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HUMAN CAPITAL: FROM INDICATORS AND INDEXES TO ACCOUNTS

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A. Introduction

1. A recent publication of the Organization for Economic Cooperation and Development (OECD) pointed out the important contributions of human capital to economic growth, to society, and the life of humans in general.¹ Despite that critical role, however, researchers and policymakers have few comprehensive measures of human capital. This workshop is intended to share information on how human capital accounts might be constructed, and to develop an agenda for the OECD to produce such accounts. The proposals in this paper for the construction of single and multiple country human capital accounts are to be debated by the distinguished panel concluding this workshop – and ultimately by other decision-makers.

2. OECD attempts to construct measures for all of its member countries to facilitate cross-country comparisons. Human capital accounts exist for a number of single countries; some of those will have been presented and discussed at the workshop. In a few cases, those human capital accounts have been constructed using similar methodology; accordingly some country comparisons could be made.² However, the need for comparable multi-country human capital accounts is largely unmet.

B. A starting point for multi-country comparisons: OECD's Indicators of Education Systems and the Lisbon Council's European Human Capital Indexes

3. Two sets of multi-country indicators or indexes already exist. Both will be described during the workshop. Section C of this paper defines what is meant by an account versus an indicator or an index.

4. OECD's Education at a Glance annual publication covers 30 OECD countries and 6 partner countries, with data as recent as 2006.³ The document presents many types of indicators in more than 500 pages and about 150 tables: from indicators for educational attainment, types and relative levels of expenditures, relative earnings by educational attainment, study abroad, vocational programs, years in school, to indicators on the level of government at which decisions are made. It also provides a variety of information on inputs indicators such as class size and teachers' pay. Charts and tables typically are in bar graph form, or as an index with indicators presented relative to a base of 100. As the data collected by OECD apparently is in raw form, e.g., the actual

¹ Keeley (2007).

² Several published papers construct human capital accounts using methodology largely paralleling the Jorgenson-Fraumeni (1992a, 1992b) methodology for the United States. Those include Ahlroth, et al. 1997 (Sweden), Ervik, et al. 2003 (Norway), Le, et al. 2005 (New Zealand), and Wei 2008 (Australia).

³ See the most recent edition, Organisation for Economic Co-operation and Development (OECD) (2008), Education at a Glance 2008, OECD Indicators. The publication is part of OECD's Indicators of Education Systems (INES) program.

earnings levels by level of educational attainment, the pre-existing data set could be a huge resource for the construction of a human capital account.⁴

5. The Lisbon Council European Human Capital Index is a human capital input, or cost of creation, cost index which is constructed for the 13 European Union (EU) states and 12 Central and Eastern European states.⁵ The Human Capital Endowment measure is an input to two of the other three components of the overall European Human Capital Index. The measure sums up expenditures on formal education, and the opportunity cost of parental education, adult education, and learning on the job. Parental education includes, among other activities, teaching children to speak, be trustful, have empathy, and take responsibility. The Human Capital Utilization Index is the endowment measure divided by total population; the Human Capital Productivity Measure is Gross Domestic Product (GDP) divided by the endowment employed in the country. Finally the Demography and Employment measure estimates the number of people who will be employed in the year 2030 in each country by looking at economic, demographic, and migratory trends.⁶ To the extent that the raw data underlying the averages (e.g., the Human Capital Endowment of the average person) could be made available, constructing a human capital account would be greatly facilitated.⁷

C. An account versus an indicator or an index

6. This author conceives the proposed human capital account as having five essential elements, which, taken together, differentiates it from the existing human capital indicators or indexes described above.

- The account should have at least two out of three components – volumes, values and prices – where the third can be determined by any of the other two.
- The account should have a common numeraire, such as a base currency.
- The account should be related to a generally accepted macro measure, which is normally GDP, but could also be total population.
- The account should include both inputs and outputs.
- The account should form a complete system within the account itself and relative to both a nonmarket and a market (GDP) set of accounts.

A human capital account comprising the first three elements could likely be created in the medium term, while including the final two goals would take a longer period of time. Indicators and indices typically have some of those five elements, but not all.

7. Accounts in volumes, values, and prices allow comparisons across time; facilitate comparisons across countries, and within-country aggregation over human capital components; and, in conjunction with input and outputs, allow for productivity estimation.

⁴ September 26, 2008 email from Bo Hansson of OECD.

⁵ See Ederer (2006) and Ederer *et. al.* (2007). The 2006 paper states that the index was developed by the German think tank Deutschland Denken!. In addition, the paper is part of a research project undertaken by several individuals associated with the think tank, and with the institutional support of Zeppelin University.

⁶ Ederer (2006), p. 4 and 20.

⁷ It is understood that the data underlying the measures are publicly available from their original sources; however not having to re-collect the data could save a substantial amount of time and effort.

8. Having a common numeraire across countries also facilitates cross-country comparisons; improves estimations of the impact of immigration and emigration; and allows for aggregation across countries.

9. The author recommends use of GDP as the reference macro variable for two reasons. First, although per-capita calculations are helpful, they do not indicate the absolute size of human capital in a country. Two countries may have the same average human capital per person, but one of those countries may have twice as many citizens as the other, and thus a human capital twice as large. Most importantly, the use of GDP as the reference macro-variable allows for comparisons between the human capital account and the GDP accounts, and for the possible integration of the two accounts. In that sense, the author prefers that the human capital accounts are satellites to the GDP accounts.

10. Construction of both inputs and outputs allows for human capital accounts to be linked to GDP accounts, and ensures that production accounts are useful in productivity and other types of analysis. The author hopes that the volume of inputs can be measured independently of the volume of outputs.

11. A complete system of human capital accounts would provide a greater understanding of the impact of human capital by, for example, showing the sources of change in human capital. Since human capital plays a critical role both in market and nonmarket activities, having human capital accounts integrated into a complete set of accounts is certainly desirable.

D. Transition from indicators or indexes to a human capital account

12. The primary focus of this section is human capital investment and stock, rather than the inputs that create the investments. Constructing investment and stock is the proposed medium-term goal. As is true with nonhuman capital accounts, such construction requires volume and value investment and stock data, as well as depreciation and asset lifetime data. The decision on how to value human capital investment is important. Unlike most tangible nonhuman investment, human capital investment is not bought and sold in the market place.⁸ For the education component of human capital formation, the proposal is to begin with formal education, and to later expand the accounts to include informal and vocational education, training, and other formal education such as adult education.

13. The starting point for a human capital account is a demographic account: the total number of people – including immigrants and excluding emigrants; their ages and sex; their highest level of attained education; and their participation in the labor force. In the medium term it is unlikely that such information can be obtained by single year of age, or by single level of highest level of education attained. Education at a Glance categories are the most obvious medium-term choice.⁹ Because of the significant importance of education to human capital, the author proposes that information by single year, or single level, be the first extension of the demographic accounts for all individuals under the age of twenty-five. Forward-looking survival rates, similar to how asset lives are considered in tangible capital accounts, are needed to adjust human capital by lifetime expectancy. Emigration and immigration by the same categories listed above would allow for complete accounting for changes in population, education level, and labor force participation.

⁸ Humans sell and buy labor services, but that is not the same thing as buying and selling human capital.

⁹ The Education at a Glance categories for adults seem to follow the following pattern: 25 to 34, 35 to 44, 45 to 54, 55 to 64, and over 65 – with some exceptions that appear to relate to the use of other data such as data from the International Standard Classification of Education (ISCED).

14. Rounding out a quantity-based human capital account will require additional descriptive information.¹⁰ Such information includes enrollment by level of education categories, as well as at least some time-use data.

15. In the absence of actual data on enrollments by single year of age and by individual level of education, reasonable approximations could be made by using the age at which education typically begins to start the process of generating enrollments by single year of age and individual level of education. Divergences between actual and estimated would arise from students starting at different ages, repeating or skipping levels of education, dropping out, or pursuing (usually higher) education at a slower or faster pace than expected. The greatest uncertainty about the relationship between enrollment and highest level attained is when a student is enrolled in a tertiary program, particularly one that leads to the award of an advanced degree such as a doctorate.¹¹ Cases like that would probably require more detailed data.

16. Time-use data allow analysts to make choices regarding valuation of time, and also facilitate construction of inputs.¹² At a minimum, compilers need to know the amount of time spent working; attending school; sleeping, eating and other maintenance activities; or in leisure.

17. Valuation is the major challenge of constructing a human capital account. Once quantities and values exist, volumes can be constructed for a number of aggregates. Issues of quality adjustment, e.g., moving from quantities to volumes at a disaggregated level, potentially occur for both inputs and outputs.

18. Because it is time sold to an employer, the value of time at work is the value of an output. The perspective is a factor (or human capital) market perspective, rather than a product market perspective, where labor (or human capital) is an input, not an output. Valuing time spent at work is not difficult. The only choice is whether to use before- or after- labor tax market wages. Since the value of that time is included in the GDP market accounts, there is already a direct connection to the GDP accounts. That perspective – viewing the value of time as the value of an output – extends to the value of time spent in nonmarket activities.

19. Valuation of nonmarket time is more difficult. Nonmarket time can be separated into time spent in school and in doing homework; time spent in activities receiving a zero value such as sleep; time spent in educating, nurturing, or caring for others; time spent in health activities, including illness prevention; and time spent in other activities. The debate is about which time should receive a zero value. Although sleep, eating, and maintenance time is typically excluded, some analysts value leisure time; others do not. Time spent in other activities, which is typically valued in a household production account, includes time in such activities as cooking, washing, and cleaning. The remaining three general categories – time spent in school and in doing homework; time spent in educating, nurturing, or caring for others; and time spent in health activities, including illness prevention – mainly represents investment in human capital. All arguably have a consumption component. For example, students socialize with others in school, and individuals enjoy leisure activities with their children, and while engaged in health-improving exercise. By the same token, some of the other categories include activities that might be considered investment in human capital, such as cooking a meal or

¹⁰ In this paper the author uses System of National Account (SNA) terminology. An index of statistical terms can be found on the OECD web site (see OECD, undated). The term “quantity” refers to counts, such as the number of students. The difference between a quantity and a volume is that the latter is a quality-adjusted value enumerated in the numeraire of the base year. Sometimes quantities are used as proxies for volumes.

¹¹ The U.S. data on educational attainment and enrollment are inconsistent with each other. Some respondents apparently report that they have attained a higher level than actual. The educational attainment reported is not possible given enrollment data. The author calls that a “rose-colored glasses” effect.

¹² The author understands that OECD is undertaking the construction of education-related measures of time use.

sleeping, but which could also easily be labeled as human capital maintenance, rather than investment. In the medium term, it is best to avoid trying to make fine distinctions among time-use categories, although analysts should be aware of complicating elements.

20. The literature on household production describes alternative approaches that can be used to value time spent in other activities.¹³ The most commonly used methodologies to value that time use an input-cost approach, which includes a replacement-cost and an opportunity-cost approach. The term “replacement” refers to the fact that the value of the time input is determined by how much it would cost to replace that worker with a paid household worker. The choice is typically between using the cost of a generalist, e.g., someone who performs all of the household tasks, or specialists, e.g., a number of workers such as cooks and plumbers who are particularly skilled in performing individual tasks.¹⁴ The U.S. Committee on National Statistics’ Panel to Study the Design of Nonmarket Accounts, chaired by Katharine Abraham, recommended an unusual variation on the replacement approach: a productivity-adjusted replacement cost. Under that variation, the specialist cost is adjusted by the relative productivity of the individual undertaking the activity compared to a specialist.¹⁵ The difficulty lies in determining what that relative-productivity adjustment should be. With an opportunity-cost approach, the market cost of the individual who performs the unpaid household task is used to value that time.¹⁶ To represent the marginal value of time, a marginal wage is desirable, but because it is typically unknown, an average wage is usually used. All of the described evaluation methods require information on market wages.

21. The last possible approach to valuing time spent in other activities is to use an output-price approach, under which the good or service being produced by the time spent is valued at the price at which a similar good or service can be bought in the market. Because obtaining the data for implementing that approach is difficult, the author recommends using an input-cost approach in the medium term.

22. Alternative scenarios might be presented, as is done frequently with alternative valuation methods for time spent in other activities.¹⁷

23. In the medium term, the author recommends that time spent in health activities, including illness prevention, should be identified, but should be valued in the same way as other time is valued. Simply put: health accounts, which could quantify the value of time spent in those activities, are very difficult to construct. When sufficient research has been conducted into the subject of health-related activities as human capital formation, the author recommends a workshop be conducted on the topic.

24. Jorgenson and Fraumeni have developed an approach to valuing time spent in spent in formal schooling, which Jorgenson is summarizing at the beginning of the conference.¹⁸ The approach quantifies the impact of education on lifetime income to determine investment in education. The investment is made while an individual is in school; accordingly lifetime income is expected lifetime income, which results in very large

¹³ One description of alternatives is in the “Assigning Prices” section of Abraham and Mackie (2005), pp. 28-34.

¹⁴ The generalist approach is frequently called the housekeeper approach, as it assumes one person (a housekeeper) is hired to perform all tasks.

¹⁵ See equation 1.2, p. 31 of Abraham and Mackie [2005].

¹⁶ The unpaid household worker may not perform market work. That is not a problem as the opportunity cost wage is typically taken as the average wage paid to those who do market work who fall in the same demographic category.

¹⁷ See Fraumeni (2008) in Spanish. An earlier draft of the Spanish language version in English is also listed in the bibliography for 2008.

¹⁸ Jorgenson and Fraumeni (1992a, 1992b).

investment estimates. Some have criticized that approach, focusing on whether economic rent is being earned by educated individuals. Some alternative estimates might modify the basic Jorgenson and Fraumeni assumptions, producing smaller, although still sizeable, estimates of investment in education. The addition of homework time would simply increase the time input to the investment (as if individuals spent more time in school). The underlying methodology would be unchanged. Whether homework time should be included in the medium term depends upon the ease with which information on homework time can be compiled.

25. In the medium term, the Jorgenson-Fraumeni investment in education approach should be adopted to value time spent in formal education – in part because, as previously noted, several countries have already constructed similar human capital accounts. Inclusion of informal and other formal education, such as adult education, and training is a longer-term objective. Capturing the impact of market and nonmarket experience is desirable, but even data on accumulated market experience are limited.¹⁹ Although the author has a strong preference for including both nonmarket and market lifetime income, she acknowledges that some analysts have suggested including only the market component.²⁰ The panel and the workshop attendees should certainly debate, among other issues, a decision to include both – or market only – in the medium term

26. In the 1990s, Jorgenson and Fraumeni undertook a project to estimate investment in children beyond investment coming from births.²¹ Although the project was never completed, its methodology paralleled that for investment in education. At-birth investment in children is the expected lifetime income of a child at birth. Investment in children from time spent in educating, nurturing, or caring for them was estimated by examining the impact of having children on the expected lifetime income of their parents. (Although nonparents can invest in children, no attempt was made to include their time.) Information on the composition of households, and the income earned by adult members of the households was collected. The magnitude of the data collection effort was daunting. Extending that approach to time spent by individuals in educating, nurturing, or caring for others that are not their children would be even more difficult. Accordingly, the author does not recommend that investment in children, other than through births, be included in the human capital accounts in the medium term. She also recommends that time spent in educating, nurturing, or caring for other – similar to time spent in health activities, including illness prevention – be identified, but valued in the same way as other time is valued.²²

27. In market labor accounts for a number of countries, quality adjustment is a common feature. Market labor is not simply measured as the number of hours worked, or the number of full-time equivalent employees. Indexes aggregate over labor input categories, typically using wages, to create a quality-adjusted volume. When replacement cost or opportunity cost wages are used in indexes to create nonmarket volumes, the assumption is that the quality adjustment of the market applies to the nonmarket activities. That assumption is definitely debatable, and one that underlies the use of such wages to value nonmarket time. The suggestion in *Nature's Numbers* that a productivity-adjusted replacement cost be used highlights the issue, but the question is how to quantify the adjustment.²³ Folbre has considered that issue carefully in the context of her work on caring.²⁴

¹⁹ Market wage equations often use age as a proxy for years of market experience.

²⁰ Wei (2008) includes only the market component because of the difficulty of valuing nonmarket activities.

²¹ The birth only component or human capital investment is presented in Fraumeni (2000) p. 116.

²² Folbre (2008) values such time, but in a manner similar to how other time is valued.

²³ See Abraham and Mackie (2005).

²⁴ See Folbre (2008).

28. Changes in the human capital stock come from births, education, market and nonmarket hours, emigration and immigration, and deaths. To avoid double-counting between the investment in education and nonmarket hours components, nonmarket hours exclude hours spent in education. Human capital appreciates or depreciates depending upon changes in expected lifetime income for an individual over the course of his life. Death is equivalent to retirement of a nonhuman asset. Perhaps taking care of one's health, along with educating or caring for others, can one day be added to the list of sources of changes in the capital stock.

E. Longer term objectives

29. A number of references have already been made to the longer-term objectives of human capital accounts, which include constructing human capital inputs and more detailed nonmarket accounts, treating time spent in health activities and in educating, nurturing, or caring for others as human capital investment, and developing an expanded education component to better describe human capital formation.

30. For the analytical reasons already discussed, a set of human capital accounts should comprise both inputs and outputs. The inputs should include parents, teachers, schools, books and other educational materials, social capital, and the individuals themselves. Furthermore, just as is true for outputs, inputs should be adjusted to quality if at all possible. Performance assessment, such as OECD's Programme for International Student Assessment (PISA), and data from OECD's *Education at a Glance*'s chapter on parental perception related to school and science learning, frequently unavoidably mix teacher and overall school performance with students' abilities and effort. Nonetheless, just as on the output side, initial, even if imperfect, measures should be constructed.

31. Given the wide array of nonmarket activities that affect human capital formation, a full nonmarket account would be very useful as a companion to, or integral component of, a human capital account. While time-use accounts are central to a full nonmarket account, a human capital account partnered with a nonmarket account would still not likely measure human capital.

32. As has already been detailed, treating time spent in health activities, and in educating, nurturing, or caring for others, as human capital investment makes sense.

33. The list of education activities that affect human capital is much longer than formal, non-vocational education. Early childhood education; vocational education and training both on- and off-the job; adult education; and informal education all can influence human capital. Early childhood education occurs both in formal settings like schools and daycares, and in informal activities such as reading to children at home. While time-use accounts can record the time spent in such activities, it is difficult to have enough information to value them appropriately.

34. Two other longer-term objectives are worthy of note. The first of those is the influence of mobility – both between and within countries – on the value of human capital. Can workers move to where they are most needed? Can individuals fulfill their potential by moving to localities where there is access to education, or where human capital formation is feasible, even encouraged? Second, as previously noted, cross-country comparisons are facilitated by using GDP as the reference point. Making level comparisons, however, would require something like the purchasing power parities (PPP's) used in the Penn World Tables.²⁵ Because

²⁵ See http://pwt.econ.upenn.edu/cic_main.html for information on the Penn World Tables.

mobility measures and PPP's are topics beyond the expertise of the author, she makes no recommendations on that matter.

F. Conclusion

35. When decisions are made about the nature of the medium-term human capital accounts, other decisions will also be necessary. Those include how the work program should be organized and undertaken, as well as a timetable. The general organizational model used in the EU-KLEMS project seems attractive: a consortium of organizations worked with country statistical offices and other data suppliers to collect data that were molded into a consistent format by project leaders. OECD could be the project leader, perhaps working with an advisory group, or with a leadership team hired for the purpose.

36. A five-year timetable for completion of the medium-term construct seems reasonable. No timetable is being proposed for completion of the longer-term goals.

37. The construction of country-comparable human capital accounts is an important goal. As the foreword to the Keeley book states²⁶

“Economic success crucially depends upon human capital – the knowledge, skills, competencies and attributes that allow people to contribute to their personal and social well-being, as well as that of their countries.”

We should begin the process of quantifying that crucial factor without delay.

²⁶ Keeley (2007), p. 3

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