649_39263294_33706505_1_1_1_1,00.html

<http://www.oecd.org/dataoecd/58/28/47769132.pdf>

<http://www.oecd.org/dataoecd/60/40/46349020.pdf>

http://www.oecd.org/document/0/0,3746,en_2649_201185_47837376_1_1_1_1,00.html

⁶ More information is available at <http://hdr.undp.org/en/>.

(e) More recently, the United Nations “Inclusive Wealth Report”, undertaken by the UN University International Human Dimension Programme and the United Nations Environment Programme, presented estimates of inclusive wealth (the sum of manufactured, human and natural capital) for 20 countries; in this approach, human capital is captured by measuring the population’s educational attainment and the additional compensation over time of this training (UN-IHDP, UNEP, 2012).

C. Lessons learned from national and international initiatives

34. The concept of human capital has evolved over time, from a narrow scope focusing on cognitive knowledge, working skills and economic returns associated to them, to today’s more comprehensive definition that embraces a broader range of attributes of individuals and of benefits stemming from it. The human capital concept defined by OECD (2001) has received wide acceptance.

35. However, implementing this overarching definition raises significant measurement challenges. The multi-faceted nature of human capital, the complex links between the various types of human capital investment and the diverse benefits that it delivers make it impossible to find a one-size-for-all measure of human capital, given current knowledge in this field. By necessity, the measurement of human capital has to be undertaken step by step.

36. Currently, many countries are using the definitions of human capital that focus on the productive capacity of individuals. Even among the countries that refer to the wider OECD definition, most of their measurement initiatives focus on formal education and on the economic returns accruing to individuals, rather than to human capital in general and to all the benefits (economic and non-economic, private and collective) from human capital investment. Given the current state of knowledge, this seems to be a practical and reasonable point of departure.

37. Following from this more narrow focus, measurement activities in this field have aimed to develop summary indicators providing simple proxies for human capital (e.g. average years of schooling, educational attainment). While the data requirements of such indicators are limited, so is the scope of these proxies. As a result, in more recent years, human capital measurement has moved in the direction of quantifying the knowledge and cognitive skills of students of adults after they left school. In more recent years, the challenge of developing monetary measures of human capital in a systematic way has received increasing interest.

38. All the approaches to measuring human capital described above have advantages and disadvantages. Depending on the purpose, different approaches can be applied individually or jointly to address different issues. However, the monetary measures generated from the cost-based and income-based approaches should arguably have core status. One reason for the increased interest in monetary measures of the stock of human capital is that these measures can be compared with those for economic capital based on the SNA, whose construction is one of the main tasks of national statistical offices. Steps in the direction of broadening the ‘capital boundary’ of the SNA have been taken in recent years following the decision to treat research and development as a ‘produced asset’.⁷ The development of satellite accounts for human capital (or education) is a first step in the

⁷ SNA 2008 recommends that research and development expenditures be valued at either the contract price or cumulated costs. Increased for changes in prices and reduced because of consumption of these fixed assets over their asset life.

direction of a similar extension of the capital boundaries of economic accounts with respect to human capital.

III. Main issues and challenges ahead

39. Despite the fact that an increasing number of countries have applied, or are planning to apply, the income-based approach to measuring human capital, several issues and challenges remain. These challenges relate to both data availability and to methodological issues, both of which are discussed below. One way of bringing together the range of information in this field, and to explore the source of the differences between various approaches, is to construct satellite accounts for human capital or education, an option that is also described in this section.

A. Data availability

40. The data needed by the income approach are currently either not available for some countries or are not in a form suitable for direct use. Based on the OECD experience in constructing monetary estimates of the stock of human capital (Liu, 2011), several issues stand-out:

(a) First, the quality and sources of earnings' data cross-classified by different characteristics of workers vary significantly across countries. Data may refer to different earnings concepts (hourly and weekly earnings in most cases, annual and monthly earnings for some countries) and may include different elements of the remuneration packages of workers. In some cases, data on earnings refer only to the main job while in other countries they may also cover secondary jobs and other remunerated activities. Finally, earnings data for different countries typically refer to different categories of educational attainment, and may be collected as either point estimates or in the form of earnings brackets;

(b) Second, despite the great progress accomplished in collecting harmonised educational statistics, there remain issues with the quality of data on school enrolment and graduation rates, as definitions and classifications are not always comparable across countries, due for instance to differences in educational systems and in ways of counting students (e.g. students who repeat the year, students who graduate for a second time, etc.);

(c) Third, human capital estimates would ideally require data on survival rates broken down by education. While some national estimates exist, and they highlight large mortality differentials by socio-economic characteristics, these breakdowns are not available for all countries and they are rarely comparable across countries. More generally, mortality statistics by educational level are not compiled through common standards across OECD countries, and in several countries they simply do not exist (OECD 2011).

41. More generally, constructing estimates of human capital based on the income-approach requires that data from a range of sources – e.g. earnings statistics, population census, labour force surveys, mortality records – are integrated and harmonised to meet the requirements of human capital accounting.

B. Methodological issues

42. Besides data issues, several methodological challenges also need to be addressed. First, most human capital estimates currently available rely on the assumption that cross-sectional earnings data are good predictors of future cohorts' earnings. However there is ample evidence that cohort effects are typically large. This suggests that it would be

appropriate to use longitudinal earnings data that disentangle age and cohort effects, and that make it possible to account for cohort-specific factors. Similarly, it would be important to separate wage premia due to educational attainment from those due to adult-training, on-the-job learning and other firms' characteristics, as failure to do so may lead to overstate the educational contribution to human capital. With respect to labour market indicators (e.g. employment rates and earnings), it is also important to separate business cycles effects that distort comparisons (e.g. by depressing earnings or employment rates for different categories of workers during a recession).

43. A further difficulty when applying the lifetime income approach relates to the choice of some of the key parameters required by the method, such as the expected real growth of labour income in the future, the discount rate and the price deflators used for temporal and country-comparisons. While assumptions on these parameters are currently left to the discretion of researchers, their choice would ideally require further theoretical and empirical backup: clear guidance in each of these fields is clearly needed. Similar challenges confront the cost-based approach with respect to the choice of depreciation rates and price deflators.

44. Perhaps the biggest challenge for developing monetary measures of the stock of human capital is represented by the large discrepancies between estimates of the value of the stock of human capital based on the income-based and the costs-based approaches. These discrepancies should be better understood and reconciled. One way to address this challenge would be to apply the two approaches simultaneously, which would offer an opportunity to identify the main factors accounting for the differences and to reconcile the two methods. Satellite accounts could be used for such purpose, as they would allow linking stock and flow measures of human capital in a fully-fledged accounting system which is consistent with rest of SNA. The next section discusses in more details the rationale and feasibility of developing human capital satellite accounts.

C. Satellite Accounts for Human Capital

45. Currently, both the investment and the stock of human capital are considered to fall outside the boundaries of the SNA 2008. This is because, on one side, human capital investment is considered as an activity that cannot be delegated to a third party, the basic criterion used to define 'production' in the SNA; and, on the other side, because ownership of human capital is hard to ascertain in a legal sense since human capital is embodied in each individual and cannot be sold or transferred to others (with the partial exception of the offspring). Extending the production and asset boundaries of economic accounts to incorporate human capital investment would change the SNA fundamentally, and the construction of a satellite account for human capital is one way in which these objectives could be pursued. Box 1 describes basic principles underlying the construction of satellite accounts according to the SNA 2008.

46. Satellite accounts for human capital would describe in a coherent framework the relation between the different aspects of the education and training system, while preserving a link to the core accounts of the SNA. However, no common conceptual framework for human capital satellite accounts currently exists. Some countries have developed basic satellite accounts of education focusing on the services provided by the formal education system⁸; while others (e.g. Italy) are in the process of developing them.⁹

⁸ The French Ministry of Education has produced satellite accounts for education since 1980. These are based on the input approach, and aim to provide a systematic description of the financial flows related

Box 1. Basic principles of satellite accounts

The goal of satellite accounts is to supplement the main aggregates of the central framework of the SNA with measures that give a different picture of the economic process. Satellite accounts are frameworks designed to expand the analytical capacity of the core SNA accounts without overburdening them or interfering with their general-purpose orientation. Satellite accounts organize information in an internally consistent way that suits the particular analytical focus at hand, yet they maintain links to the existing national accounts. They can add detail or other information about a particular aspect of the economy, for instance integrating monetary and physical data. Or they can arrange information differently, by cutting across sectors to assemble information on both intermediate and final consumption. For example, satellite accounts could gather business expenditures on training (treated as intermediate consumption in the core accounts) and education-related expenditures by households and government. They can also rely on different classifications than those used in core accounts. The SNA distinguishes between two types of satellite accounts.

First, those created by rearranging items in the central SNA classifications, with the possible introduction of complementary elements. This type of accounts is typically applied to specific fields, and may be regarded as an extension of the sector accounts in the core set. Satellite accounts of this type may differ from the core accounts due to alternative treatments of ancillary activities, but do not depart for SNA concepts in a fundamental way. The main reason for developing such a satellite account is to encompass all the flows recorded in the core accounts for the sector of interest

Second, those based on concepts that depart from those used by the SNA. The sorts of variations in basic concepts may include a different production boundary, an enlarged concept of consumption or capital formation, an extension of the scope of assets, etc.. This type of analysis may involve experimental methodologies, changes in classifications, and will give rise to complementary aggregates, the purpose of which is to supplement the central system.

The terminology and concepts associated to satellite accounts reflect the experiences of the countries that have constructed them. These accounts aim to answer different types of questions. Who is producing? What are the products stemming from these production processes? What are the inputs used in production? Who is financing these production activities? What are the returns from these expenditures? Who is benefiting from them? Satellite accounts present information in ways that differ from the core accounts in terms of definitions, classifications, and accounting conventions, in order to answers some of the questions listed above.

to the consumption of educational services in the French system. These accounts tabulate expenditures to provide information on how much is spent; who is undertaking these activities; who is financing them; and who benefits from them. Consistency with the central framework of the national accounts is ensured by linking the concepts of the satellite account and the concepts of the SNA central framework, and the definitions of expenditures in the satellite account and of output in the central framework. (MENJVA, 2010). Similarly, the Australian Bureau of Statistics has developed experimental measures of the value of the human capital stock. The approach is an adaptation of the JT method, and focuses on human capital formed through investment in post-school education and working experience for Australia; the goal is to estimate human capital flows and to integrate them flows with the corresponding changes in stocks (Hui, 2008).

⁹ The Italian NSO (ISTAT) is developing a strategy to measure human capital stocks and to advance towards the construction of a satellite account on human capital (DiVeroli and Tartamella, 2010). Bos (2011) details a proposal to construct a satellite account for the Netherlands, based on an input approach and focused on the supply of human capital.

47. In its basic form, a satellite account of this type would comprise detailed information on all the financial transactions recorded in the core accounts that pertain to the educational sector, distinguishing transactions by *spending, production and financing*. These transactions could be further broken down into various levels and subgroups (production units, financing units, etc) and by sector of the educational system (e.g. primary education, secondary education, etc.). In practice, education satellite accounts of this type consist of the three sets of tables on spending, production and financing, disaggregated into a finer level of detail. This type of satellite account informs on who is financing and who is producing educational services; on human capital investment in different products, activities and from different institutional sectors; and on the amount of investment by its main use (intermediate consumption, final consumption, export of educational services). Construction of this type of satellite account requires making choices on the following aspects:

(a) Defining the boundaries of the educational sector (e.g. formal education, in-work training) and the various activities connected with the production of human capital (e.g. teaching; tutoring, parenting, nurturing, etc.);

(b) Identifying categories of beneficiaries of human capital investment (beyond the standard institutional categories of the SNA such as government, households), i.e. resident versus non-resident households, household with different characteristic;

(c) Identifying the units financing investment in human capital (i.e. government, non-financial corporations, financial corporations, non-profit institutions serving households and households).

48. Building satellite accounts of this type that are comparable across countries would require making choices on the issues listed above, as well as compiling information based on harmonised criteria. While most educational statistics are now based upon common standards and definitions (e.g. levels of education are classified through the ISCED 97 methodology; statistics on beneficiaries and funders are collected through the OECD-Eurostat-UNESCO questionnaire), there is much heterogeneity with respect to the detailed breakdown available in various countries. Data sources such as the OECD Educational dataset could provide a starting point to gather the information needed to support the construction of basic satellite accounts of education for OECD countries.

49. A more ambitious approach to satellite accounts is that described in Abraham et al. (2005). The basic idea of these satellite accounts is that formal and informal educational services as well as training are seen as a production process, where people transform inputs (teacher's time, parenting time, etc.) into outputs (cognitive and non-cognitive skills). Separate recording of inputs and outputs would allow going beyond the standard conventions that value the production of the educational sector in terms of the costs of inputs used in production and consider expenses incurred in purchasing such inputs as a form of consumption rather than investment. Human capital resulting from long-life accumulation of skills would hence be considered as an asset subject to depreciation and revaluation.¹⁰ These basic principles may constitute the core conventions of satellite accounts that aim at providing independent estimates of the inputs and outputs that enter human capital production and at estimating productivity of human capital.

¹⁰ One implication of this approach for core SNA would be that outlays for education and training (or, at least, part of them) should be considered as capital formation in human capital assets (as opposed to final or intermediate consumption, as they are at the moment). In practice, developing satellite accounts for human capital does not entail changing the status of educational expenditures in the SNA.

50. In practice, countries may decide to develop satellite accounts with varying levels of complexity, opting for a more or less broad definition of human capital and for a more or less exhaustive inclusion of the inputs and outputs associated to human capital investment. In general inputs would be estimated through the cost-based approach, while outputs might be estimated through the income-based approach or other pricing methods that are independent on human capital inputs.

51. The key distinction for constructing this type of satellite accounts is that between market and non-market inputs, on one side, and market and non-market outputs, on the other. Measuring non-market inputs and outputs pose additional challenges, as values are not directly observable. Abraham et al. (2005) suggest the following list of inputs and outputs:

(a) Market inputs include paid labor (teacher and support staff), materials (books, etc), fixed capital (school buildings, equipment, etc). These inputs may be purchased by both private and public sectors (a non-market producer). While evaluating these inputs is not trivial, the SNA already provide this type information, especially for current expenditures, while information on capital spending and depreciation would be more challenging to compile. Information on market and government inputs could be compiled by spending units, production units and financing units – as discussed in the case of basic satellite accounts;

(b) Non-market inputs include volunteer labor, parent and student time, but also inputs to informal learning activities (e.g. participation into cultural events) and social capital. Measuring non-market inputs raises two challenges, i.e. measuring the quantity and the price of these inputs. With respect to the former, time-use surveys are a good source for collecting information on the amount of time devoted to learning activities, while pricing of these non-market inputs could be done through either the opportunity- or the replacement-cost methods (see Abraham et al., 2005 for a discussion of these two methods in the case of education). Including other types of non-market inputs is significantly more challenging. Estimating non-formal learning would require information on time spent on cultural activities or reading books, which is sometimes available in time-use surveys, but also distinguishing between activities that increase skills and those undertaken for simple entertainment. Even more challenging would be to include in the accounts monetary measures of the contribution of social capital to skills formation, When considering human capital as a lifelong asset, the investment undertaken after completion of studies, notably in the labour market, should also be considered: this would entail including training activities but also estimating depreciation (e.g. due to long-term unemployment) or revalorization of human capital;

(c) Market output refers to the flow of economic benefits that stem from the skills and competencies embodied in each person that result from formal and informal learning process and that are sold on the market against compensation. While different methods exist for evaluating educational market outputs, the income-based approach for valuing the stock of human capital appears as the natural option. Differently from the input measures included in these accounts, measures of the flow of market output would need to be derived from estimates of the changes in the stock of human capital based on the income-based approach;

(d) Non-market output includes the non-monetary benefits delivered by human capital investment. These broader benefits accrue to individuals privately but also to society at a large. Private non-market benefits include better health status and higher longevity, civic awareness and participation, job quality and job satisfaction, social connections, subjective well-being and personal security. Public non-market benefits to society as a whole include higher productivity, lower social spending, higher public health and safety, and stronger social inclusion. Measuring this wider range of benefits is certainly much

more challenging: while the evidence on the importance of the non-monetary benefits is robust, it comes in the form of estimates showing that, when controlling for a number of other factors, education has a positive impact on these various components of well-being, i.e. higher educated individuals have higher probability of experiencing a positive well-being outcome. This implies that well-being benefits to education are not quantified through a monetary metrics; it would hence be necessary to find appropriate prices for incorporating these benefits in a satellite account of human capital. Pricing methods for non-market outcomes exist (Abraham et al. 2005, and Schreyer 2010) but they are far from being consensual as they require many arbitrary assumptions as well as a relative large set of data.¹¹

IV. Conclusions and recommendations

52. In recent years, both individual researchers and organisation have developed experimental measures of the stock of human capital in monetary terms. Measures of this type allow comparing the stock of skills and competences embedded in people with the stock of other types of assets, and to assess the relative contribution of a range of factors (demographic, education and labour market) to the evolution of human capital. While there is broad recognition that the benefit of human capital are much broader than the economic returns to individuals who have invested in it, there is also shared agreement that a gradual, step-by-step approach, which starts from these economic returns, is the only option for putting in place comprehensive accounts in this field. Even if limited in terms of the range of benefits considered, the policy implications of such accounts for the measurement of human capital are potentially large, as they imply that expenditures related to human capital formation should be considered as a form of investment rather than consumption.

53. While both the cost-based and the income based have been used to derive monetary measures of the stock of human capital, most of the NSOs who answered the questionnaire undertaken to support this in-depth review expressed a preference for the latter. Recent international experience in this field also suggests the feasibility of producing this type of measures based on the information that is already available within the statistical system of CES countries, even if the scope for improvements in terms of consistency and comparability of the underlying data remain significant (Liu, 2011). More importantly, the two approaches to estimating monetary values of the human capital stock should not be seen as alternatives, but rather as complements within a more comprehensive information system. Such comprehensive system could be described through human capital (or educational) satellite accounts. Obviously, data requirements and methodological issues to be confronted in the construction of these satellite accounts become more challenging as the scope of these accounts increases.

54. On this background, the authors of the stock-taking report propose that:

(a) Studies be carried out to investigate in more detail the discrepancies between the estimates of the stock of human capital based on the cost-based and the income based approach;

¹¹ One pricing method that could be considered is a more sophisticated version of the income-based method, based on the incremental earnings brought by higher well-being (e.g. the higher salary due to higher health status, higher job satisfaction, higher subjective well-being). Another possibility would be to estimate private and public returns to education by applying the standard internal rates of returns methodology to non-market benefits (e.g. considering the lower medical expenditures that an individual or society at large incurs in as a result of higher health status due to higher education).

(b) Initiatives be undertaken to influence the type of data that are collected internationally, so as to allow improving the quality of these monetary estimates of the stock of human capital;

(c) A group be established to construct experimental satellite accounts for human capital, based on common methodologies and on agreement on the ambition of such accounts;

(d) Work be pursued to estimate non-economic returns to human capital, with the objective of incorporating these estimates in more sophisticated types of satellites accounts in the future.
