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**Reports, guidelines and recommendations prepared under the umbrella of the Conference****Extract from the Guide on Measuring Human Capital****Note by the Task Force on Measuring Human Capital***Summary*

The paper presents an extract from the Guide on Measuring Human Capital. It covers the main conclusions of the Guide and the existing concepts and key issues for a statistical definition of human capital.

The Guide was prepared by the Task Force on Measuring Human Capital consisting of Norway (Chair), Australia, Canada, Italy, Netherlands, New Zealand, Poland, Slovenia, United Kingdom, United States of America, the Organisation for Economic Co-operation and Development, the Wittgenstein Centre for Demography and Global Human Capital, the University of Wisconsin-Madison, the Central University for Finance and Economics in Beijing and the United Nations Economic Commission for Europe. The Bureau of the Conference of European Statisticians reviewed the Guide in February 2016 and decided to send it for electronic consultation. The Guide is available at:  
[www.unece.org/index.php?id=40939#/](http://www.unece.org/index.php?id=40939#/)

The full text of the Guide has been sent to all members of the Conference of European Statisticians for electronic consultation. Subject to positive outcome of the consultation, the Guide will be submitted to the 2016 plenary session of the Conference for endorsement.



## **I. Introduction**

### **A. Why this guide?**

1. Understanding human capital is of significant interest to policymakers. Statistics on human capital may help to understand the drivers of economic growth and the functioning of the labour market, as well as to assess the long-term sustainability of a country's development path.

2. Based on the outcome of a Conference of European Statisticians (CES) seminar in 2011 and the recommendations in the subsequent stock-taking report, CES established the Task Force on Measuring Human Capital in 2013. Its objective was to pursue the conceptual development of human capital measurement, with priority on developing experimental human capital satellite accounts. In addition, the stock-taking report recommended that further work should be carried out in the following areas: investigating the discrepancies between the cost-based and income-based approach; improving the quality of data collected internationally; and pursuing work to estimate the non-economic returns to human capital.

### **B. Importance and policy relevance**

3. 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 GDP' have 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.

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 capital per capita (including human capital) be passed on to the next generation (UNECE, 2009).

5. To produce meaningful measures of the total capital stock of each country, measures of each of its components are needed. 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, 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.

7. Recent reflections on the limits of GDP as a welfare measure (e.g. Stiglitz et al., 2009; OECD, 2011; and various EU initiatives) have underscored that people's material conditions (i.e. their economic well-being) are determined not only by current income and consumption but also by the assets they own – e.g. housing property, financial assets and

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.

8. 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.

9. While some of these non-economic benefits of education are captured through the monetary measures of human capital that are reviewed in this guide (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 affected by activities that enhance health conditions as well as family and community well-being. This, again, has also implications for human capital measurement.

## C. Overview of the Guide on Measuring Human Capital

10. The *Guide on Measuring Human Capital* discusses the concept of human capital, methodological and implementation issues, and challenges related to valuating human capital. The Guide provides recommendations aimed at producing estimates that are as consistent as possible with national accounting concepts and comparable across economies. However, the guide does not recommend the inclusion of human capital in the central framework of the SNA as more research is needed. The Guide suggests starting with a narrower approach, namely the development of a satellite account for education and training. The Guide continues by encouraging the development of a human capital satellite account, and provides an example showing how integration of human capital might influence the sequences of accounts. Finally, the Guide provides additional examples of how human capital has been measured in selected country-specific contexts, the type of data used and a comparison of these estimates across countries. Chapter 2 is included in this document while the Guide contains details for this and subsequent chapters.

### 1. Chapter 2: Concepts and definitions

11. This chapter provides a generic overview of the concept of human capital. It discusses what is meant when referring to human capital, how is it defined, and does the stock of human capital capture only future economic benefits from investing in the development of knowledge and skills? It also discusses issues related to encapsulating non-economic returns such as better health. However, it is noted that for this Guide the concept and related valuation of human capital will, for the most part, be based only on the economic returns.

### 2. Chapter 3: Methodological issues

12. This chapter looks in more detail at the methodological challenges related to the measurement of human capital. In particular, it looks at the theoretical basis for the cost of production and lifetime income approaches to estimating human capital and the challenges

in implementing them. It also discusses briefly how these approaches can be complemented by a third approach, the indicators approach, to provide a more complete picture of what is happening.

### **3. Chapter 4: Implementation and measurement issues**

13. This chapter aims to be a practical implementation guide for national statistical offices compiling human capital estimates. It discusses issues in implementation and measurement for each of the three approaches described in chapter 3. As stated earlier, the framework of this Guide is confined to economic returns, formal education and job-related training, and the working age population. This chapter adds to this a focus on internationally comparable measurement and data. Recommendations are made for the extent of implementation and data sources in order to arrive at internationally comparable estimates of human capital.

### **4. Chapter 5: Satellite account for education and training**

14. Given the aim of linking human capital estimates to the System of National Accounts (SNA), a first step could be the development of a Satellite Account for Education and Training. The construction of such a satellite account is relatively straight forward as most of the cost data are already available in national statistical institutes (NSIs). Such a satellite account can in itself present an important analytical tool for supporting analysis and policy-making decisions and in addition, can provide a foundation for enhanced human capital studies at the international level.

15. This chapter presents the setup of a satellite account for education (hereafter SAE), both formal and non-formal, including training able to supplement the SNA core system and using data that are already largely available in the core accounts of SNA. The proposed scheme includes a set of main tables and other supplementary tables. It should include detailed information on financial transactions, thus being able to distinguish between who is producing and who is financing the total expenditure on education services.

### **5. Chapter 6: Human capital: Going beyond the System of National Accounts**

16. This chapter moves to treating expenditures on education and training as investments rather than current expenses. This requires changes to a number of accounts within the SNA depending on which of the options presented in chapter 2 are used. In chapter 6, a proposed treatment is demonstrated through the use of a satellite account for human capital. This satellite account provides an example of how economic aggregates such as gross domestic product, investment, consumption, saving and national net worth would change when expenses related to human capital are classified as investment rather than as current expenditures.

### **6. Chapter 7: Human capital country studies**

17. There are a large number of country specific human capital studies, some of which look at several countries and others which focus on one country. This chapter surveys a representative sample of them. A country ranking table is presented in the main body of this paper. It includes 10 rankings by six different types of human capital measures: Programme for International Student Assessment (PISA), Programme for International Assessment of Adult Competencies (PIAAC), Barro-Lee, Inclusive Wealth Report (IWR), Jorgenson-Fraumeni (J-F), and World Bank. Only J-F human capital measures have been previously described in this report, accordingly the other human capital measures are briefly described in this chapter.

## D. Main conclusions

18. The Guide shows that it is feasible to construct human capital satellite accounts. It provides an example of constructing such a satellite account, which shows the impact of human capital on the values of GDP, investment, consumption, savings and net wealth.

19. Statistical agencies must overcome a number of challenges for the construction of a human capital satellite account. The most pressing challenges include the following:

- (a) to choose between alternate models of where human capital is produced;
- (b) to structure the treatment of human capital investment through the sequence of accounts in the SNA;
- (c) to obtain sufficiently comprehensive and detailed estimates of the costs of education and training;
- (d) to select an appropriate price deflator for human capital investment;
- (e) to select an appropriate depreciation rate for human capital; and
- (f) to reconcile alternative methods for estimating the human capital stock and investment.

20. The recommendations in this Guide are a first attempt to come up with an estimate and a recording of the role of human capital in a way that is aligned with the principles of the national accounts. The estimates can either be achieved by developing a satellite account on education, or go beyond the present SNA by fully integrating the narrower definition of human capital.

21. Because of both data constraints and methodological issues, the Guide recommends, as a first step, to develop a satellite account for education and training. The objective of such a satellite account is to distinguish and provide breakdowns of the various expenditures on training and education, including the identification of the financing arrangements for these expenditures. The proposal introduces a slight extension of the production boundary as it recommends recognizing the output from the internal expenditures on education and training by employers.

22. For estimating of the value of human capital stock, the Guide recommends the use of either the “cost-based approach” or the “lifetime income approach”.

23. The cost-based approach starts from the Perpetual Inventory Method (PIM) calculating the human capital stocks as the depreciated value of the monetary costs of the investment in human capital. The data requirements for implementing this method are expenditures on formal education and job-related training, foregone costs for students in education and employees in training, a depreciation rate related to the various investments in human capital. Data on initial human capital stocks and price indices are needed as well. Assumptions need to be made regarding the rate of depreciation, and the service lives and depreciation pattern of the relevant assets.

24. The lifetime income approach is based on the net present value of the future benefits earned from human capital. These benefits are usually based on labour income by different categories of age and educational attainment. The method requires detailed data on labour earnings, employed persons by sex, age, educational attainment and school duration, as well as survival rates, income growth and a discount rate.

25. From a theoretical point of view, the net present value estimate from the lifetime income approach is preferable, as it adds all future benefits that can be allocated to the relevant asset, thus replicating a market-equivalent valuation. Its measurement however requires quite a number of assumptions on the future development of the (active)

population and the development in the level of economic benefits. It is also significantly affected by the discount rate that is applied. For that reason, a cost-based estimation is recommended as an alternative method.

26. Usually, the estimates from the lifetime income approach are substantially higher than the ones based on the cost-based approach. Various reasons may cause this difference, obviously one of them being that not all future labour income can actually be attributed to human capital. Another reason may be that part of human capital is actually not produced, but for example genetically inherited.

27. From a purely conceptual point of view, one can argue that in a setting of perfect competition, the cost-based approach ought to result in an estimate which is equal to a valuation estimated using the lifetime income approach. In the “production process” of human capital that is further elaborated in the Guide, the difference between the costs/inputs and the benefits/outputs are attributed to an operating surplus/mixed income resulting from investing in education, be it formal or informal.

28. More research is needed on the formation of discrepancies between results from the cost-based and income-based approach. Another important research area is the estimation of non-economic returns to human capital, which currently poses formidable definitional and measurement challenges.

## **II. Concepts and Definitions**

### **A. Defining human capital**

#### **1. General definition**

29. The origin of the human capital concept can be traced back to the work of Adam Smith in the 18th century. Smith underlined the importance of “the acquired and useful abilities of all the inhabitants or members of the society”; while an individual will incur costs to obtain such abilities, once acquired they stand as “a capital fixed and realised, as it were, in his person” (Smith, 1776).

30. The practical implications of the idea of treating individual’s abilities as a kind of capital, i.e. as an asset, were not widely recognised until the 1960s, when economists began to incorporate such a notion into their work. This shift partly reflected the view that the concept of human capital could explain the large difference between the increase in the economic output of a country and that of the traditional inputs (land, labour, and capital according to the SNA) entering its production. Some economists suggested that investment in human capital was probably the major explanation for this difference (e.g. Schultz, 1961).

31. There are many definitions of human capital used in the literature, but most of them stress the economic returns of human capital investment. Schultz (1961), for example, defined human capital as “acquired skills and knowledge”, to distinguish raw (unskilled) labour from skilled labour. Similarly, the Penguin Dictionary of Economics (1984) defined human capital as “the skills, capacities and abilities possessed by an individual which permit him to earn income”, a definition which emphasises the improvement of people’s economic situation due to human capital investment. The World Bank (2006) similarly defined human capital as the productive capacity embodied in individuals, with special focus on its contribution to economic production.

32. As economies become more knowledge-based and globalised, the economic importance of human capital to both individual’s competitive advantage and to countries’

economic success become more significant than ever. However, as mentioned above, human capital investment delivers many other non-economic benefits as well, such as improved health status, enhanced personal well-being and greater social cohesion. These broader benefits are viewed by many authors as being as important as, if not larger than, the economic benefits in the form of higher earnings and economic growth.

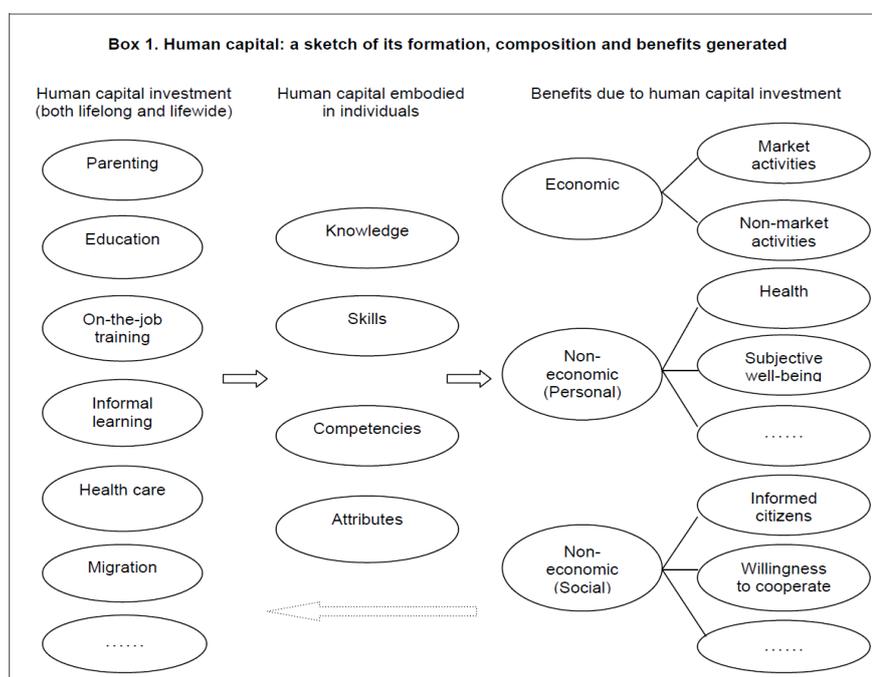
33. Acknowledging these broader benefits, OECD gradually extended its definition of human capital. In an OECD report published in 1998, human capital was defined as “the knowledge, skills, competences and other attributes embodied in individuals that are relevant to economic activity” (OECD, 1998). A later report, however, defined human capital as “the knowledge, skills, competencies and attributes embodied in individuals that facilitate the creation of personal, social and economic well-being” (OECD, 2001). Box 1 provides a brief overview of the elements that are included in this broader definition of human capital according to the 2001 OECD report, displaying the various channels through which human capital is developed and the diverse benefits that it delivers.

34. The OECD definition is all-embracing. It incorporates various skills and competencies that are acquired through learning and experience but may also include innate abilities. Some aspects of motivation and behaviour, as well as the physical, emotional and mental health of individuals are also regarded as human capital in this broader definition (OECD, 2011).

35. The components of human capital proposed by OECD reflect its multi-faceted nature. For instance, they include both general and work-specific skills, both tacit and explicit ones. They cover not only the cognitive skills that were conventionally recognised by research in this field but also non-cognitive skills such as intra- and inter-personal skills that have assumed an increasingly important role in modern societies.

#### Box 1

#### Human capital: a sketch of its formation, composition and benefits generated



## 2. Limiting the definition of human capital to economic returns

36. The SNA more and more recognises the importance of including knowledge based capital in the national accounts statistics. However, unlike physical capital, all types of knowledge, skills, competencies and attributes are invisible. It should be clear from the start that this does not prevent them from being recognised as investments and capital accumulation in the system of national accounts. For example, the 1993 SNA already recognised intangible, knowledge related expenditures on (i) mineral exploration and evaluation; (ii) software and databases; and (iii) entertainment, literary and artistic originals, as investments, thus adding to the stock of productive capital. In the 2008 SNA, this has been further extended with expenditures on research and development. In addition, goodwill and marketing assets are to be included, but only when evidenced by transactions on the market, for example as part of a takeover of a corporation at a price which is higher than the intrinsic value, or net worth, of the corporation in question. Also other intangible assets, such as transferable leases, which may be traded as a separate item (think of sales of long term rental contracts of shopping spaces, and contracts with soccer players or other sportspersons), are only recorded when acquired on the market, although in practice the recording of these assets may contain significant gaps. More generally, human capital has certain characteristics in common with the capital stock items included in the present asset boundary of the SNA: they accumulate through investments and they decline through use and obsolescence, although in different ways. For example, while the capital stock items recognised in the SNA will typically wear out through use, human capital typically grows through use and experience, while it depreciates due to lack of use, obsolescence of knowledge, population ageing and many other factors.

37. In looking at human capital, this Guide will mainly deal with the narrower definition of human capital, in the sense that it will mainly focus on a valuation of the elements which are related to the economic returns. It will thus not consider the inclusion of all kinds of non-economic returns. Also various spill-over effects of human capital will not be taken into account, unless implicitly included as part of the estimation procedure. The main reason for this choice is related to the consistency with the present framework of national accounts, which basically is confined to the economic value of assets, and its use in economic activities. Going beyond the purely economic returns would also create various definitional and measurement issues, although it can be noted that in the research area attempts have been made to value human capital using an extended income definition including for example unpaid activities within households and leisure time (see e.g. Jorgenson and Fraumeni). Notwithstanding these research activities, it goes without saying that such an extension would multiply the measurement problems, leaving apart the significant additional, more conceptually related, issues in defining and delineating human capital and accordingly even further extending the production boundary of the present system of national accounts. As such, the recommendations in this Guide should be considered as a first attempt to come up with an estimate and a recording of the role of human capital which is relatively closely aligned to the basic underlying principles of national accounts, be it in the form of a more moderate attempt to develop a satellite account on education (see chapter 5 of the Guide), or going beyond the present SNA by fully integrating the narrower definition of human capital (see chapter 6 of the Guide). Although the definition of human capital applied in this Guide is limited to the economic valuation, on a number of places some attention will be paid to non-economic returns as well.

## B. Human capital and the 2008 SNA

38. The present international standard for the compilation of national accounts, the 2008 SNA, contains various references to human capital. In paragraph 1.54, the following is stated:

*It is often proposed that expenditures on staff training and education should be classified as gross fixed capital formation as a form of investment in human capital. The acquisition of knowledge, skills and qualifications increases the productive potential of the individuals concerned and is a source of future economic benefit to them. However, while knowledge, skills and qualifications are clearly assets in a broad sense of the term, they cannot be equated with fixed assets as understood in the SNA. They are acquired through learning, studying and practising, activities that cannot be undertaken by anyone else on behalf of the student and thus the acquisition of knowledge is not a process of production even though the instruction conveyed by education services is. The education services produced by schools, colleges, universities, etc. are thus treated as being consumed by students in the process of their acquiring knowledge and skills. This type of education is treated as final consumption. When training is given by an employer to enhance the effectiveness of staff, the costs are treated as intermediate consumption.*

39. In the above definition, the so-called “third-party” criterion is used for not treating expenditures on education, etc. as investments in human capital, in the sense that the activities of learning, studying and practicing, and the subsequent accumulation of knowledge is embodied in a person and cannot be transferred to another person. As such these activities do not align to the so-called production boundary, human capital being an asset that is “produced”. This strict or rigorous application of the third party criterion is arguable. In practice, there may be other examples of services which cannot be separately sold on markets or which cannot be provided from one unit to another (see also paragraph 1.40 of the 2008 SNA, describing the production boundary). One example one could refer to is goodwill related to the past building up of brand names with a high reputation. Such capital may also be fully embodied, as an undistinguishable part of the relevant enterprise. Although in the present standards only purchased goodwill is recognised as being part of the asset boundary, these assets would probably be included as produced assets, if one could establish in practice a link to the process of producing these assets.

40. In paragraphs 2.34, 3.46 and 3.48, the 2008 SNA continues stating the following:

*The coverage of assets is limited to those assets which are subject to ownership rights and from which economic benefits may be derived by their owners by holding them or using them in an economic activity as defined in the SNA. Consumer durables, human capital and those natural resources that are not capable of bringing economic benefits to their owners are outside the scope of assets in the SNA. (paragraph 2.34)*

*The coverage of assets is limited to those assets used in economic activity and that are subject to ownership rights; thus for example, consumer durables and human capital, as well as natural resources that are not owned, are excluded. (paragraph 3.46)*

*Human capital is not treated by the SNA as an asset. It is difficult to envisage “ownership rights” in connection with people, and even if this were sidestepped, the question of valuation is not very tractable. (paragraph 3.48)*

41. The criterion of whether or not economic benefits can be derived from holding or using the assets in question looks slightly circular: as the predominant type of benefits, (additional) compensation of employees, is not recognised as being attached to the relevant

assets, the assets are assumed not to bring any benefits at all. However, it is quite obvious that significant (extra) benefits are actually derived from investments in human capital. Also the criterion of “ownership” is questionable. It goes without saying that one would not like to see ownership of people, but if one looks upon human capital as a separate, although embodied in a person, entity, it does not seem problematic to view the relevant person owning human capital which clearly brings future economic benefits to him/her.

42. In summary, one could also argue that there is a slight inconsistency in the 2008 SNA when it comes to the non-recognition of human capital as part of investment and capital stock. On the one hand, it is excluded because of the third party criterion in defining the production boundary, basically raising the issue whether or not human capital is a “produced” asset. On the other hand, in defining the asset boundary, there is no reference to a third party; when discussing this boundary, only criteria such as ownership rights and economic benefits being derived from the asset in question are being used. It is clear, however, that human capital differs from the usual types of capital in that it is fully embodied in persons, and as such is an entity that cannot be sold as a separate item on the market. To the defence of the 2008 SNA, one should also note that the treatment of human capital is considered as one of the items for the research agenda. As stated in paragraph A4.55:

*Human input is the major input in most production processes, and the value of that input is to a large extent dependent on the knowledge that humans bring to the production process. It is well recognized that an educated population is vital to economic well-being in most countries. Despite the fact that there are major conceptual and practical problems with identifying the value of an educated labour force, there are repeated requests to address this issue within the SNA framework.*

## **C. Recording and measuring human capital as an asset**

### **1. Economic benefits from human capital**

43. Box 1 suggests that human capital investment generates both economic and non-economic benefits, which can accrue to both the person undertaking the investment and to society at large. Economic returns accruing to the individual include enhanced employability and, if the person is employed, improved earnings and career prospects; while non-economic benefits can take the form of an increase in the person’s productivity in performing non-market activities (e.g. household production) or of personal benefits that are not related to production (e.g. greater enjoyment of arts and culture, higher health status and subjective well-being).

44. The benefits of human capital investment can also spill-over to other agents. At the firm level, the higher productivity of some employees, due to their higher education and experience, may increase the performance of other workers and, hence, the firm’s profitability. At the macro-economic level, evidence has highlighted the positive impact of human capital on economic growth. Further, these spill-overs are not limited to economic returns: education may make people better citizens and better parents, leading to greater social cohesion.

45. Finally, as illustrated by the dotted arrow in Box 1, there are also feedback effects, running from the benefits generated by human capital investment to the already created human capital stock thus further augmenting the level of stocks. For example, workers with higher educational attainment are more likely to benefit from further education and training. In addition, the feedback process may lead to a virtuous cycle where more education makes further learning easier and faster, and thus more efficient. At the national level, there is a long-standing debate on the direction of causality between education and economic growth.

Various studies have shown that the causality may operate in both directions, suggesting that a feedback loop may also operate at the macro level.

46. As stated before, in this Guide, the concept of human capital is confined to the economic benefits that can be derived from the accumulation of embodied knowledge in a person. Basically, it is assumed that these benefits can be assessed by (increased) income levels, either through higher compensation of employees or through higher income from self-employment. In this respect, it can be implicitly assumed that some of the spill-over effects, such as the impact on the productivity of other workers, may actually be reflected in higher income levels.

47. Looking at the literature (see e.g. Liu, 2011), two methods are preferred in trying to arrive at an estimate of the value of human capital: either the “cost-based approach” or the “lifetime income approach”. The latter approach is based on the net present value of the future benefits earned with the input of human capital. These benefits are usually based on labour income by different categories of age and educational attainment.

48. From a more theoretical point of view, the net present value estimate seems to be the most viable one, as it adds all future benefits that can be allocated to the relevant asset, thus replicating a market-equivalent valuation. Its measurement however requires quite a number of assumptions on the future development of the (active) population and the development in the level of economic benefits; it is also significantly affected by the discount rate that is applied. For that reason, a cost-based estimation is typically provided as an alternative method. According to this method, the investment costs for creating human capital are summed to obtain an estimate. These costs do not only relate to formal education, but also training and courses provided by the employer; time spent on learning and studying at home; and other expenditures on, for example, school books and other training material. However, one should be aware of the fact that this method also requires several assumptions, for example on the distinction between expenditures with a more current nature and expenditures which add to the capital stock of human capital. Also various assumptions are needed to measure and to value the unpaid activities. Furthermore, to arrive at a capital stock estimate, one needs to make additional assumptions on the service lives and the depreciation pattern of the relevant assets.

49. Usually, the estimates from the lifetime income approach are (substantially) higher than the ones using the cost-based approach. Various reasons may cause this difference, obviously one of them being that not all future labour income can actually be attributed to human capital. Another reason may be that part of human capital is actually not produced, but for example genetically inherited. For a more detailed overview, including the various pros and cons of the different valuation techniques, reference is made to chapter 3 of the Guide.

50. From a purely conceptual point of view, one can argue that in a setting of perfect competition, the cost-based approach ought to end up with an estimate which is equal to a valuation estimated using the lifetime income approach. In the “production process” of human capital that is further elaborated in the following, the difference between the costs/inputs and the benefits/outputs are to be attributed to an operating surplus/mixed income resulting from investing in education, be it formal or informal. However, this issue should be addressed in more detail in future research.

## **2. The creation of human capital: a further elaboration of the production process**

51. In addition to the central framework using the generally agreed concepts and definition, the 2008 SNA clearly recognises the potential of having so-called satellite accounts. In a satellite framework, one has the option to go beyond recording strictly in line with the 2008 SNA central framework. The satellite account can take more modest steps

away from the core concepts, definitions and classifications, by breaking down and regrouping the various transactions that are related to education, training, etc., and potentially by extending the production boundary for example for enterprise internal expenses on training and courses. This is the subject of chapter 5 of the Guide. However, one could also go well beyond the current SNA definitions, and expand the asset boundary with human capital. This idea of treating human capital as a produced asset is used below as a way of presenting a conceptual framework of flows and stocks related to human capital. Doing so, the changes that need to be made to the core definitions are also discussed. In chapter 6 of the Guide, this conceptual framework is further elaborated as part of the presentation of a full-fledged satellite account for human capital, showing all the changes in recording needed to fully integrate the concept of human capital in the sequence of accounts.

52. A very basic question in accounting for human capital as a produced asset concerns the way in which human capital is accumulated and becomes obsolete. Regarding the accumulation of human capital, one could look upon the creation of this embodied knowledge as a kind of “production process” undertaken by individual persons, the product of which is the investment in human capital assets. Doing so, one could look upon the accumulation of knowledge according to the lifetime income approach as the measure for the output of creating human capital, whereas the cost approach focuses much more on the inputs needed to produce human capital.

53. The inputs into this production process of human capital would consist of the following:

- Formal education services, either paid by households or provided for free or at reduced prices by government and non-profit institutions serving households (NPISHs);
- Training provided or paid for by the employer;
- Other expenditures on, for example, school books and other training material;
- Time spent on learning and studying at home.

54. Slightly problematic in this view of the “production of human capital” is the fact that most of the production activity related to education and training occurs in economic units other than those which ultimately embody and “own” the assets. Therefore, to be able to build up the assets in the sector of the persons who embody this knowledge and derive benefits from them, one would need to transfer the education and training outputs resulting from the activities in these other units (for a major part government, non-profit institutions serving households, and corporations) to the sector enjoying the benefits from these services. Two options that could be considered are<sup>1</sup>:

(a) to look upon the relevant activities in the sector paying for the produced services as producing a capital output, and subsequently transferring these outputs, via capital transfers, to the households;

(b) to look upon the relevant activities in the sector paying for the produced services as producing a non-capital market output that is transferred to the households where it is used as intermediate consumption into the production process of households producing their own human capital.

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<sup>1</sup> Note that it is assumed here that all human capital is to be considered as a produced asset. One could also consider part of human capital as being non-produced and coming into existence by heritage or by increasing working experience. For reasons of simplicity, this option is not explored further in the Guide.

55. The above imputations are actually less far-reaching than one may think at first sight, as the relevant final expenditures by government and NPISHs are already recorded as social transfers in kind, and also as part of household actual final consumption (= final consumption expenditure plus goods and services provided to households by government and NPISH either free or at prices that are not economically significant). On the other hand, it should also be noted that in the case of training and courses which are internally provided by the employer the proposed recording will lead to an extension of the production boundary – similar to what has been said in relation to a possible satellite accounts for education (see paragraph 27).

56. The next step would be to change the recording of expenditures on education made by households themselves, and as such included in household final consumption expenditure. In line with the notion of the creation of human capital as a production process within households, it seems more appropriate to consider the actual expenditures by households themselves as intermediate inputs to this process.

57. For arriving at the total output level of the “production” of human capital, one has (again) two alternatives. Either to base the estimate on a cost based approach or use a lifetime income approach.

58. In the case of the cost approach, one can distinguish two variants: (i) one could include only those intermediate inputs described above, or (ii) one could also include a cost estimate of the time spent on learning and studying at home, e.g. through the attribution of a certain shadow price to one hour spent, which would also feed into the output (and the resulting value added and operating surplus/mixed income) of producing human capital. One would thus implicitly extend the production boundary, and value added levels, with unpaid activities related to studying.

59. The other alternative is to set the output level equal to the gross additions to human capital according to the lifetime income approach. In estimating the gross additions, one should not take into account the decreases in the level of human capital due to for example aging, death and emigration. It should also be noted that increases of human capital due for example to immigration of people embodying human capital are to be accounted for separately, as this concerns an import of capital which is not the result of domestic production. On the other hand, emigration can be considered as exports of domestically produced human capital. Value added of producing human capital would amount to the difference between the gross creation of human capital in a year and the actual expenditures on intermediate inputs made, be it by government, non-profit institutions serving households, corporations or households themselves. Under this second alternative, one would thus implicitly assume that the resulting value added accounts for the production of human capital for own final use, by employing own activities such learning and studying at home.

60. Looking back to the two options set out in paragraph 58 above, it should be noted that, the resulting extension of the production boundary according to the current international standards, the 2008 SNA, differs under the two options. Applying the second option would require more substantial imputations of output (and concomitant intermediate consumption). However, apart from which alternative is applied when valuing human capital (costs approach versus lifetime income approach), the imputations for value added and consequently the imputation for the value of the investment and stock for human capital are the same for both options.

61. If one would start to think about a full integration of human capital in the framework of national accounts, other considerations may need to be thought through as well. With the above imputations to reproduce the production process, one is not yet there. One may need to reconsider the nature of compensation of employees. In line with the lifetime income

approach, compensation of employees has become a form of compensation for putting human capital at the disposal of employers. As such the owners of human capital have become producers of human capital services which are sold to the employers. Such a far-reaching proposal, with very significant extensions to the production boundary (not only by the production of human capital, but also by looking at all or most of compensation of employees as a provision of services), would clearly constitute an overhaul of the present system of national accounts without precedence in the past 60-70 years of developments in the system of national accounts. A completely new interpretation of the economy would become apparent. It certainly will be very counterintuitive, having the present “economic story” in mind. But also a less far-reaching proposal, such as recording the expenditures on education as investments by the households being the economic owners of human capital, would constitute a major divisive line between past and present.

62. Given the above, including the concept of human capital in the central framework of national accounts, would be several steps too far. Instead, one could simply add a value of human capital to the central framework, as a non-produced asset. But this capital would then be totally disconnected from the rest of the system. Therefore, applying a satellite account approach seems to be the preferable option. As stated before, one can distinguish two basic alternatives. One could think of a more limited approach, a kind of satellite account for education, in which the various expenses, including in-house production of education services, are spelled out. Or one could try to develop a full-fledged satellite account for human capital, in which the various imputations described above are applied. These and other issues are discussed in chapters 5 and 6 of the Guide.

### **3. Valuation, accumulation and depreciation of human capital**

63. According to the 2008 SNA, every item on the balance sheet has to be valued “... as if it were acquired on the date to which the balance sheet relates. This implies that when they are exchanged on a market, assets and liabilities are to be valued using a set of prices that are current on the date to which the balance sheet relates and that refer to specific assets” (SNA 2008, para. 13.16). Doing so, one has to take into account that the value of a certain asset will decrease while aging and having been more used/depleted, as a consequence of which the future benefits that can be derived from such an asset will decrease.

64. To adequately value assets using (equivalent) market prices, one would need prices from second-hand markets on which the items in question are regularly, actively and freely traded. This may be the case for e.g. cars and residential dwellings, but certainly not for most other non-financial assets. In absence of market equivalent prices for the relevant assets, two alternatives are mentioned in the 2008 SNA:

65. Net Present Value method: the value of an asset is approximated by the present, or discounted, value of future economic benefits expected from a given asset;

66. Perpetual Inventory Method (PIM): the value of the capital stock is approximated by accumulating and revaluing acquisitions less disposals of the type of asset in question over its lifetime and adjusted for changes such as depreciation, destruction for example by natural disasters, etc.

67. Both methods should, in principle, provide the same results, in the sense that the net capital stock estimated by PIM should use so-called age-price profiles which approximate market prices, whereas market prices would in open, transparent and competitive markets be equal to the net present value of the future capital services that can be derived from the relevant asset.

68. In compiling national accounts, the PIM usually is the preferred method. The PIM resembles the current replacement cost method, often applied in business accounting. The

stock of assets is set equal to the sum of past years' investments. Doing so, the assets acquired in past periods will need to be revaluated to current price levels, to arrive at the appropriate value. Also depreciation of the assets in place needs to be taken into account, to reflect the decrease in value due to the use of the relevant assets. Finally, one of course needs to account for the disposals of the relevant assets, either as a result of a sale or because the asset is scrapped at the end of its economic life cycle.

69. Using PIM, the accumulation of assets is equal to the new additions, investments in newly produced assets plus purchases (less disposals) of second-hand capital goods. The depreciation costs, or "consumption of fixed capital" according to SNA-terminology, should include "... the decline, during the course of the accounting period, in the current value of the stock of fixed assets owned and used by a producer as a result of physical deterioration, normal obsolescence or normal accidental damage" (SNA 2008, para. 10.25). Unforeseen elements, e.g. obsolescence due to unforeseen technological developments, are to be accounted for as "other changes in the volume of assets", as a kind of revaluation. Depreciation can be measured by the decrease, between the beginning and the end of a certain period, in the net present value of the remaining sequence of expected future benefits. In the words of the 2008 SNA (para. 6.246):

*The value of a fixed asset to its owner at any point of time is determined by the present value of the future capital services (that is, the sum of the values of the stream of future rentals less operating costs discounted to the present period) that can be expected over its remaining service life. Consumption of fixed capital is measured by the decrease, between the beginning and the end of the current accounting period, in the present value of the remaining sequence of expected future benefits. The extent of the decrease will be influenced not only by the amount by which the efficiency of the asset may have declined during the current period but also by the shortening of its service life and the rate at which its economic efficiency declines over its remaining service life. The decrease is expressed in the average prices of the current period for an asset of exactly the same quality and should exclude holding gains and losses. When the flow of future benefits that determines the present values used to derive consumption of fixed capital is expressed in terms of flows that include an element of inflation, then the discount factor should be nominal. When the flows are expressed in terms of current period prices, then a real discount rate should be used. Either procedure results in a present value expressed in current period prices.*

70. As can be derived from the above paragraph, from a conceptual point of view, the value estimate using PIM in the case of the cost-approach should not differ from the one using the Net Present Value method in the case of the lifetime income approach. The same holds for the accumulation and depreciation patterns of human capital. In terms of the lifetime income approach, depreciation would equal the loss of one year of future benefits through ageing minus the winding down of the discount (the discount rate times the value of the asset). However, as said before, usually the cost approach will arrive at value estimates that are lower than the ones using the lifetime income approach. Possible reasons for this difference are the exclusion of certain cost elements, part of the human capital actually not being produced, or an overestimation of the value using the lifetime income approach.

71. To estimate the total capital stock (and depreciation), when using the PIM, the following data and assumptions, broken down by type of asset, are required:

- A sufficiently long time series of data on gross fixed capital formation (or investments) or a benchmark;
- A sufficiently long time series of price indices (deflators);

- An estimate of the capital stock for a certain year in the past;
- Assumptions regarding the average service lives of the relevant assets;
- Assumptions regarding the depreciation function, or “age-price profile”, of the relevant assets;
- Assumptions regarding the mortality function, or “retirement function”, of the relevant assets.

72. More details on the general methodology and practices of measuring capital stocks can be found in the second edition of the OECD Manual “Measuring Capital” (OECD, 2009).

73. On some occasions, the net present value method is also applied in national accounts. This is most certainly true for non-produced assets, such as natural resources. But also in case of, for example, intellectual property products, this may prove to be the most promising and viable method to arrive at a good approximation of the market-equivalent price of an asset. Using this method, the most critical elements of information are:

- Assumptions regarding the average (remaining) service lives of the relevant assets;
- An adequate forecast of the economic benefits that will be derived from the relevant assets.

74. In addition, as said before, the assumptions in relation to the discount rate are critical for the valuation of the capital stock.

75. Leaving aside the possibly non-produced part of human capital, the accumulation and depreciation of “produced” human capital has certain resemblances with other non-financial assets in the system of national accounts. There are differences as well. Looking at the accumulation of assets, there is a clear similarity in the way the assets are built up by expenditures which have the character of investments. Different from the more traditional types of capital goods is the fact that a substantial part is related to unpaid activities which implicitly enter the production boundary. The latter however also has some resemblance with in-house production of, for example, literary originals, in which case an author is writing a book at home, although in this case the result clearly is a tradable “intellectual property product”.

76. Another difference with the more traditional form of fixed assets is that human capital is created over a very long period before it is actually put to use in economic activities and generating economic returns. In this respect, one should consider the investments in formal education, before entering the labour market, as a kind of work-in-progress, which is finalized at the end of the schooling period, and subsequently reclassified from work-in-progress to the fixed capital stock. This treatment is similar to large investment projects which take longer than a year. One could make this distinction between work in process and finalized capital in the recording of the creation of human capital as well. It goes without saying however that this would further complicate the estimation procedures somewhat, not adding to the total value of asset accumulation. On the other hand, if one would like to make the distinction between “work-in-progress” and capital stocks of human capital actually used in production, this could relatively easily be built into a system of measuring human capital.

77. Furthermore, due to the embodied nature of human capital, there cannot be any (negative) accumulation through purchases (or sales) of the asset of human capital as such. On the other hand, as stated before, one can consider (part of) compensation of employees as a form of compensation for the supply of human capital services. Finally, domestic stocks of human capital can be accumulated (or diminished) by immigration (or emigration) of people.

78. Looking at depreciation, the value of human capital will decrease by aging, and the consequent shortening of the period up to retirement or death. This has clear similarities with the shortening of the remaining service life of more traditional assets. On the other hand, human capital is different in the sense that more classic “wear and tear” through the use of assets, while eventually evident, often exhibits quite different patterns of change with use. As stated before, embodied knowledge may actually increase as a result of using it in practice, as a result of gaining more experience, etc. Or vice versa, the stock of human capital may depreciate quicker because of non-use, for example as a result of long-term unemployment. Economic obsolescence of human capital may also be a quite important factor in accounting for depreciation, in case of shifts in the required knowledge and skills. To the extent that this obsolescence is “normal”, it is to be looked upon as depreciation.

79. Similar to more traditional capital stock items, there may be sudden shocks in the value of the stocks of human capital, which are to be viewed as so-called “other changes in the volume of assets”. These changes could be negative, for example as a consequence of unexpected economic changes which make a substantial part of the available human capital obsolete. It can also relate to positive shocks, for example the extension of the retirement age by way of changes in the relevant laws and regulations.

80. From a measurement perspective, the above would clearly require a rather perfect world of data. As this is not the actual practice, one will have to apply (rough) assumptions and guesstimates to approximate the various elements in the conceptual framework. Looking at the cost-based approach, one would need sufficiently long time series of data on the expenditures (including estimates for the value of unpaid activities). Here, “sufficiently long” means that one would like to have a consistent time series as long as possible, and preferably one that surpasses the service life of the relevant asset. In that case, the estimates of capital stock for more recent years would be based on actually measured data on gross fixed capital formation and/or the “rough estimates” for the starting stock would have a relatively low weight. It may be clear that the availability of long time series may be quite demanding in the case of human capital which typically has a rather long service life.

81. The age at which the relevant asset is put out of service, because it has reached the end of its service life, is typically referred to as the “retirement” of the asset. Usually, some kind of retirement or mortality function is assumed. This can be a “simultaneous exit”, i.e. all assets are retired at the moment when they reach the average service life of the asset in question. Other retirement patterns assume a certain bell-shaped function around the average age of retirement (see OECD, 2009, section 13.2.).

82. The depreciation function, or “age-price profile”, reflects the decrease in value of an asset during its service life. As for human capital, this information typically is not available from directly observable market prices; assumptions will have to be made. Leaving apart the information on the service life, there are two basic possibilities. Either one directly assumes a certain age-price profile, for example a linearly-declining function, giving rise to constant absolute values of depreciation over an asset’s lifetime. Or one makes assumptions regarding the “age-efficiency profile”. The latter reflects the productive capacity of an asset over its service life. This information can then be used to construct an age-price profile. The geometric age-efficiency profile is the one most commonly used (for more details on different methodologies for individual assets and for cohorts of assets, including the pros and cons of these methods, reference is made again to the OECD Manual “Measuring Capital”). In estimating depreciation patterns in the case of PIM, one could also make use of the resulting depreciation function when applying the Net Present Value method.

## D. Non-economic returns

83. Getting a full picture of each component encompassed by the broad OECD definition of human capital, of the causal links between each type of human capital investment, of the corresponding benefits and feedback loops among them, is quite complicated. Encompassing all the elements of Box 1 into a single measure of the stock of human capital is a daunting task. The most sensible approach is to address this task step-by-step.

84. This Guide applies this principle of gradualism, by focussing on a narrower range of elements of human capital, starting from those aspects characterised by either lower conceptual challenges or greater data availability. The option pursued is to focus on the economic returns to the individual, as the main benefits due to human capital investment. Currently, many researchers and institutions are using definitions that focus on the productive capacity of individuals. Even when accepting the broader OECD definition as a useful reference point, most of the ongoing statistical work on measuring human capital takes formal education and the economic returns to individuals as points of departure.

85. The pragmatic approach advocated here has implications. For instance, focusing on economic returns implies that the health component of human capital will have to be dealt with separately from the education aspect of human capital. As a matter of fact, health status is sometimes considered as a specific kind of asset, i.e. as health capital (e.g. Abraham and Mackie, 2005). A framework for the systematic description of the financial flows associated with health care has been developed jointly by the OECD, Eurostat and World Health Organisation (OECD et al, 2011). Treating health as a separate type of capital does not imply that health status is irrelevant for the measurement of the “educational” capital explored here. However, it implies that the measure of the human capital stock described here will only reflect the impact of health care activities in improving people’s economic returns. Moreover, as stated before, the narrower focus on economic returns is also more in line with the current conceptual framework of defining and valuing assets in the system of national accounts.

86. Non-economic returns, or better to say non-monetary returns, relate to a whole range of benefits delivered by human capital investment. These broader benefits accrue to individuals privately but also to society at a large. Private non-monetary 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-monetary benefits to society as a whole include higher productivity, lower social spending, higher public health and safety, and stronger social inclusion.

87. 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 means that well-being benefits to education are not quantified through a monetary metric. To include these benefits, it would be necessary to find appropriate prices for incorporating these benefits. Pricing methods for non-monetary outcomes exist (Abraham et al. 2005, and Schreyer 2010), but they are far from being agreed upon as they require many arbitrary assumptions as well as a relatively large set of data. 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-monetary benefits (e.g. considering the lower

medical expenditures that an individual or society at large incurs as a result of higher health status due to higher education).

### **III. References**

88. A list of publications referred to in this document can be found in the full report, available at <http://www.unece.org/index.php?id=40939#/>

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