Sub-group on Well-being and Sustainability

Guidance note on Labour, Human Capital and Education[1]

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1. Introduction

1. The *System of National Accounts, 2008 (SNA)* does not currently provide for a detailed articulation of labour and human capital, this stands in stark contrast to the guidance provided on other inputs into the production process such as capital, goods and services. This is a major gap with detrimental consequences for the utility and relevance of the national accounts.

2. Crucial policy questions that hinge on a better understanding of the links between the labour market, production and income include:

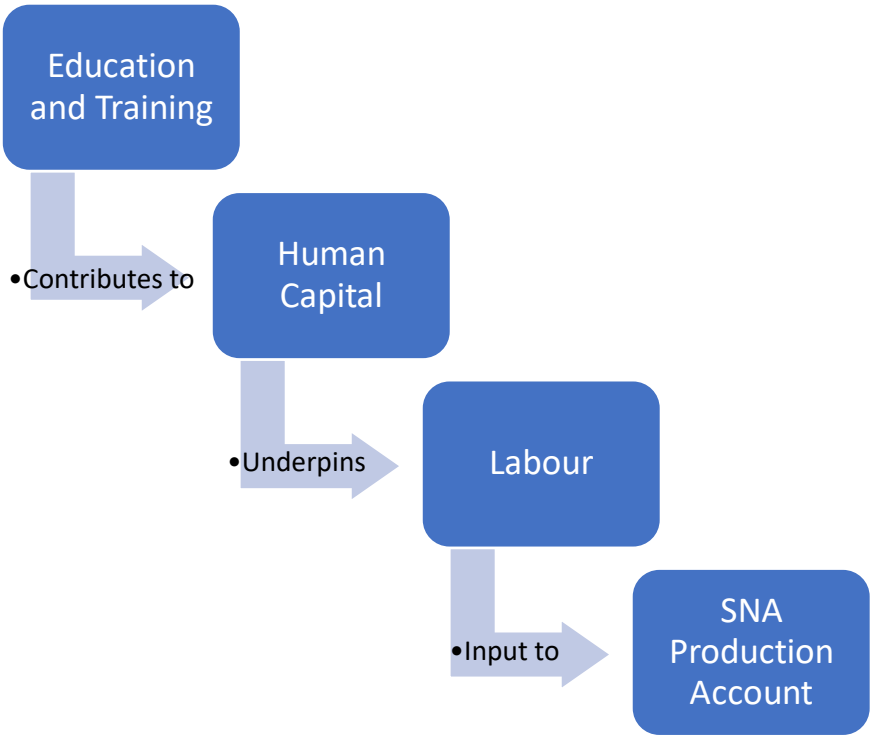
(a) Issues of inclusive growth, equity and the distribution of income;
(b) Impacts on the labour market, and the changing nature of 'work', from changes in production arrangements, including those driven by digitalisation and globalisation;
(c) Measurement of productivity and the ability to deliver real income growth to households.

3. The idea of viewing human knowledge and abilities as an asset – as human capital - and to estimate its value is not new, but has gained more prominence in recent years, especially in the context of sustainable development. Policymakers are calling for ways to understand and quantify human capital, in order to better understand what drives economic growth and the functioning of labour markets, to assess the long-term sustainability of a country's development path, and to measure the output and productivity performance of the educational sector. Devising a robust methodology for the monetary valuation of the stock of human capital is especially crucial as studies suggest that human capital is the most important component of the total capital stock in advanced economies.

4. 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. 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.

5. In addition, it is also necessary to determine what factors contribute to the formation of human capital stock, such as education and training, and the need for policy makers to plan for such investments. Important in this context is the financing of the education system and the investment in training, including in-house.

6. This note provides guidance on how these dimensions of education, human capital and labour could be included within the system of national accounts. These topics are framed to sit into the existing national accounts framework as:



7. The following sections of this paper cover:

(a) Section 2 - Current treatment of labour, education and human capital in the SNA
(b) Section 3 - An overview of existing material, guidance and practice for each of the three research areas
(c) Section 4 – Links to the work of other task teams in the research agenda
(d) Section 5 – Recommendations for the future SNA update

2. The current treatment of labour, education and human capital in the SNA

8. The treatment of human capital in the *System of National Accounts, 2008 (SNA)* is succinctly discussed in Chapter 2 of the *Guide on Measuring Human Capital (UNECE,2016)*[2] henceforth referred to as '*The Guide*'. Overall, the 2008 SNA is clear on its presently peripheral views on human capital and labour, but is receptive to supplementary analyses and (as per other statistical domains) promotes the need for harmonization and consistency.

9. The *SNA* sets out its position to exclude human capital from the asset boundary in Chapter 1, 'Section D. The boundaries of the SNA', which define its purely economic scope[3]. The central premise is that it is not consumption of education and training services in and of themselves that may form human capital assets, but rather the assembly of these inputs by the persons consuming them into productive knowledge, skills, competencies and attributes.

10. As such, these are self-embodied: while the services provided fall within the production boundary, the resulting human capital can only be generated by individual application[4] (its acquisition cannot be undertaken by anyone else, and ownership cannot be transferred to a third party) and these assets are therefore not considered to be 'produced'.

11. Accordingly, the *SNA* treats education as a service that is consumed entirely at the point of delivery, either as final consumption by households or government, or as intermediate consumption by corporations. Education comprises both individual services such as learning and tuition, and collective services such as central administration, standard-setting and regulation.

12. Labour is at the heart of production, forming a primary input alongside capital, but, unlike capital, is not presented as an account in the *SNA*. The *SNA* references that labour statistics form an important adjunct to the accounts in brief [*2008 SNA*, paras 2.156-2.158], and some of the linkages to population and productivity are set out in Chapter 19, including a summary of measures of quality-adjusted labour inputs [*2008 SNA*, paras 19.55-19.57].

3. Overview of existing material, guidance and practice

Labour Accounts

13. A number of National Statistical Institutes already publish Labour Accounts, including (but not limited to) Netherlands, Denmark, Norway, Switzerland, Australia, Malaysia

[2] Available at: https://unstats.un.org/unsd/nationalaccount/consultationDocs/HumanCapitalGuide%20Global%20Consultation-v1.pdf

[3] Its consideration of human capital by definition excludes any non-economic outcomes, as for any other type of production or accumulation.

[4] Much as timber may be purchased to build a house or be burned as firewood, the impact of education and training on an individual's human capital stock may range from significant to zero.

and Iran. In some cases, production of the accounts stretches back many years with well-established concepts, sources and methods in place. The International Labour Organisation Committee on Labour Statistics discussed Labour Accounts in 1997 (*Labour accounts, core of the statistical system on labou*r by Wim P. Leunis and Kees G. Verhage)[5] and 2002 (*Labour Accounts: A Step Forward to a Coherent and Timely Description of the Labour Market*)[6]. More recently UNSIAP commenced delivery of a training program to support development of these accounts.

14. The Labour Account provides a conceptual framework through which existing labour market data from diverse sources can be confronted and integrated, with the aim of producing a coherent and consistent set of labour market statistics.

15. The Labour Account helps address data coherence by:

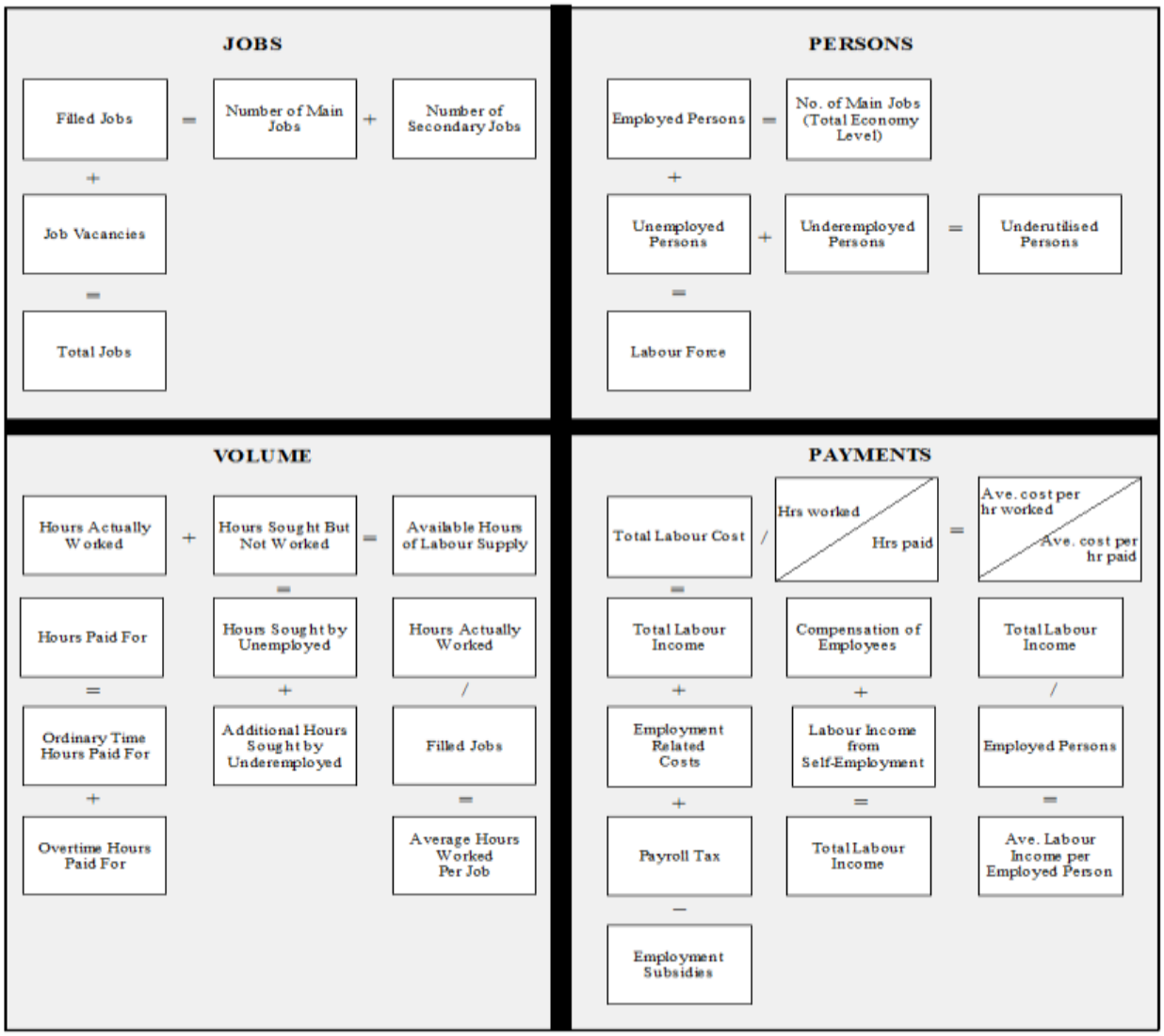
(a) bringing together related labour statistics from multiple sources in a single set of tables;
(b) applying a consistent set of concepts across the data to explore statistical anomalies;
(c) making transparent adjustments to data to offset conceptual and scope differences; and
(d) making further informed and documented data adjustments to provide a balanced set of labour statistics.

16. While each country has adopted slightly different approaches, broadly, Labour Accounts consist of four quadrant tables: jobs, persons (both employees and self-employed), volume (i.e. hours worked) and payments.

[5]Available at: https://www.ilo.org/wcmsp5/groups/public/---dgreports/---stat/documents/publication/wcms_087915.pdf

[6]Available at: Labour Accounts: A Step Forward to a Coherent and Timely Description of the Labour Market

Figure One: Labour Account Identity Relationship Diagram



17. Accounting conventions are necessary to define the scope and treatment of activities that occur within the economy. The production and residency conventions adopted in the *SNA* are used in the Labour Accounts to determine the scope of activities covered, and the size of the economy measured. The scope of the economy defined by these conventions embraces the activities of all enterprises resident within the economic territory and engaged in the production of goods and services, which fall within the scope of the National Accounts production boundary.

18. It is important to note the items presented in the labour account are completely aligned with existing national accounts definitions where they currently exist, and complement these existing definitions with additional items (such as those for filled and vacant jobs) to provide a more complete picture of the labour market.

19. Further, to provide completeness and comprehensiveness, the labour account brings together in one place concepts that in the current system of national accounts are presented

across different accounts. These concepts are linked through a set of defined accounting identities and enable users to analyse the data through different economic perspectives (such as analysing payments from both an employer and employee perspective).

Jobs

20. A job is a set of production related tasks that can be assigned to and undertaken by a person, for remuneration either in cash or in kind. Jobs are created by enterprises. A 'filled job' exists where an enterprise establishes explicit or implicit employment contracts with individual persons to undertake the job. Estimates of movements in the number of jobs in the economy provide a measure of labour market performance and capacity.

21. Defining a job is difficult. In the language used in national accounts, a job is an economic activity through which people engage in production. However, a dictionary definition is perhaps easiest to comprehend: a task or piece of work, especially one that is paid.

Persons

22. Explicitly including persons within the sequence of accounts allows not just a more complete understanding of the labour force, it also allows us to bring in the demographic dimension. This provides an opportunity to move beyond an aggregate household view by providing insights into the experience broken down into educational demographic groupings of interest such as: gender, age, educational attainment and ethnicity.

23. The size of the labour force is a measure of the total number of people of working age who are working, or actively looking for work - that is, the number of people employed and unemployed together as one group.

Labour volume

24. The Labour Volume quadrant describes the relationship between the hours of labour that are supplied by individuals and the hours of labour that are used by enterprises. It quantifies the number of hours actually worked by persons in all jobs. These data have a direct link to National Accounts and productivity statistics, as they are measures of labour input used in the production of goods and services.

25. Measuring changes in the level of hours worked for different groups of employed persons (both self-employed and employees) is important in order to monitor working and living conditions, as well as analysing economic cycles. Information on hours of work enables various analytical insights such as: classification of employed persons into full-time and part-time status; the identification of underemployed persons; and the creation of high frequency (monthly or quarterly) aggregates on hours worked.

Labour payments

26. The Labour Payments quadrant accounts for the costs incurred by enterprises in employing labour and the incomes received by people from their labour provision. It can be described as the cost of labour, and reflects the interactions between labour supply (persons in the labour force), labour demand (jobs and employed persons), and labour volume (hours worked). This is one component of labour already quite well covered by the *SNA*, and would be expected to be fully consistent with the measures already include within the National Accounts. An articulation of labour payments to be covered is included in Annex 1 (note this annex is an Australian example that will be generalised in future work of the task team).

Education and Training Account

27. Several international guidelines on education accounts exist, such as such as the UNESCO Methodology of National Education Accounts (NEA) 7, the UNESCO-OECD-Eurostat (UOE) Manual for data collection on formal education8 and the OECD publication "Education at a Glance". The NEA framework and the UOE data collection on formal education provide a set of coherent and internationally comparable data. However, they both differ in several ways from the SNA. The most recent one the UNECE Satellite account for education and training: Compilation Guide is fully consistent with the national accounts framework. This extended account uses the national accounts and the relevant feeder systems (education statistics, GFS, COFOG and COICOP statistics, trade-in-service statistics) as a starting point with the supply and use tables acting as a framework for ensuring consistency.

Satellite accounts for training education (UNECE 2016)

28. Satellite Account for Education and Training: Compilation Guide9 presents a framework and practical guidance aiming to help countries construct internationally comparable accounts. The proposed framework was pilot tested in five countries: Belarus, Canada, Israel, Norway and the United Kingdom.

29. In addition to providing estimates of the total expenditure on education and training, and thus leading to improved cost measure of human capital, the objective of such a satellite account is to distinguish and provide breakdowns of the various expenditures, including the identification of the financing arrangements for these expenditures.

30. In developing the compilation guide, other international work in the field of education mentioned above was considered and the main differences regarding the scope of education, coverage of activities, valuation principles and classification used were analysed and explained (see Chapter 6 of the SAET Compilation Guide for a more complete comparison).

Satellite Account for Education and training - conceptual framework

31. The Satellite Account for Education and Training (SAET) defines the total current expenditure on education in a way consistent with the national accounting framework. It is largely based on monetary data already available from the national accounts but provides a more detailed description of the education system. The SAET includes monetary and non-monetary data to broaden the analysis and this is made possible by the rich set of statistics on education already collected by countries in the context of the UOE data collection.

32. The SAET largely respects the current production boundary of education and training in national accounts, although expands it to include the output from enterprise internal expenses on in-house training (own account training). The idea is to provide policy makers with more detailed data on the expenditures on education, and the financing of these expenditures. In addition, it provides for more detailed classification of education and training activities by purpose, which is based on International Standard Classification of Education, 2011 (ISCED)10 and currently not part of SNA.

Scope of SAET

32. The scope of education and training activities in the SAET covers all public and private expenditure for formal education and vocational training. The expenditure for education and training activities to be considered refers to the following items:

(a) Teaching, administrative and other activities in formal education and vocational training services;
(b) Non-formal cultural, recreational, sport and vocational education and training activities (also including free courses and e-learning);
(c) In-house training by employers;
(d) Associated goods and services directly related to the delivery of education and training services;
(e) Gross fixed capital formation in the education industry.

33. SAET includes the expenditures on education and training for all residents of a country, as this is what is needed to measure investment in human capital. Following this, the SAET will cover expenditures related to domestically produced education, as well as that imported (resident students abroad). Expenditures of non-resident students contribute to the human capital of another country and should thus be recognized as exports.

34. The SAET proposes to set up the accounts in a supply and use framework. Producing data from both supply and use side allows confrontation of the alternate estimates and improve the quality of both.

Classifications

35. The SAET defines two sets of classifications, i) classification of production and financing units by institutional sector and ii) classification of education and training by purpose. The former classification is that used in the *2008 SNA* while the latter is mainly based on *ISCED* 2011 levels. The proposal is a classification with seven education and training purposes (EPs), where the first four are directly related to *ISCED*. In addition, there are three purposes related to

[7] Available at: http://uis.unesco.org/sites/default/files/documents/who-pays-for-what-in-education-national-revealed-through-accounts-2016-en_0.pdf

[8] http://uis.unesco.org/sites/default/files/documents/uoe2016manual_11072016_0.pdf

[9] http://www.unece.org/fileadmin/DAM/stats/publications/2020/ECECESSTAT20201.pdf

[10] Available at http://uis.unesco.org/sites/default/files/documents/international-standard-classification-of-education-isced-2011-en.pdf

non-formal education and training, which are outside the scope of *ISCED*, namely: cultural, sports and recreation education; other education and vocational training; and in-house training. It should be noted that these are not products as typically understood in the CPC, but a bridge table between the education and training by purposes and CPC is established (see Annex 2).

36. References to ISIC Rev.4 are also needed for the allocation of specific products and services given for free, treatment of research and development, associated products, educational administrative expenditures and professional military training.

Special issues

37. With respect to early childhood education, the intention is to cover only the education part (if any) and to leave child care activities out of the scope of the account. Similarly, only the instructional part of cultural, sport and recreational education courses should be included if data sources allow to do so.

38. The scope of training in SAET includes training employees by employers: both in-house (produced by the enterprise itself) and external training (produced by third-party organizations). In the current *SNA*, external training is already included as intermediate consumption and output of the corporations, NPISH and governments that provide training. In-house training is not included and will, therefore, be recorded as an additional product in SAET. The overall effect of including it in the accounts is an increase in output and intermediate consumption of the market sector (additional output, which industries then purchase as intermediate consumption).

Education and Training Account Tables

39. The main tables include monetary data that follow the national accounts focusing on the production aspects of the education system; indeed, national accounts register the expenditure incurred by the different agents within the field of education as components of the production costs, linked to their different activities as providers of educational goods/services. The proposed structure of the SAET tables constitutes the encouraged lay-out of the accounts. Nevertheless, depending on country circumstances, countries could opt for more detailed breakdowns.

40. The set of proposed core tables are presented in Annex 3 and consist of:

(f) Education and training output, by provider and education purpose (Current prices) (Table A.1);
(g) Education and training expenditure, by purchaser and education and training purpose (Current prices) (Table A.2);
(h) Financing, by sector and education and training purpose (Current prices) (Table B.1);
(i) Cost structure, by education and training purpose (Current prices) (Table B.2).

41. The monetary data from the main tables could be supplemented with non-monetary data such as: population, enrolled students (by *ISCED* level), adults in continuing vocational training and in lifelong learning (broken down by sex and age group), teachers/staff (by *ISCED* level) or employed persons by educational attainment. Combining these two data sets could

allow the calculation of cross-sectional time series on per capita or per student expenditure that provide important insights for policy measures. Five examples of supplementary tables that could be relevant are presented in Section 3.6 of the SAET Guide, but each country can enrich the SAET with specific tables relevant to their particular situation.

Satellite Account for Education and training – Practical experience

42. The SAET framework was pilot tested in five countries: Norway, Belarus, Canada, Israel and the UK. The country pilots showed that, despite some measurement issues related mainly to training activities, setting up of a SAET is feasible using more detailed disaggregation of the data that are already included in national accounts. The government sector is the main player in education activities in all countries, therefore the main data sources are the government accounts (government finance statistics). This is also an area where good data are available globally. More challenging is to find suitable data for the private sector. Different surveys of private providers of education services and NPISH reports were used by the countries.

43. The main measurement challenges include:

(j) Inconsistency between the various data sources or the lack of sufficient detail in the classification currently used in the national accounts regarding education by level.

(k) Availability of source data to estimate expenditures related to in-house training. A wide-ranging data source such as the Continuing Vocational Training Survey (CVTS) can provide good base for the estimates, but these surveys are costly and not available in many countries. Other existing data sources often do not distinguish between education and training purchased by employers for their employees and training provided directly by the employer (in-house training).

(l) Free courses and particularly e-learning are included in SAET but there are many practical difficulties related to its measurement. Paid on-line courses offered both by education institutions and other providers will be captured in the estimates using data from household surveys or company accounts. Free on-line courses provided by resident non-market education institutions will also be implicitly included in the total costs. The most problematic part are the informal free courses provided by units outside of the education sector. These latter offerings would generally not be captured within these measures (such as informal learning on digital platforms).

The volume index of education and training output

44. The SAET includes estimates of education and training output by providers and education purposes in current prices. It is recommended in the compilation guide that future development of the account should lead to calculations in volume terms.

45. Changes in the nominal value of education and training output reflects both changes in the price index and changes in the volume index of education and training output. The volume index of education and training output in the SAET serves a number of purposes. First, it can be compared with the volume index of inputs to estimate the productivity of education and training provider. Second, the volume index of education and training output can be used to calculate investments in human capital in constant prices, which are then accumulated to derive the cost-

based estimate of stock of human capital embodied in individuals receiving education and training.

46. The challenge is what to do in the absence of a market price has been debated for the last 20 years, and in Eurostat's *Handbook on Prices and Volume Measures in National Accounts (2016)* the recommendation is compiling the constant price estimate using a "direct" volume index. The handbook defines *"education output is the amount of teaching received by the students for each type of education".* The quantity of teaching received by students can be measured by the number of hours they spent at being taught. This measure is referred to as the number of 'student-hours' (or 'pupil-hours'). Where this measure is not available, the simple number of students or pupils can be an alternative, provided that the hours of tuition that an average student receives remain broadly stable over time. For some levels of education (for example tertiary education and distance-learning) the number of students may in fact be a better indicator of the education service delivered, since formally taught hours may comprise a variable and even small part of the education service (which may be more in the form of written material or informal teaching), see Eurostat 2016 chapter 4.16.

47. Education and training output are captured by the amount of teaching or observed activities such as the number of hours students are taught or number of part time or full-time students enrolled dis-aggregated by education purposes. When education and training output is provided by market producers, the methods of compiling the volume index are similar to the methods of compiling the volume indices for other market goods and services. But when it is provided by non-market producers, *SNA 2008 (chapter 15)* presents three possible methods of compiling volume estimates of education and training output.

48. OECD (2010), Eurostat (2016) and Diewert (2017) provided methodological guidance for output-based approaches in the measurement of education and training output.

Human Capital Account

49. The *SNA* increasingly recognises the importance of including knowledge-based capital in the national account statistics. However, unlike physical capital, all types of knowledge, skills, competencies and attributes are invisible. In order to provide a full account of the growth of human capital, it is necessary to establish an integrated stock–flow accounting system in which changes in the stock of human capital can be allocated among investment, depreciation, growth of working age population and revaluation.

Guide on Measuring Human Capital

50. In 2016, the United Nations Economic Commission for Europe (UNECE) published the guide on *Measuring Human Capital*[11] with the objective of pursuing the conceptual development of human capital measurement and with a particular focus on developing experimental human capital accounts.

[11] Available at: https://unstats.un.org/unsd/nationalaccount/consultationDocs/HumanCapitalGuide%20Global%20Consultation-v1.pdf

51. The guide 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.

52. The *Human Capital Guide* shows the feasibility of setting up human capital accounts and encouraged countries and international organizations to continue the work on estimating the role of human capital. However, the guide does not recommend the inclusion of human capital in the central framework of the *SNA,* recognising this would be an extremely significant departure from the current conceptual design and structure of the standard.

53. The guide discusses two approaches for valuing human capital, either the "cost-based approach" or the "lifetime income approach". The cost-based approach uses the costs of generating human capital (e.g. expenditures on education) as a starting point, while the lifetime income approach tries to estimate the value of human capital by calculating the net present value of future earnings. Despite the feasibility of constructing human capital satellite accounts, there are a number of challenges that statistical agencies must overcome to produce them. Among the most pressing ones are how to structure the treatment of human capital investment through the sequence of accounts in the *SNA*; the choice of an appropriate price deflator for human capital investment; the choice of an appropriate depreciation rate for human capital; and the reconciliation of alternative methods for estimating the human capital stock and investment.

Practical Experience in Compiling Extended Accounts for Human Capital

54. There are six major international studies of human capital, each of which covers at least 130 countries. Of these, two are monetary measures, one by United Nations Environment Programme (UNEP) and Kyushu University Urban Institute, and the other by the World Bank. The other four measures are indexes, one each by the Institute of Health Metrics and Evaluation (IHME) of the University of Washington, International Bank for Reconstruction and Development (IBRD) and World Bank, United Nations Development Programme (UNDP), and World Economic Forum (WEF).

55. Both of the monetary measures for a large number of countries use a lifetime income approach. They differ in their application of this methodology in part because of the amount of data the different organizations had available to them. The World Bank has a very large data set, the International Income Distribution Data Set (I2D2), which includes over one thousand harmonized surveys of individuals aged 15-65 covering partially at least 139 countries.

56. The UNEP and Kyushu University Urban Institute measure, commonly referred to as the Inclusive Wealth Report (IWR), and the World Bank measure, commonly called the Changing Wealth of Nations (CWON) are described in Annex 4. A description and comparison of all six measures is included in the forthcoming book, Barbara M. Fraumeni, (ed.) *Measuring Human Capital* with the index measures described in Annex 5. A number of individual country monetary measures have been published; these published before 2016 are described in chapter 7 of the UNECE *Human Capital Guide*.

57. The *UNECE Guide* included a pilot measurement test based on Canadian data, this implied that by using the cost-based approach, the capitalisation of expenditures on education and training would increase GDP 10 per cent, and capital formation by 76 per cent, while total final consumption expenditure would decline by 7 per cent. In comparison, the income-based approach would increase GDP by 30 per cent, and capital formation by 150 per cent, while final consumption of households, NPISH and government would decrease by 7 per cent.

Further Issues in Human Capital

58. The majority of this note, and its recommendations, focus on core human capital concepts such as investment in education and training activities, as well as its market-based relationship to the labour accounts. This focus has been selected in order to provide pragmatic recommendations as we embark on developing official standards for this area of measurement. This section recognises that the concept of human capital at its most complete include considerations beyond the scope of our recommendations.

59. The scope of a human capital account, as often defined, allows for investment and valuation in several other key topics, some of which are known in the literature to be either as, or more, important for individual human capital accumulation. These are:

(m) Health
(n) Parental and family engagement
(o) Cultural and social engagement
(p) Wider work-related human capital accumulation beyond in-work training

60. Health is a key principle of an individual's human capital. This ranges from the lack of various diseases, illnesses and disabilities qualifying a higher level of physical and cognitive skills directly, as well as enabling further development into the future. Lack of good health can be seen as an impairment of an individual's opportunity to develop, while also having a detrimental impact on an individual's human capital today. It can also relate to supporting the longer use of an individual's human capital, whether in the marketplace or in wider economic activity, as what may be seen as an increase of the life-length of the human capital asset. It is clearly of vital importance, but because there has not been a consensus made on what aspects of health should be considered in scope, as well as their treatment (e.g. should different aspects of health be separate 'products of activity' that can be invested in independently, or should health feed indirectly into the core concepts of human capital valuation such as through the appropriate deflation, depreciation rate) and potential measurement challenges, that this section requires further research before recommended to be considered in scope.

61. Similarly, the other topics referred to, around the family situation, and other activities people engage in both as adults and children culturally and socially, such as attending museums, social clubs, personal projects etc. are known to influence people's cognitive, physical, social and emotional development, all of which are facets of their human capital. However, there is still active research into the mechanisms underlying what matters (e.g. the debate between parental income versus the opportunities such income provides, such as tangible resources and intangible time and security). In addition, it is still an active question on how to incorporate into either an income-based or cost-based approach, in terms of conceptual

valuation and sources that may be internationally comparable, such that it is difficult to recommend a consensus at this stage.

62. Finally, beyond the wider social aspects feeding in to human capital investment, it is known that there are other mechanisms that influence a person's development in the workplace. In particular, support networks, mentorship opportunities, and the quality and quantity of feedback on a person's work allow them to improve their skills and knowledge, and hence their potential human capital. Additionally, there are aspects of the employed being stretched in their work, while also being supported, so that they are able to improve their marginal productivity. This expands on the concept of 'experience' referred to in Mincerian wage equations. Here, we refer to potential rather than realised human capital as the difference between the skills and knowledge embodied in an individual, compared with the market valuation for the use of (potentially a subset of) their skills and knowledge as applied in employment. All these concepts are clearly important in the aggregate, but due to measurement issues, such as how to convert such opportunities above as intangible 'investment' when there is no market transaction, and what the imputed transaction may need to be, mean this is still an active research area. What is needed is a conceptualisation for general principles of what is in scope and what is not, that can be applied to work scenarios before starting to measure such concepts as investment in human capital.

4. Links to Other Research Agenda Themes

Unpaid Household Activities

64. Paid employment as measured in the Labour Accounts sits within a broader set of 'work' activities shown in the table below, which clearly includes unpaid household activities as well as volunteer work. One could easily imagine extensions to the Labour Accounts which include, in a coherent and integrated manner, all types of work undertaken to produce unpaid household services and volunteering, thus becoming a type of 'Work Account'.

<table>
<tr><td>Intended destination of production</td><td colspan="2">for own final use</td><td colspan="5">for use by others</td></tr>
<tr><td rowspan="2">Forms of work</td><td colspan="2" rowspan="2">Own-use production work</td><td rowspan="2">Employment (work for pay or profit)</td><td rowspan="2">Unpaid trainee work</td><td rowspan="2">Other work activities</td><td colspan="3">Volunteer work</td></tr>
<tr><td rowspan="2">in market and non-market units</td><td colspan="2">in households producing</td></tr>
<tr><td>of services</td><td>of goods</td><td></td><td></td><td></td><td></td><td>goods</td><td>services</td></tr>
<tr><td>Relation to 2008 SNA</td><td colspan="8">Activities within the SNA production boundary
Activities inside the SNA General production boundary</td></tr>
</table>

65. Unpaid household activities also feature prominently in discussions of human capital measurement. While the recommendations in this paper are to focus human capital

measurement efforts on the education and training inputs and on the lifetime earnings approach, it should be acknowledged that the research interest in this topic goes much further than the initial limited steps we are recommending.

66. As such, the research agenda for unpaid household activities is crucial in supporting further research and development in human capital. Types of unpaid household activity that are of interest to human capital research include (but are not limited to):

(q) Childcare links to human capital accumulation and labour market participation
(r) Informal/independent education at home
(s) Adultcare as a way of supporting decline in human capital
(t) Cooking as a way to link to nutrition
(u) Volunteering as an alternative to paid work for human capital accumulation (also relevant for the extended account on education and training)
(v) Leisure aspects (outside of unpaid work) –cultural engagement and links to increasing aspect of digital production in the informal work area

67. Family engagement has been shown to have a large and consistent effect on children's development, coming through in their educational achievements, length of time in education overall, and further labour-market impacts. Hence it is important, when attributing the value of education output, in terms of the volume index, as well as the total investment in human capital of a country, to account for this engagement.

68. Similarly, caring for adults who are sick and/or disabled, or too old to look after themselves, presents a similar way of either developing the individual's human capital, or delaying any depreciation to their skills and knowledge, both physical and mental. This is also already captured in the extended accounts for unpaid household service work, and may also be incorporated ultimately in a full-fledged set of human capital accounts.

69. Beyond investment in mostly cognitive and physical skills and knowledge through the education and training system, investment in people's health also enables human capital to develop. One key way to enable measurement of individual investment in people's health is through the nutritional effect of cooking, which is another core activity of the extended accounts for unpaid household service work.

70. More closely linked to core investment in human capital, as the 'work experience' aspect of the seminal decomposition of human capital investment by Gary Becker and Jacob Mincer[12], is volunteering. Volunteering provides an alternative means for individuals in the resident country to develop their skills and knowledge, and subsequently apply them to the workplace. This could be in the form of unpaid work experience, charitable work, or more informal helping out of others not captured by the care activities referred to above. In either

[12] For a study on the Mincer equation applied to EU countries, see: 'Wage determinants in the EU – Evidence from SES2014 data', (Alcantara/Henrion/Leythienne) at: https://ec.europa.eu/eurostat/documents/7870049/10654224/KS-FT-20-003-EN-N.pdf/b39e3e72-936e-359d-a3ea-561ae13fcde9

case, parts of it can be seen as self-investment in one's own human capital, and so should be considered for a full human capital valuation.

Health and Social Conditions

71. Measurement considerations and issues for health-related activities frequently mirror those for education activities, for example non-market, own-account, household production. As such, efforts should be made to ensure consistency between the recommendations for health and education accounts. The data produced in the health account will also be of keen interest to research into human capital. Therefore, it would be beneficial to ensure consistency in classifications and demographic breakdowns used across the two streams of work.

Distributions of Household Income and Expenditure

72. Formally including the Labour Accounts within the sequence of *SNA* accounts supports analysis of the distribution on income derived from labour. The 'people quadrant' within these accounts enables us to link compensation of employees to demographics groupings of interest in a formal and consistent manner. See guidance note on *measuring distributions of household income and expenditure* for more detail.

Productivity

73. There are clearly important links between the measurement topics discussed in this paper and productivity measurement including labour productivity, total factor productivity and the KLEMS framework. However, this paper does not intend to go into detail on productivity measurement other than to note that improvements in the measurement of labour inputs and human capital will result in enhanced productivity measures. Some of these links are further articulated in Annex 6.

5. Recommended Approach

Labour Accounts

74. It is proposed that Labour Accounts are included within the central framework in the update to the *System of National Accounts*. These accounts would be described in a new additional chapter of the *SNA*, placed between current chapter 9 "The use of income accounts" and chapter 10 "The capital accounts". This chapter should: 1) highlight the importance of this labour related data, 2) present the scope and coverage of the proposed accounts, 3) link the labour accounts to other relevant accounts, and 4) discuss measurement issues.

(a) **Highlight the importance of the work** - Labour is at the heart of production, forming a primary input alongside capital. Providing employment and income and is of fundamental importance to policy makers. Household's economic 'experience' is to a large degree shaped by their labour 'experience'.

(b) **Present the scope and coverage of the proposed accounts** - The labour accounts will be based on the *SNA* production boundary and should, at a minimum, cover remunerated work captured through the four dimensions of: jobs, people, volume (hours), and payments. The people quadrant will include demographic breakdowns by: gender, age and educational attainment. The accounts will include both

monetary and non-monetary (for example number of jobs, number of hours etc) values. The accounts will reflect existing aggregates for many components of the volume (hours worked etc) and payments (COE etc) quadrants. New aggregates will be presented in the Jobs and Persons quadrants.

(c) **Link the labour accounts to other relevant accounts** - The chapter will describe the links to other relevant chapters of the *SNA*, in particular the chapters covering the production and various income accounts. It will also describe links to other related material such as productivity, population and unpaid household work.

(d) **Finally, discuss measurement issues** - The chapter will cover measurement challenges including advise on the use of source data from household surveys, business surveys, and administrative data. Including how to confront and reconcile this data from a supply and demand perspective. Links to relevant ILO labour standards will also be covered.

Education and Training

75. To present accurate and relevant indicators of education and training services that are extensions of the *SNA* core framework, two primary supplements to the *SNA 2008* are recommended. These accounts extensions build on existing material, particularly the Satellite Accounts for Education and Training (SAET). Specific recommendations for the proposed extension to the *SNA* core are:

(a) **Produce Satellite Account for Education and Training (SAET)** - As a first step to analyse the costs (investment) related to education training, include SAET in an extension to the core national accounts. The SAET should be set up in the Supply and Use (SUT) framework to ensure consistency and completeness.

(b) **Introduce the classifications for education and training by purpose**, based on ISCED 2011 in the extended framework (see Annex 2).

(c) **The valuation of the costs should be both in current and constant prices**. The volume measures should be set up using best practice methods, as described in Eurostat's *Handbook on Prices and Volume Measures in National Accounts* (2016).

(d) **Own-account production, i.e. in-house training, of education services should be imputed as secondary output** and allocated to intermediate consumption (in the extended accounts).

(e) **Review if imputed values for unpaid household services should be included in the extended accounts** (presently not included in the SAET).

(f) The monetary data from the main tables should be supplemented with non-monetary data to enrich the analyses.

76. The Education and Training Account should be positioned as a step towards producing an extended Human Capital account as well as a very useful dataset in its own right.

Human Capital

77. It is recommended that extended accounts for human capital are developed. No change is proposed to the core *SNA*. This is a major step in the development of national accounting and should be viewed as a long-term development process. It is however vital that

we commence tackling this area of measurement given its vital role in economic development and progress.

78. Some pragmatic and achievable first steps for these extended accounts are recommended:

(a) Develop cost-based education measures, in accordance with the recommendations under Education and Training above

(i) With methodology described in the UNECE Guide on Measuring Human Capital (UNECE 2016) and in the SAET Compilation Guide (UNECE 2020) to produce nominal estimates of flows

(ii) Volume indexes calculated using best practice methods

(iii) Calculation of nominal stock estimates using the Perpetual Inventory Method (PIM). Noting that this further research is required to agree on the assumptions underpinning the PIM calculation

(b) Produce income-based monetary stock measures with gender, age, and education detail

(i) Nominal estimates based on methodology described in annex 4 and in the UNECE Guide on Measuring Human Capital (UNECE 2016).

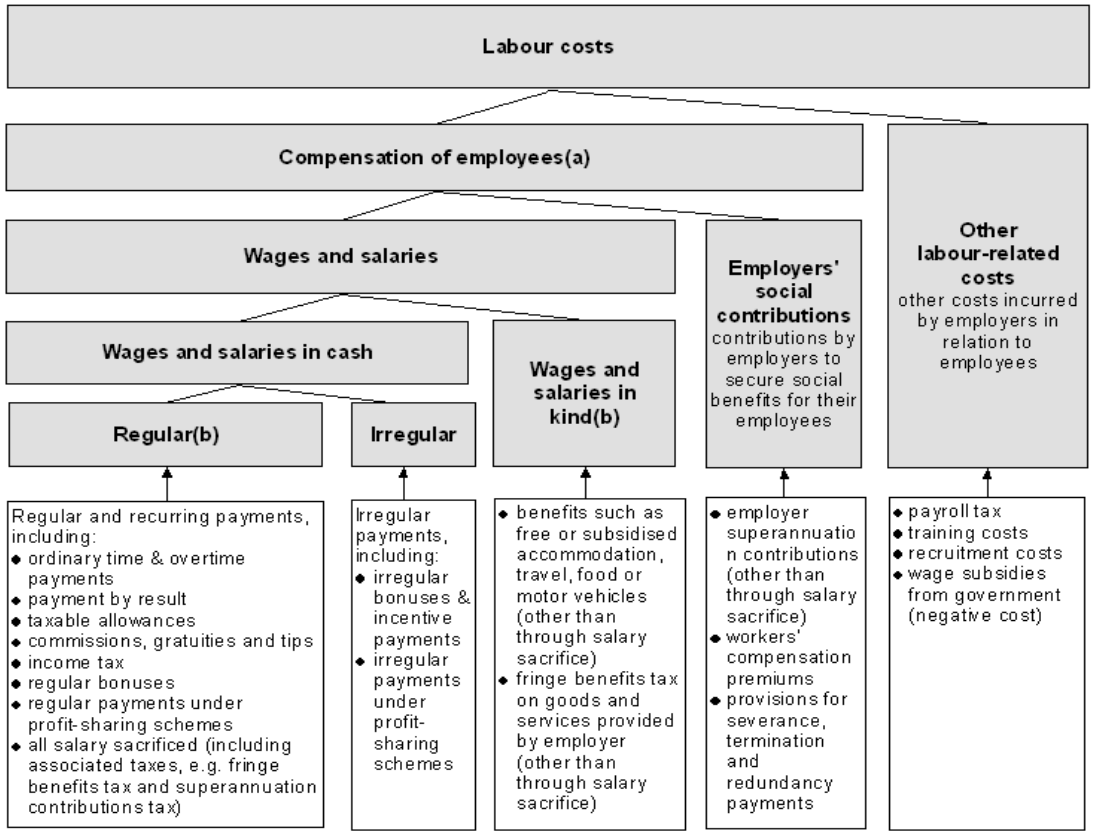
(ii) Create market-based nominal estimates as a starting point, with the addition of nonmarket estimates depending on the construction of household production accounts with supporting time-use studies as recommended in other guidance notes

(iii) If feasible, provide the gender, age, and education detail consistent with that provided in the labour accounts recommended elsewhere in this report

(iv) Construction of volumes with index numbers

Annex 1 Labour Payments

12.1 AUSTRALIAN CONCEPTUAL FRAMEWORK FOR MEASURES OF EMPLOYEE REMUNERATION



(a) The concept 'employee income' is broadly comparable with compensation of employees.
(b) Conceptually, earnings comprise regular wages and salaries in cash and regular wages and salaries in kind.

Annex 2 Classification of Education and Training by Purpose

Education and training purpose	ISCED	CPC ver. 2.1	
EP 0	ISCED 0	921	- Early childhood educational development; - Pre-primary education;
EP 1	ISCED 1	922	- Primary education
EP 2	ISCED 2-4	923 924	• Lower secondary (general & vocational) education; • Upper secondary (general & vocational) education; • Post-secondary non-tertiary (general & vocational) education;
EP 3	ISCED 5-8	925	• Short-cycle tertiary (general & vocational) education; • Bachelor's or equivalent level; • Master's or equivalent level; • Doctoral or equivalent level

EP4	Not included in ISCED	92911 92912	Cultural education services (piano and other music instruction; art instruction; dance instruction and dance studios; art instruction except academic; photography instruction) Sports and recreation education services (sports instruction; camps; gymnastics instruction; riding instruction; swimming instruction; martial arts instruction; card game instruction; yoga instruction, etc.)
EP 5	Not included in ISCED	92919 93411 93412	Other education and training services, n.e.c. (external) - training for car, bus, lorry and motorcycle driving licences - training for flying certificates and ship licences - services provided by music camps, science camps, computer camps and other instructional camps, except sports - computer training services - management training services Vocational rehabilitation services for persons with disabilities (external) Vocational rehabilitation services for unemployed persons (external)
EP6	In-house training	92919 93411	Other education and training services, n.e.c. (internal) Vocational rehabilitation services for persons with disabilities (internal)

Annex 3 Satellite Account for Education and Training Core Tables

Table A.1

Education and training output, by provider and education and training purpose. Current prices.

		Supply								
		Central govern-ment	State govern-ment	Local govern-ment	NPISH	Market producers in education industry[13]	Other market produ-cers	Imports	Taxes less subsidies on products	Total
Educa-tion and training purpose	EP0 - Pre-primary education									
	EP1 - Primary education									
	EP2 - Secondary education									
	EP3 - Higher education									
	EP4 - Cultural, sport and recreation education									
	EP5 - Other education and									

[13] Includes households as producers.

	vocational training									
	EP6 - In-house training									
	Associated products and administra-tive expenditures, not allocated									
Total output = Total current expenditure										
R&D production of ISIC 85 (own account and production for sale by the Education Industry)										

Table A.2

Education and training expenditure, by consumer and education and training purpose. Current prices.

Use									
		Final consumption expenditures					Intermediate consumption – market producers	Exports	Total
		Central government	State government	Local government	NPISH	Households[14]			
Education and training purpose	EP0 - Pre-primary education								
	EP1 - Primary education								
	EP2 - Secondary education								
	EP3 - Higher education								
	EP4 - Cultural, sport and recreation education								
	EP5 - Other education and vocational training								
	EP6 - In-house training								
	Associated products and administrative expenditures, not allocated								
Total output (intermediate and final consumption) = Total current expenditure									
		Gross fixed capital formation in education industry (ISIC 85)							
		Central government	State government	Local government	NPISH		Market producers in education industry		Total

[14] Households as consumers only

		ment						
R&D (both purchased and produced for own account)								
Capital formation (excluding R&D)								
Total gross fixed capital formation								

Table B.1

Financing, by sector and education and training purpose. Current prices.

		Education and training purposes								
		EP0 Pre-primary education	EP1 Primary education	EP2 Secondary education	EP3 Higher education	EP4 Cultural, sports and recreation education	EP5 Other education and vocational training	EP6 In-house training	Associated products and administrative expenditure, not allocated	To
Resources										
Central government	Final consumption expenditure of central government									
	Plus - transfers / subsidies to other sectors (detail to be country specific)									
	Less – transfers / subsidies from other sectors (detail to be country specific)									
	Central government financing									
State government	Final consumption expenditure of state government									
	Plus - transfers / subsidies to other sectors (detail to be country specific)									
	Less - transfers / subsidies									

	from other sectors (detail to be country specific)									
	State government financing									
Local govern-ment	Final consumption expenditure of local government									
	Plus - transfers / subsidies to other sectors (detail to be country specific)									
	Less - transfers / subsidies from other sectors (detail to be country specific)									
	Local government financing									

NPISH	Final consumption expenditure of NPISH									
	Plus - transfers to other sectors (detail to be country specific)									
	Less – transfers / subsidies from other sectors (detail to be country specific)									
	NPISH financing									
House-holds[15]	Final consumption expenditure of households									
	Plus - transfers to other sectors (detail to be country specific)									
	Less – transfers / subsidies from other sectors (detail to be country specific)									
	Household financing									
Other sectors[16]	Intermediate consumption									
	Plus - transfers to other sectors (detail to be country specific)									
	Less – transfers / subsidies from other sectors (detail to be country specific)									
	Other sectors financing									
Rest of the world (exports)										
Total resources										

[15] Households as consumers only.

[16] Corporate sectors and households as producers.

Table B.2

Cost structure, by education and training purpose. Current prices.

		Education and training purposes								
		EP0 Pre-primary education	EP1 Primary education	EP2 Secondary education	EP3 Higher education	EP4 Cultural, sports and recreation education	EP5 Other education and vocational training	EP6 In-house training	Associated products and administrative expenditures, not allocated	Tot
Uses										
All sectors (or by sectors if desired)	Compensation of employees									
	Intermediate consumption									
	Consumption of fixed capital									
	Taxes on production and imports, less subsidies									
	Operating surplus									
Total current domestic expenditures										
Rest of the world (imports)										
Total current expenditure										

Annex 4 Monetary Measures of Human Capital

World Bank's latest CWON project used the Jorgenson-Fraumeni (J-F) approach (Jorgenson and Fraumeni, 1989, 1992a, 1992b) with wage profiles estimated using Mincer equations. The Mincer equations and wage profiles are based on an updated version of Montenegro and Patrinos (2016). The J-F methodology is described in chapter 4 of the Human Capital Guide. The modification of the J-F approach in CWON is briefly summarized in the introduction by Liu and Fraumeni to the *Human Capital Measurement* forthcoming book.

Lifetime labor income is calculated as:

(1) $$li_{a,e} = p_{a,e}^{m} w_{a,e}^{m} + \left(1 - r_{a,e}^{e+1}\right) * \varphi * v_{a+1} * li_{a+1,e} + r_{a,e}^{e+1} * \varphi * v_{a+1} * li_{a+1,e+1}\ ,$$

where

$li_{a,e}$ = lifetime labor income for an individual with age *a* and education *e*;

$p_{a,e}^{m}$ = employment probability;

$w_{a,e}^{m}$ = employee compensation;

$r_{a,e}^{e+1}$ = school enrolment rate for those of education of *e* in process of completing a one-year higher level of *e*+1 (assuming equal to 0 for those aged 25-65);

φ = adjustment factor;[17]

v_{a+1} = probability of surviving one more year.

The first term on the right $p_{a,e}^{m} w_{a,e}^{m}$ is labor income for the current year. The second term on the right $\left(1 - r_{a,e}^{e+1}\right) * \varphi * v_{a+1} * li_{a+1,e}$ is lifetime labor income for those who are not continuing their education in the current year. The last term on the right $r_{a,e}^{e+1} * \varphi * v_{a+1} * li_{a+1,e+1}$ is lifetime labor income for those who will earn the lifetime labor income of individuals with an *e+1* level of lifetime labour income in the future. The lifetime labor income of the self-employed is calculated in a similar manner.

The IWR human capital per capita estimates depend on a model developed by Arrow (2012, 2013).

(2) $$hc_{ed} = \left(e^{\rho ed} * P_{5+ed} * \int_{0}^{T} w(\tau) e^{-\delta \tau} d\tau\right) / P,$$

where

hc_{ed} = human capital per capita with *e* average years of school completed;

ρ = rate of return on education (assumed to be 8.5%);

P_{5+ed} = population who has years of school complete equal to or greater than e, considered the adult population;

w = average employee compensation;

T = expected working years;

δ = discount rate (assumed to be 8.5% following Klenow and Rodríguez-Clare, 1997);

P = total population.

[17] The adjustment factor (φ) is defined in terms of the real rate of labor income growth (g) and a discount rate (σ), i.e. $\varphi = (1+ g)/(1+ \sigma)$.

The first term on the right is one unit of human capital for one unit of the adult population times the adult population. The second term is the shadow price of one unit of capital determined by the lifetime labour income of an adult. The per capita human capital is assumed to apply to all individuals, whether they work or not. Note that total IWR human capital is different from CWON human capital as the later is computed only for workers. Also, the IWR uses PPPs to deflate nominal human capital, while CWON uses a GDP deflator in US dollars. In both cases, the deflator does not reflect the characteristics of the human capital, except for income. If the price of consumer durables rise, the volume of human capital will fall. J-F computed the volume of human capital with a Divisia/Tornqvist which is directly a function of the relative marginal productivities of the human capital. For some countries, particularly less developed countries, volumes dependent upon PPPs can be quite different than volumes depending upon a GDP US dollar dominated deflator.

Annex 5 Index Measures of Human Capital

As noted, there are four human capital indexes for a large number of countries produced by IHME, UNDP (Human Development Index – HDI), the World Bank (WB), and WEF. 195, 189, 157 and 130 countries are covered for years 1990-2016; 1990, 2000, 2010, 2013, 2015-2018; 2018; and 2017; respectively.[18] Each of the indexes are defined differently, although all have an education component and all but WEF has a health and survival component (see table 3.1.2). The WEF index also differs from the other measures as it has a number of subcomponents dependent upon the WEF's Executive Opinion Survey, two components that none of the others include, and a large number of indicator sub-components. Another unique feature of the WEF index is that it measures the skill diversity of recent tertiary graduates with a Herfindahl-Hirschman Index (HHI) of concentration among the broad fields of study. The UNDP HDI index is the only index that has a standard of living component. The descriptions of the four human capital indexes listed in Table 3.1.1 reflects perspective differences.

Table 3.1.1 Description of Human Capital Indexes

IHME	UNDP HDI	WB	WEF
Expected years lived from age 20 to 64 years, adjusted for educational attainment, learning, and functional health status.	Summary measure of achievements in three key dimensions of human development: a long and healthy life, access to knowledge and a decent standard of living.	The amount of human capital a child born in 2018 can expect to acquire by age 18.	A holistic assessment of a country's human capital—both current and expected—across its population.
Lim et al., 2016	UNDP, 2019	IBRD & WB, 2018	WEF, 2017

Table 3.1.2 lists the components by type. A detailed description of each component and the method by which an aggregate index is formed is in Table 3.1.3.

Table 3.1.2 Major Components of Human Capital Indexes

[18] Information in this section is a summary based upon Liu and Fraumeni's introduction to Fraumeni, editor, (forthcoming).

Component Type	IHME	UNDP HDI	WB	WEF
Education	X	X	X	X
Health & Survival	X	X	X	
Deployment				X
Know-How				X
Standard of Living		X		

Table 3.1.3 Detailed Description of Human Capital Components			
IHME	UN HDI	WB	WEF
Education			
Average years of completed schooling, by 5-year age groups, from 5 to 24; range = [0-18]	Expected years with range = [0-18] Mean years with range = [0-15]	Expected years by age 18 of those who start preschool earliest at age 4; range = [0-14]	%s of the population with at least a primary education; secondary education, or tertiary education
Harmonized average test score, relative to highest national average score, by 5-year age groups, from 5 to 19, scaled [0-1]		Harmonized average test score (out of a benchmark score of 625)	% of the population with the ability to both read & write and make simple arithmetic calculations.
			% of children in the official primary school age range who are enrolled in either primary or secondary education
			WEF's Executive Opinion Survey (EOS) question "How would you assess the quality of primary schools in your country?"
			% of children in the official age range for lower secondary education who are enrolled in secondary education
			Ratio of female to male enrollment rate in lower secondary education
			Technical/vocational enrolment as a % of enrollment in upper secondary education following completion of compulsory general (basic) education

			Enrollment in tertiary education as a % of the total population of the most recent five-year age cohort that has left secondary school
			Herfindahl-Hirschman Index of concentration among the broad fields of study of recent tertiary graduates
			WEF's EOS question "How well does the educational system in your country meet the needs of a competitive economy?"
			WEF's EOS question "To what extent do companies in your country invest in training and employee development?"
Health and Survival			
Expected years lived from age 20 to 64; Prevalence of health conditions linked to productivity/learning: anemia, cognitive impairment, hearing loss, vision loss, infectious diseases, by 5-year age groups, from age 20 to 64, scaled [0-1]	Life expectancy; range = [20-85]	Share of 15-year-olds who survive until age 60	
Stunting and wasting rates among children under age 5		Stunting and mortality rates among children under age 5	
Deployment			
			% of the population that engages actively in the labor market, either by working or looking for work
			Ratio of female labor force participation rate over male value, expressed as a %
			unemployed as a % of the total number of persons in the labor force
			% of persons of the employed who, given the opportunity, are willing available to

			work additional hours
Know How			
			% of persons employed in occupations with tertiary education requirements
			% of persons employed in occupations with at least secondary education requirements
			% of persons employed in occupations with at least secondary education requirements
			WEF's EOS question "In your country, how easy is it for companies to find employees with the required skills for their business needs?"
Standard of Living			
	Ln (Gross National Income per capita in 2011 PPP $); range = [ln(100)-ln(75,000)]		

Annex 6 Labour Input in the KLEMS Growth and Productivity Accounts.

This project, financed by the European Commission, is aimed to analyse productivity in the European Union at the industry level, includes measures of employment and skill creation, capital formation and multifactor productivity (MFP) (http://www.euklems.net/). The EUKLEMS database is updated for the 28 European economies https://euklems.eu/?doing_wp_cron=1589558150.1105999946594238281250), but a WORLD KLEMS Project (with data form Argentina, Australia, Canada, Chile, China, India, Japan, Korea, Russia, USA) has also joined the activity (http://www.worldklems.net/index.htm) has recently added).

The Project disseminated two indicators on Labour Input, for the period 1995 onward, referring to the *shares of employment type in total industry employment* and the *shares of labour compensation type in total industry labour compensation* for the Sections of NACE rev.2 sectors, broken down by gender, by three age groups, and by educational attainment with the aim to proxy for differences in work experience. Skills are broken down in three classes and definitions are consistent over countries: High qualification comprise workers with a university degree and above (ISCED 5 and 6); Medium qualification comprise those with upper secondary and post-secondary non-tertiary education (ISCED 3 and 4); Low qualification comprise those with lower secondary (compulsory education) and below (ISCED<3).

The levels of hours worked in each industry are taken from the national accounts data. These are broken down into the respective labour types using data from the EU labour force survey (EU LFS).

Information on hours worked by these categories are approximated by calculating the share of the number of workers of each type in total employment in each industry (restricted to 15 categories). Multiplying these shares with the number of hours worked in the industry results in the number of hours worked of a labour type in an industry. Series on hours worked by labour types broken down by skills are not part of the standard statistics reported by NSIs, not even at the aggregate economy level and that there is no single international database on skills also which can be used for this purpose.

Compensation data include wages and salaries but also all other costs of employing labour which are borne by the employer. To calculate the nominal costs, shares data on (hourly) wages of the respective labour types for each industry are taken from the Structure of earnings survey (EU SES), then calculating the volume index of labour services inputs in each industry.

The Accounts allow the measurement of both the labour growth and the labour composition effect. A shift in the share of hours worked by low-skilled workers to high-skilled workers will lead to a growth of labour services which is larger than the growth in total hours worked (Timmer, O'Mahony, van Ark 2007).

Moreover, in the latest release for EU countries, also vocational training by industry as part of Gross fixed capital formation (***GFCF***) is supplied among the intangibles assets. This is proxied by using information from the EU labour costs survey (EU LCS) for business industries. These data provide the share of vocational training in total labour costs, which are applied to compensation resulting in a time series of expenditures (Stehrer eta al 2019).