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Measuring Human Capital

Human Capital Satellite Account: An Example for Canada

Prepared by Task Force on Measuring Human Capital

Summary

The paper is an extract from the Guide on Measuring Human Capital. Using data from the Canadian National Accounts it introduces the set-up of a Human Capital Satellite Account as presented in chapter 6 of the Guide.

The Bureau of the Conference of European Statisticians reviewed the Guide in February 2016 and decided to send it for electronic consultation. The full text of the Guide is available at:

www.unece.org/index.php?id=40939#/

I. Introduction

1. Human capital can be defined as the knowledge, skills, competencies and attributes embodied in individuals that facilitate the creation of personal, social and economic well-being (OECD, 2001, chapter 1). It can be acquired through education and training and provides individuals with both economic and non-economic benefits. Currently, the entries in the System of National Accounts (SNA) that reflect human capital expenditures are treated as current expenses. They are consumption expenditures for households, governments and non-profit institutions serving households (NPISH); and current expenditures, be it intermediate consumption or compensation of employees, for corporations.

2. This chapter moves to treating expenditures on education and training as investments rather than current expenses. This requires changes to a number of accounts within the SNA, and there exist alternative methods for doing so. Here, a treatment is demonstrated through the use of a satellite account for human capital. This satellite account provides an example of how economic aggregates such as gross domestic product, investment, consumption, saving and national net worth will change when expenditures related to human capital result in output that is accumulated as part of investment rather than result in current consumption.

3. The human capital satellite account in this chapter goes beyond the current SNA by fully integrating human capital. A more moderate approach is the education and training satellite account presented in chapter 5. The education and training satellite accounts focuses on the output and inputs of education and training activities in the expanded supply and use tables of the SNA.

4. Using the structure of the SNA to integrate skills and knowledge as a form of capital, the satellite account presents additional information on the link between human capital and economic performance, while simultaneously retaining the core strengths of SNA estimates. The size of investment in human capital provides an assessment of the role of skills and knowledge acquired through education and training in economic and productivity growth. It can be compared with other types of investment such as investment in machinery and equipment, structures and research and development to provide an improved understanding of their relative importance for economic growth. Total capital stock estimates in the expanded balance sheet provide information on the evolution of national wealth and the sustainability of development in an economy.[1]

5. Empirical estimates in the human capital satellite accounts are based on human capital investments made in Canada that are recorded in the Canadian System of National Account (CSNA) or derived from the survey and administrative-data collection systems that form the source data for the CSNA. Throughout the chapter, the concepts employed are drawn from the SNA, but the data are based on the aggregates reported in the CSNA.

6. Consistent with the Guide on Measuring Human Capital (hereafter the Guide), this chapter focuses on formal education and formal training. These are the areas where the data provide robust estimates; but the analysis could be expanded to include other types of human capital investment such as the costs of child rearing, informal training, investment in health, and the addition and subtraction of human capital due to migration.

[1] The concept of expenditures on education being an investment and the existence of human capital as a form of wealth have been familiar in economics for at least 50 years (e.g., Schultz 1961; and Becker 1964). Goldin (2001) noted that the modern concept of the wealth of nations and the concept of capital embodied in people emerged in the early twentieth century.

7. Including investment in human capital in the SNA raises a number of challenges. Among the most pressing are where the asset is produced, 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 a reconciliation of alternative methods for estimating the human capital stock and investment.[2]

8. This chapter follows the Guide and structures the treatment of human capital through the sequence of accounts in the SNA. It follows the two methods in chapter 2 for integration, but also expands on the assumptions used and acknowledges that alternative treatments are possible. In some instances, such as the choice of a depreciation rate for human capital or the choice for a price deflator, the chapter provides an assessment of the issues and then proceeds to demonstrate the impact of a particular approach. Importantly, not all options or alternatives are fully elaborated. Rather, using those approaches that correspond most closely with the data sources available for the CSNA, the chapter demonstrates the effect of placing human capital into the sequence of accounts in the SNA based on the options presented in this Guide.

9. The remainder of the chapter is organized as follows. Section II. briefly outlines major approaches for estimating the value of human capital for inclusion in a human capital satellite account. A comprehensive discussion of the various approaches is presented in Chapters 3 and 4 of the Guide on measuring human capital. Section III. treats human capital as a produced asset and characterizes the production process for human capital. The choice among alternative views on the production of human capital turns out to be key for the development of a human capital satellite account. Section IV. presents the integration of human capital in the SNA when human capital is estimated using the cost-based approach. Section V. presents the integration and additional changes to the sequence of accounts when human capital is estimated using the income-based approach. It also indicates where the extra value of investment found under the income approach can be attached to particular variables. Compared to the cost approach, the income approach values do not correspond as closely with the concepts and recommendations of the SNA 2008, and are only presented in a more aggregated form. Sections VII. and VIII. present an experimental human capital satellite account for Canada. The estimates for Canada are suggestive of the magnitudes of the changes to the national accounts when education and training are treated as investments. Section VIII. concludes.

II. Measurement of Human Capital for a Satellite Account

10. To incorporate human capital into the SNA, the monetary value of human capital investment and human capital stock need to be estimated. This Guide recommends two approaches to do so. They are the cost-based approach (eg. Kendrick 1976) and the income-based approach (eg. Jorgenson and Fraumeni 1989, 1992a and 1992b)[3]. Kendrick (1976) estimated investment in human capital as total expenditures on education, training, health and child rearing. After applying the appropriate deflator, the cost-based approach produces an estimate of human capital investment in constant dollars which can be accumulated to derive a human capital stock using the perpetual inventory method. A major advantage in

[2] Chapters 2, 3 and 4 provided a comprehensive discussion of the issues associated with the measurement of human capital.

[3] Chapters 2 and 3 provide more detailed descriptions of these approaches.

using the cost of production approach is its ability to delineate what the investment streams are.[4]

11. In contrast, Jorgenson and Fraumeni (1989, 1992a and 1992b) adopt an income-based approach and estimate the investment in human capital using estimates for expected lifetime income.[5] Under this approach, assumptions about the progress of lifetime income are applied to the age and education characteristics of a population. [6]

12. In the income-based approach, the present discounted value of individual's lifetime income provides an estimate of human capital stock, and the gross increase in lifetime income from education and training provides an estimate of investment in education and training. The advantage of this approach is that it directly measures the concept that is being sought—the present discounted value of lifetime earnings from labour. However, in doing so, it is more difficult to delineate what sources of investment underlie the estimates. Some types of investments, such as schooling, can be more easily examined; however the effect of experience, on the job training or natural ability is not as readily identified.

13. Both cost-based and income based approaches are used to value assets in the SNA when market prices are unavailable. For example, the income-based approach is used to value sub-soil asserts while the cost-based approach is used to value R&D intangible assets in the SNA.

14. Previous studies found that the two approaches yield quite different estimates of human capital investment and stock (Gu and Wong for Canada, 2014, Jorgenson and Fraumeni for the U.S. 1989). The difference between the two approaches can be traced to the difference between the rate of return to education and the discount rate used in the income based approach, and to difficulties in separating the increase in compensation of employees from the effect of education as opposed to from the effect of training, physical capital, and technological progress (Abraham, 2010), or simply genetically inherited intelligence. The difference between the two estimates can also be partly attributed to costs not included in the cost-based estimates of education such as the costs of child rearing or in some cases the foregone earnings of students.

III. Human Capital as a Produced Asset

A. Measuring human capital, education and training

15. The human capital satellite account focuses on expenditures for formal education and formal training. Education and training can be paid for by all sectors of the economy with share for each sector varying across economies. Table 1 presents the types of

[4] The cost-based approach also has the appeal that it can be readily extended to additional potential sources of human capital, such as health and safety, labor mobility, and rearing children to working age. But those expenditures often include both consumption and investment components. It is a major challenge for the cost-based approach to determine the part of those expenditures that represents investment.

[5] Fraumeni, Christian and Samuels (2015) updated the estimates for the U.S. in Jorgenson and Fraumeni to more recent years.

[6] In addition to the cost- and income-based approaches for estimating human capital stock, the indicators approach is also commonly used (Chapter 3). The indicators of human capital investment that are derived from that approach -- school enrolment, adult literacy and the average years of schooling – are not estimates in monetary value and therefore cannot be integrated with the SNA.

expenditures on education and training that will be capitalized in a human capital satellite account.

16. The expenditures on formal education consist of direct costs and indirect costs. The direct costs of education include the wage and salaries of teachers, the consumption of fixed capital, intermediate consumption, and in cases of market producers, operating surplus of private schools. The indirect costs of education are an imputation for the time use of working age students.

17. The expenditures on formal job-related training include direct costs to the sectors providing instruction, plus the compensation of the workers during the periods when they are not producing. The direct costs include the wage and salary costs of in-house trainers and outside trainers, tuition reimbursements, materials and fixed capital inputs.

B. Placing human capital into the SNA 2008

18. The treatment of human capital investment through the sequence of accounts in the SNA requires assumptions about the production process of human capital. Following Chapter 2, there are two alternative views for the production of human capital that are considered here.

19. First, human capital can be viewed as output produced in the household sector. To produce human capital, the household sector uses intermediate inputs for the creation or production of human capital, either paid for by households or provided by the NPISHs, enterprises or government. Under this model, the relevant sectors create intermediate input for human capital by combining direct and indirect inputs. The intermediate input for human capital is recorded as an output which is used by households as an intermediate input in the human capital creation process. It is important to note that the output now labelled intermediate input for human capital is a combination of new outputs, such as own account training, and existing outputs that are re-classified, such as formal education. The inputs into the household production process also include student time and direct purchases of education services by households. This option is chosen in Liu (2015) to develop a human capital satellite account.

20. When investment in human capital is viewed as output produced in the household sector, the intermediate input for human capital from the sectors undertaking direct and indirect training and education is transferred to the household sector, with a concomitant recording of a current transfer in kind.

21. Second, human capital can be viewed as output produced in the sectors that undertake expenses for education and training[7]. Under this view, human capital creation is a diverse process that takes place in all resident sectors, and the model employed for valuing human capital investment assumes that sectors use their inputs to directly create human capital. Under this model, households combine student time with direct purchases of human capital items to form human capital in the household sector, while the relevant sectors making the expenses on education and training combine inputs based on their direct and

[7] Under one type of example, investment in education is viewed as the output produced in the education sector in the extended national accounts that are proposed by Jorgenson and Fraumeni (1989, 1992a and 1992b). The inputs to the education sector include labour costs for teachers and administrative staff, capital input, intermediate inputs, and foregone earnings of students. The output of the education sector is defined as the effect of education on the level of knowledge, skills, and competencies of students.

indirect expenses to produce human capital investments as an output of their respective sectors. When investment in human capital is viewed as the output produced in the sectors that undertake education and training, the human capital produced outside of the household sector is subsequently transferred to the household sector with a concomitant capital transfer in kind[8].

22. In both cases, the relevant expenditures, be it in the form of intermediate consumption or investments, the full recording of human capital in the proposed satellite account requires that the household sector controls and reaps primary economic benefits from human capital. Thus, human capital must be recorded in the household sector capital account to reflect the ownership of the asset. The fact that the human capital asset is found exclusively on the household balance sheet means that the charge for the consumption of fixed capital is also only found in the household sector accounts.

23. The choice between the two views on production of human capital does not affect gross saving, net saving or gross fixed capital formation at the national level. But it affects their measurement at the sector level. The impact on gross saving plus capital transfers, which is the entry against which gross fixed capital formation is compared when calculating net lending, is the same for both types of transfer. As a result, differences occur in gross and net disposable income levels, net saving levels, net saving rates and gross saving rates due to the type of production model assumed and the type of transfer employed.

IV. Human Capital Satellite Account: Cost-based Approach

24. This section presents two structures for a human capital satellite account when human capital is estimated using the cost-based approach. The human capital satellite account includes an expansion of the current accounts, the capital account and the wealth account to include human capital investment or human capital stock as explicit entries. The current accounts include the production account, the distribution of income account and the use of income account. The capital account records the net accumulation of non-financial assets and liabilities. The current and capital accounts produce main aggregates such as GDP, national income, gross saving and gross fixed capital formation that are used to evaluate economic performance. These accounts are produced for five major sectors: households, non-profit institutions serving households, corporations, general governments, and the rest of the world.

25. To assess the effect of treating education and training as investment, this section first summarizes the changes to current and capital accounts at the national level. These changes are shown in column 4 of Tables 3 and 4. Subsequently, the changes to current and capital accounts for domestic sectors are discussed. Transactions with non-residents, as recorded in the rest of the world accounts, are not considered. Throughout the discussion, changes to flows and stocks are presented.

A. Current and Capital Accounts at the National Level

26. When expenditures on human capital are treated as investment, it will increase the overall level of GDP and national income by the imputed labour compensation of students

[8] The capital transfer would be assumed to be a form of a grant whereby funds are allocated to households for the explicit purpose of knowledge creation.

plus the costs of training in the corporate sector[9]. It will change the composition of GDP (Colum 5, Table 2). Gross fixed capital formation increases by the sum of education costs and training costs, while consumption decreases by the value of education consumption for the government, NPISH and households sectors from their reclassification to investment.

27. The expanded current and capital accounts also change the composition of national income. Mixed income increases by the imputed labour compensation of students, while gross operating surplus increases by the costs of training in the business sector.

28. To understand these overall changes to GDP and national income, it is useful to look at various types of human capital investments separately, how they are treated in the current SNA and how this recording needs to be modified when they are treated as investment. Those various types of human capital expenditures include the direct costs of education, the indirect costs of education, the costs of training in the non-market sectors (government and NPISHs), and the costs of training in the corporate sector.

29. The non-market output of education by the government and NPISH sectors and education expenditures of households are included in the SNA as final consumption expenditures. These will be treated as capital formation in a human capital satellite account. This will not affect gross domestic product and but will change the structure of GDP from consumption to capital formation. It has no effect on national income or the composition of national income.

30. The indirect cost of education represents foregone earnings for working-age students and it measures what would have been earned if the students were not attending school (Becker 1964). In contrast to the output from the direct costs of education which are included as current consumption in the SNA, indirect costs of education are not included in the SNA, and the output they generate adds to GDP. GDP and gross investment both increase by the amount equal to the imputed foregone labour compensation of working age students. National income and mixed income increases by the same amount, while there is no change to gross operating surplus.

31. The adjustments related to training expenditures in a human capital satellite account differ between the corporate sectors and the non-market sectors. This is a result of the difference in the measurement of output in the current SNA. In the current SNA, output of the corporate sectors is measured by the market value of goods and services produced, while the output of the non-market sectors is measured by the costs of inputs that are used to produce output. The additional training output in a human capital satellite account is valued at costs for both sectors.

32. In a human capital satellite account, direct costs (purchases as well as costs for in-house training staff) plus the compensation of workers on training in the corporate sector are combined to produce a newly recognized training output. As these training costs are currently attributed to the costs of non-training output, the recognition of these costs as production costs for a separate training output raises the operating surplus for the non–training output. As a result, value added will increase by the costs of training in the corporate sector.

33. For the non-market sectors, the value of input costs is used to measure the value of output. As the value of input costs does not change, the overall value of output in the non-market sectors does not change in a human capital satellite account. The recognition of training as a separate output results in these costs no longer contributing to the value of

[9] Some of the training may actually be provided by unincorporated enterprises. For ease of exposition, in the remainder of this chapter, only the corporate sector will be referred to.

other outputs for these sectors and thus the other outputs fall in value by an amount equal to the increase in training output, as a consequence of which there will be no change to GDP because of the capitalization of training expenditures in the non-market sectors.

34. There is no imputed rental income for human capital stock in the human capital satellite account proposed in this Guide. The compensation of employees represents the return on human capital employed in the current SNA. This treatment is not consistent with the current SNA, where the return on capital typically ends up in gross operating surplus and mixed income, typically broken down into net operating surplus and consumption of fixed capital[10]. In this case, the compensation of employees is gross of the consumption of human capital.

35. To be consistent with the treatment of gross operating surplus and mixed income, the compensation of employees in a human capital satellite account can now be divided into net compensation of employees and consumption of human capital. For compensation of employees, consumption of human capital is deducted from gross national income to arrive at net national income estimates. The consumption of human capital represents that portion of gross income which must be invested to maintain its productive capacity.

B. Current and Capital Accounts at the Sector Level – Household production

36. The changes to sector accounts differ between the two options for presenting human capital production. Table 2 summarizes the changes to the sector accounts when human capital is assumed to be produced in the household sector. Table 3 summarizes the changes to the sector accounts when human capital is assumed to be produced in the sectors paying the relevant expenses.

37. When human capital is viewed as output of the household sector (Table 2), the education and training output financed by the corporate and non-market sectors are transferred to the household sector as part of intermediate consumption, with a concomitant current transfer in kind. These inputs are combined with other direct purchases of education and training goods and services by households as well as student time to produce human capital in the household sector. The imputation for student time is recorded as household output and results in an increase in mixed income in the household sector.

38. The output of the corporate sector is increased by the value of human capital, which is the sum of all costs of training in the sector. This value is added to the gross output and gross operating surplus of the corporate sector. The output of education currently recorded as final consumption in the government and NPISH sectors is moved from non-market to market output while training output is recognized as a separate output of these sectors based on costs.

39. As result of these changes, disposable income in the household sector increases by the value of additional output generated in the household sector with the creation of human capital.

40. The disposable income of the government and NPISH sectors decrease by the expenditures on education and training that are transferred to the household sector via current transfers. The disposable income of corporations is not affected as the current transfers in kind are compensated by an increase in income from the treatment of training expenditures as a separate output.

[10] The inconsistency has been noted by Kendrick (1976).

41. Final consumption in the use of income account must also be adjusted. Consumption in the household sector decreases by the amount of personal direct education expenditures that are reclassified as intermediate input for human capital. Final consumption in the government and NPISHs sectors decreases by their expenditures on education that are transferred to the household sector.

42. Gross saving and gross fixed capital formation are also affected. Gross saving in the household sector rises by total investment in human capital, which is now recorded as a household output. Gross fixed capital formation in the household capital account increases by the same amount. As gross saving in the household sector increases by the value of total human capital investment, the net lending/net borrowing balancing item does not change. There are no changes to the capital accounts in the other sectors.

43. Lastly, treating expenditures on education and training as investment has a significant effect on wealth as shown in the national balance sheet. The balance sheet records the stock of assets (financial and non-financial) and liabilities at the end of a period as a result of saving and borrowing, investment and lending, revaluations and other changes in the volume (e.g. discovery of natural resources) of assets. Net worth is the balancing item that equals the difference between assets and liabilities. Balance sheets are presented for the major sectors of the economy (general government, NPISH, household, corporations,), for the economy as a whole as well as for the rest of the world.

44. On the national balance sheet, a new entry for human capital is included in the household sector. This raises household wealth and household net worth by the value of human capital, with an identical adjustment at the national level. All other sectors are unaffected.

C. Current and Capital Accounts at the Sector Level – Human capital production in all sectors

45. Under the view that human capital is produced in the sectors paying the expenses for education and training activities, the satellite account in this chapter follows the conceptual framework presented in Chapter 2, and assumes that a capital transfer in kind is used as the counterpart transaction for the subsequent allocation of human capital to the household sector. Table 3 summarizes the changes to the sector accounts under this alternative.[11]

46. Human capital is assumed to be created directly in the sectors undertaking education and training expenses. In this case, the change in the value of output (now defined as human capital) for the corporate and non-market sectors is the same as in the previous option and the changes to value added and gross operating surplus increases as before. However, as human capital formation is assumed to occur within the sectors undertaking the expenses, the gross saving of these sectors must increase by the value of outputs of the human capital investment.

47. This additional saving is then used to support the capital transfers to the household sector and the resulting increase to GFCF that is recorded in the household capital account.

48. Under this approach, the changes to the household sector in the production account are less dramatic as the only changes come from the addition of imputed labour compensation for student time and the redefinition of final household consumption of

[11] In this paper, the focus is on corporation and government expenditures. An extension could include human capital transfers due to migration. This is not done here, but would only necessitate that an additional asset be included in the capital transfers already shown in the non-resident sector account.

education from consumption to intermediate consumption used to produce human capital. However, there are dramatic changes to the use of income account. Of particular importance is the dis-association that occurs between the disposable income and the savings used to invest in human capital and the charge for the consumption of human capital. The former remains with those sectors that undertake expenditures while the latter is deducted from compensation of employees.

49. The treatment for how to adjust the national balance sheet is identical to the previous example as the two approaches lead to the same value of human capital investment being booked in the household sector.

V. Human Capital Satellite Account: Income-based Approach

50. This section outlines the changes to the human capital satellite account when human capital is estimated using the income-based approach. The gross flow of investment under the income-based approach is larger than that from the cost-based approach, and the difference between the two approaches represents the extra value of human capital investment that will be added into the satellite account over and above that already discussed.

51. As was noted in earlier chapters, the income-based investment estimates may include a number of household input flows, such as parent time, that are not included in the flows recognized under the cost based approach. Equally, it is possible that the values for flows based on the summation of costs, such as education, may under-estimate the value of the output. This would occur if, for example, governments provided the services at less than market cost. Consequently, it is not clear how to allocate the additional value across sectors at this time.

52. Therefore, the framework for integrating the income-based human capital estimates into the satellite account only adds the additional value of investment from the income approach to aggregate variables, and it makes the strong assumption that all extra investment is a form of mixed income because there is insufficient information at present to allocate the difference to certain activities performed by households themselves (thus ending up in mixed income) or to gross operating surplus.

53. When the extra value of human capital investment is included, estimates of income and expenditure in the current and capital accounts increase to reflect the extra value of human capital investment derived from the income-based human capital estimate. The extra value of human capital investment in education and training is added to investment from the cost-based approach, which raises GDP, national income and mixed income when integrated into the SNA framework. Gross saving and gross fixed capital formation also rise by the same amount. The consumption of fixed capital will also increase to reflect the higher levels of human capital stock.

54. Total wealth and national net worth in the national balance sheet increase by an additional amount that is equal to the difference between human capital stock estimated from the income-based and cost-based approaches. As noted above, the stock of human capital from the income approach provides an all-inclusive measure that includes the accumulation of human capital stock from education and training as well as increasing experience, birth, migration, health and other types of activities that may affect the income from labour of individuals. It is a direct measure of the value of human capital in the production process.

VI. Integration of the Cost-based Estimate of Human Capital in the CSNA

55. This section presents estimates of investment in education and training in Canada and illustrates the effect of treating education and training expenses as investments on gross domestic product, national income, saving, investment and total wealth. The section focuses on the estimates of human capital investment and capital stock based on the cost-based approach. The effects of the income-based estimates will be presented in the next section. The section starts with the current prices' estimates of investment in human capital. Those estimates are then deflated to obtain investment in constant prices, which are accumulated to derive capital stock estimates. The capital stock estimates are subsequently re-inflated to present current price estimates for the human capital stock.

56. In a human capital satellite account, the changes will be made to the accounts for all sectors that include corporate, government, household and NPISH sectors. However, the example of human capital satellite account in this section will exclude the NPISH sector as the costs of education and training are not readily available for the NPISH sector in Canada.

A. Human Capital Investment

57. The integration of human capital in the SNA starts with the estimate of human capital expenditures of various types of expenditures, including direct and indirect costs of education and training by sectors.

58. The indirect costs of education represent the foregone earning of students. It is estimated by the number of hours that a student spends in school in a year times the hourly labour compensation of employees of the same age, education, and gender. The hours that a student spends in school is obtained from the Survey of Labor and Income Dynamics.[12] A distinction is made between part time and full time students. On average, a full time student spends about 1000 hours a year in the school, while a part time student spends about 230 hours in the school. The number of hours in the school also differs by the type of school attended.[13]

59. The direct costs of formal education include household expenditures on education and government consumption expenditures on education. Those direct expenditures are reported in the final demand tables of the supply/use tables of CSNA.

60. The indirect costs of training are estimated from the Adult Education and Training Survey. The indirect costs of training per worker are estimated as average hours spent on training times the average hourly labour compensation per employee, whereas the average hours spent on training per employee are estimated as the participation rate in job related training for an employee times average duration for the training in a year. The incidence and duration of adults' participation in job-related formal training are estimated from the Adult Training and Education Survey (Statistics Canada, 2007). In 2008, the participation rate for job-related training is 0.357 for a worker and the average duration of training is 49

[12] Statistics Canada IMDB 3889.

[13] Assuming that a student spends 40 weeks in a year, 5 days a week, and 5 hours a day in a school, the total hours the student attends a school is 1000 hours a year

hours. The indirect costs of training in terms of foregone earnings for 2008 are estimated to be 500 dollars per worker.[14]

61. The direct costs of training are not available from the Adult Education and Training Survey. The empirical evidence shows that the direct costs tend to be higher than the indirect costs. For example, O'Mahony (2012) found that the direct costs of training are about 30% higher than the indirect costs of training in the EU countries. For the U.K. the ratio of direct costs to indirect costs is close to 2. For Canada, the Conference Board of Canada finds that the direct costs of training are about 811 dollars per worker for 2008, which is 63% higher than the indirect costs (500 dollars) (Conference Board of Canada, 2012). This ratio is used to estimate direct costs of training. The average direct and indirect costs of training per worker are multiplied by the number of workers to derive total indirect costs of formal training for the corporate and non-corporate sectors.[15]

62. The estimates for this chapter do not take into account the difference in training participation and average duration of training across different types of employees (education, age and industry). The training participation and the average duration of training by type of employee can be obtained from the Adult Training Survey and those data can be used to derive more accurate estimates of training costs.

63. The current price value of investment in education and training must be decomposed into a price component and a volume component when investment is included in the national accounts. A natural choice of the price deflator for human capital investment is hourly labour compensation, adjusted to take into account the changes in the composition of hours worked towards more educated and more experienced workers. This composition-adjusted hourly labour compensation assumes that the average hourly labour compensation changes due to the shifts toward more educated workers and more experienced workers is counted as a change in the volume of human capital investment.

64. The composition-adjusted hourly labour compensation assumes that there are no differences in the quality of human capital within a type of employee. To account for the within-type changes in human capital quality, a hedonic method has been proposed and used in previous studies (Schreyer 2010, Diewert, 2011, Gu and Wong 2014 and Fraumeni et al. 2008). To the extent that education expenditures reflect improvements in education quality as measured by changes in class size, the number of experienced teachers, and the outcomes of education (test scores), they should be counted as increases in the volume of human capital investment rather than as increases in the price of human capital investment.

65. The deflator for human capital can be also estimated indirectly as the nominal values of human capital investment and stock divided by the direct volume output measure of human capital investment and capital stock, whereas the direct volume output measure of human capital investment and capital stock is estimated as the number of individuals(students and workers) weighted across different types of individuals (e.g. education level experiences) using as weights based on nominal investment or nominal capital stock for those various types (Schreyer 2012).

66. The consumer price index is an alternative which has been employed in the previous empirical studies (Wei, 2004). The choice of CPI for the price deflator of human capital investment assumes that real hourly compensation (nominal labour compensation deflated

[14] The indirect costs of training per worker in 2008 equal the participation rate of training (0.359) times the average duration of training (49 hours) and average labour compensation per hour for employed workers (28 dollars per hour).

[15] It is assumed that the indirect cost of training per worker is same between paid workers and self-employed workers.

by the CPI) represents increases in the volume of human capital. The idea that the increase in real earnings represents the increase in the quantity of human capital can be found in Shultz (1961) and is used in empirical studies on the estimation of the human capital accumulation from education and experience based on the Mincerian wage equation.

67. Human capital stocks are derived by accumulating investment net of depreciation. Empirical studies often assume that human capital follows a geometric depreciation pattern, and the depreciation rate for training investment tends to be higher than the depreciation rates of education investment. For example, Corrado et al. (2009) assume a 40% depreciation rate for job-related training, as a part of their measure of intangible capital for the United States, while O'Mahony (2012) assumes the depreciation rate of training capital is 25% for her measurement of training capital for European countries. The Investment in Intangible Asset Survey launched by the Office of National Statistics in the UK provides the expected service life of investment in six categories of intangible assets: employer funded training, software, research and development (R&D), reputation and branding, design, and corporation process improvement. The survey finds 2.7 years of service life for training, reputation and branding, which implies a high depreciation rate for that capital (Awano et al., 2010). In the case of Canada, estimates from Gu and Wong (2010) show that the depreciation rate for human capital from the income-based approach is about 3%, which is lower than the depreciation rates assumed for the cost-based approach.

68. Research also finds that the depreciation for education is lower than the depreciation for training. The depreciation rate estimates for education investment from Groot (1998) range from 4% for the United States to 11-17 % for EU countries. Similarly, Mincer and Polachek (1974) and Heckman (1976) estimated the depreciation rates for human capital to be between 0.2 to 4.7%.

69. Tables 5 and 6 present the total costs of education and training in Canada for the years 1981, 1990, 2000, 2010. The earnings foregone represents a significant portion of the costs of education and its importance increased over time with the share of students enrolled in post-secondary education as earning opportunities increased over time. For the period 1981 to 2010, the share of foregone earnings in total costs of education increased from 25% to 65%. [16]

70. The current price value of investment in education and training must be decomposed into a price component and a volume component when investment is included in the national accounts. As discussed in Chapter 3, alternative choices exist. For this chapter, the CPI is used to deflate investment in education and training. It is assumed that human capital has a geometric depreciation pattern where the depreciation rate for training capital is 25% and the depreciation rate for education is 4%.[17]

B. National Accounts with Human Capital Investment

71. Table 6 presents the economic accounts at the national level when costs of education and training are treated as investment. The capitalization of expenditures on education and training has a significant effect on the level of national income and gross domestic product which now includes the imputed labour compensation of students and the costs of training

[16] The investment in education in Canada was similar to that in EU countries but investment in training in Canada is lower than that in EU countries. O'Mahony (2012) found that the ratio of investment in education to GDP was 5% in EU countries for the period 2003-2007 and the ratio of investment in training to GDP was about 1.6% in EU countries.

[17] This corresponds to about 40 years of average working life of an individual with double declining balance rate.

in the corporate sector. National income increases by 201.6 billion dollars which is 12.4% over the official estimate in 2010. The increase in national income is a result of 95.2% increase in mixed income and 3.8% increase in gross operating surplus. GDP increases by the same amount, 201.6 billion dollars, which represents a 12.1% over the official estimate in 2010.

72. The capitalization of education and training expenditures also significantly changes the composition of GDP. Gross fixed capital formation is 76% higher than the official estimate in 2010 once it is expanded to include investment in education and training. Final consumption declines by 7.2% as a result of the reclassification from final consumption to investment of household expenditures on education and government expenditures on education and training.

C. Sector Accounts and Total Wealth with Human Capital Investment

73. The effects of capitalizing expenditures on education and training on income, consumption, gross saving by sectors are shown in Tables 7, 8 and 9. It is important to note that the household current account in Table 7 is presented on a gross basis. If it is presented on net basis, the consumption of human capital would have to be deducted from the estimates of gross household income and gross household saving to arrive at the estimates of net household income and net household saving.

74. In the household sector accounts, the adjusted disposable income for the household sector is 283.1 billion dollars, or 28.2%, higher than the official estimate in 2010. This comes from the addition of the own-account production of human capital (minus the previous of household direct expenditures which have been reclassified to intermediate consumption). This is equivalent to the imputed labour compensation plus the transfers of education and training output from other sectors to the household sector.

75. Final consumption declines by 13.0 billion dollars, or 1.4%, in 2010 for the household sector as household direct expenditures on education are re-classified to investment. Gross saving and gross fixed capital formation increased by 296.0 billion dollars, which is the total cost-based expenditures on education and training derived for this chapter. As a result, gross saving in the household sector more than quadruples while gross fixed capital formation in the household sector more than triples in 2010.

76. Table 8 presents the corporate sector account. It shows an increase in corporate primary income from the additional output related to the expenditures on training and an equal increase in current transfers of expenditures on training to the household sector. The net effect is that there are no changes to disposable income, gross fixed capital formation and gross saving in the corporate sector.

77. Table 9 presents the sector account for the government sector. It shows a decline in government disposable income and government consumption by an amount that is equal to government expenditures in education and training as they are transferred to the household sector. There are no changes to gross fixed capital formation and gross saving in the government sector.

78. Table 10 presents estimates for total wealth that include the human capital stock. Across capital types, the human capital stock is about 50% of the non-human capital stock in 2010. The ratio of human capital stock to non-human capital increased from about 40% to 50% for the period 1990 to 2010.

VII. Integration of the Income-based Estimate of Human Capital in the CSNA

79. This section presents the estimates of human capital investment and stock for Canada using the income-based approach and examines the impact of including those estimates in the Canadian System of National Accounts. When human capital investment and stock are estimated using the income-based approach, including human capital investment in the CSNA is found to have a large and significant impact on gross domestic product, gross investment, saving and total wealth.

80. The estimates of human capital investment and the human capital stock are obtained from Gu and Wong (2010, 2014). Gu and Wong (2010) estimated the human capital stock for the Canadian working-age population. The estimate provides an estimate of human capital stock that results from all activities that increase the future earnings of individuals. Those investment activities include education, training, net migration, rearing of children and investment in health.

81. Gu and Wong (2010) subsequently decomposed the change in the aggregate human capital stock of the working age population into investment in human capital, depreciation and revaluation of human capital. Investment in human capital in a period is the sum of the changes in lifetime incomes because of education, initial lifetime incomes for the individuals who reached working age and immigration to Canada. Depreciation of human capital is the sum of changes in lifetime labour compensation because of aging for all individuals who remain in the working age population and lifetime labour compensation of all individuals who die or emigrate. Revaluation of human capital is the sum of changes in lifetime labour compensation from period to period for individuals with a given set of demographic characteristics—gender, education and age.

82. The human capital stock estimates are often restricted to the stock of the working age population. However, to construct an estimate of human capital investment from education that includes primary, secondary and post-secondary education, human capital stock estimates should be constructed for the entire population. Gu and Wong (2014) therefore extended the human capital stock of the working age population in Gu and Wong (2010) to include individuals aged 6 to 14, and estimated the investment in education as the changes in the lifetime labour compensation arising from all levels of education.

83. Table 11 presents the changes to GDP and gross investment when the income-based estimate of investment in education and training is included in the national accounts. In that table, investment in education and training estimated using the income-based approach is compared to investment in education and training estimated using the cost-based approach.

84. Investment in education as measured by the increase in the lifetime labour compensation due to education is much larger than the costs of education. In 2005, gross investment in education is 469.9 billion dollars when estimated using the income-based approach, while gross investment in education is 186.6 billion dollars when estimated using the cost-based approach. The difference between the two is the "rental income" from investing in human capital.

85. GDP is adjusted to include expenditures on training in the corporate sector, imputed labour compensation of students and rental income from human capital. The adjusted nominal GDP estimate is about 30% higher than the official GDP estimate in the current CSNA.

86. Gross investment in education and training when education investment is estimated using the income-based approach is about 1.5 times the investment in non-human capital in

2005. Including investment in human capital in the CSNA almost doubled total investment in Canada in 2005.

87. As stated before, the total non-financial wealth is adjusted to include human capital. Gu and Wong (2010) finds that the human capital stock of the working age population is about 16,189 billion dollars in 2007. For that year, non-human capital stock is 5,526 billion dollars. Human capital stock is thus three times the non-human capital stock in 2007. The ratio of human capital stock to non-human capital declined from 1990 to 2007. Total human capital stock was about four times the non-human capital stock in 1990.

VIII. Conclusion

88. This chapter presented a human capital satellite account that integrates monetary measures of human capital investment into the structure of the System of National Accounts (SNA). It describes the series of adjustments that must be made throughout the SNA when expenditures on education and training are treated as investment.

89. The chapter explores the effect of measuring human capital on the SNA using the income- and cost-based approaches. The income-based approach is employed in empirical studies of human capital, and produces a larger estimate for the human capital investment than that implied by the cost-based estimate. When the income-based approach is used to estimate human capital, the scope of the income and expenditure sides of the GDP accounts have to be broadened to account for the difference between the income and cost estimates of human capital investment.

90. When the cost-based approach is used to estimate human capital, the capitalization of expenditures on education and training is shown to have a significant effect on gross domestic product, national income, gross investment, saving and total wealth. In 2010, GDP would increase by 10% and capital formation by 76%, while total final consumption would decline by 7%.

91. The effect is much larger when the income-based approach is used as a result of the difference between income-based and cost-estimates of education investment. In 2005, GDP would increase by 30%, and capital formation by 150%, while final consumption of households, NPISH and government would decrease by 7%.

92. The chapter has focused on formal education and training. These are areas where the data provide robust estimates, but the analysis can be expanded to include other types of investment that include the costs of child rearing, informal training, investment in health, and the addition and subtraction of human capital due to migration.

93. This chapter shows that it feasible to construct human capital satellite accounts. However, there are a number of challenges that statistical agencies must overcome for the construction of such a satellite account. Among the most pressing 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 a reconciliation of alternative methods for estimating the human capital stock and investment. Accurate estimates of total costs of education and training are often lacking and represent an additional challenge.

Annex : Tables

Table 1
Costs of education and training

	Costs of education			Costs of training
Sectors	Direct	Indirect	Total	Total
Market sector/corporations	...	...	…	OJT^C
Non-market sector		...		
Governments	E^G (D)	...	…	OJT^G
NPISH	E^N (D)	…	…	OJT^N
Households	E^H (D)	E^H(I)	E^H	…*

***** The training cost of unincorporated businesses have been included with corporations, above.

Where
E^G (D):Government direct education expenditures
E^N (D):NPISH direct education expenditures
E^H (D):Household direct education expenditures
E^H (I): Household indirect education expenditures
E^H: Total Household education expenditures
OJT^C: Total job related training cost – corporations
OJT^G: Total job related training cost – governments
OJT^N: Total job related training cost – NPISH
HC: Human capital investment
VHI: Extra value of human capital from the income-based approach
$MHC^{C:}$ Intermediate inputs for human capital produced in the corporate sector
$MHC^{N:}$ Intermediate inputs for human capital produced in the NPHISH sector
$MHC^{G:}$ Intermediate inputs for human capital produced in the government sector

Table 2
Changes to sector accounts when human capital is produced in the household sector

Items	Households	NPISHs	Corpora-tions	Govern-ment	Total Economy	Additional changes from Income approach
Production account						
Resources						
Output	*+HC (= MHCN +MHCC +MHCG +EH(D) +EH(I))*		+MHC^C (=OJT^C)		+ MHC^C + HC	+VHI
--Market outputs		+MHC^N (= OJT^G +E^N(D))		+MHC^G (= OJT^G +E^G(D))		
--Non-market outputs		-OJT^N -E^N(D)		-OJT^G -E^G(D)		
Uses						
Intermediate Consumption	+E^H(D) +MHC^N +MHC^C +MHC^G				+E^H(D)+MHC^N +MHC^C +MHC^G	
Value-added/GDP	+E^H(I)		+MHC^C (=OJT^C)		+MHC^C (=OJT^C) +E^H(I)	+VHI
Generation of income account						
Resources						
Value-added	+E^H(I)		+MHC^C (=OJT^C)		+ MHC^C +E^H(I)	+VHI
Uses						
Compensation of employees						
Gross mixed income	+E^H(I)				+E^H(I)	+VHI
Gross operating surplus			+MHC^C (=OJT^C)		+MHC^C (=OJT^C)	
Redistribution of income account						
Resources						
Gross mixed income	+E^H(I)				+E^H(I)	VHI
Gross operating surplus			+ MHC^C		+ MHC^C	+
Current transfer receivable	+MHC^N +MHC^C +MHC^G				+MHC^N +MHC^C +MHC^G	
Uses						
Current transfer payable		+MHC^N	+MHC^C	+MHC^G	+MHC^N +MHC^C +MHC^G	

Disposable income, gross	+MHC^{N}+MHC^{C} +MHC^{G} +E^{H}(I)	-MHC^{N}		-MHC^{G}	+ MHC^{C} +E^{H}(I)	+VHI
Consumption of fixed capital	-CFC^{HC}					
Disposable income, net	+MHC^{N} +MHC^{C} +MHC^{G} +E^{H}(I) -CFC^{HC}	-MHC^{N}	-MHC^{C}	-MHC^{G}	+MHC^{C} +E^{H}(I) -CFC^{HC}	+VHI
Use of income account						
Resources						
Disposable income, gross	+MHC^{N} +MHC^{C} +MHC^{G} +E^{H}(I)	-MHC^{N}	-MHC^{C}	-MHC^{G}	+ MHC^{C} +E^{H}(I)	+VHI
Uses						
Final Consumption	- E^{H}(D)	-OJT^{N} -E^{N}(D)		-OJT^{G} -E^{N}(D)	-OJT^{N} -OJT^{G} -E(D)	
Gross saving	+ E^{H} (D) +MHC^{N} +MHC^{C} +MHC^{G} +E^{H}(I)				+ E^{H} (D) +MHC^{N} +MHC^{C} +MHC^{G} +E^{H}(I)	+VHI
Consumption of fixed capital	-CFC^{HC}					
Net saving	+ E^{H} (D) +MHC^{N} +MHC^{C} +MHC^{G} +E^{H}(I) -CFC^{HC}				+ E^{H} (D) +MHC^{N} +MHC^{C} +MHC^{G} +E^{H}(I) -CFC^{HC}	+VHI
Capital account						
Resources						
Gross saving	+ E^{H} (D) +MHC^{N} +MHC^{C} +MHC^{G} + E^{H}(I)				+ E^{H} (D) +MHC^{N} +MHC^{C} +MHC^{G} +E^{H}(I)	+VHI
Capital transfers						
Uses						
Gross fixed capital formation	+HC =+ E^{H} (D) +MHC^{N} +MHC^{C} +MHC^{G} + E^{H}(I)				+HC =+ E^{H} (D) +MHC^{N} +MHC^{C} +MHC^{G} + E^{H}(I)	+VHI
Net lending/net borrowing						

Table 3
Changes to sector accounts when human capital is produced in the sectors undertaking education and TR and a capital transfer mechanism is used

Items	Households	NPISHs	Corpora-tions	Govern-ment	Total Economy	Additional changes from Income approach
Production account						
Resources						
Output	$+HC^H$ ($=E^H(D)$ $+E^H(I)$)		$+HC^C$ ($=OJT^C$)		$+ HC^C$ $+E^H(I)$	+VHI
--Market outputs		$+MHC^N$ ($= OJT^N$ $+E^N(D)$)		$+MHC^G$ ($= OJT^G$ $+E^G(D)$)		
--Non-market outputs		$-OJT^N$ $-E^N(D)$		$-OJT^G$ $-E^G(D)$		
Uses						
Intermediate consumption	$+E^H(D)$				$+E^H(D)$	
Value-added/GDP	$+E^H(I)$		$+ HC^C =$ OJT^C		$+ HC^C$ $+E^H(I)$	+VHI
Generation of income account						
Resources						
Value-added	$+E^H(I)$		$+ HC^C =$ OJT^C		$+ HC^C$ $+E^H(I)$	+VHI
Uses						
Gross mixed income	$+E^H(I)$				$+E^H(I)$	
Gross operating surplus			$+ HC^C =$ OJT^C		$+ HC^C$	+VHI
Redistribution of income account						
Resources						
Gross mixed income	$+E^H(I)$				$+E^H(I)$	
Gross operating surplus			$+ HC^C =$ OJT^C		$+ HC^C$	+VHI
Current transfer						
Uses						
Current transfer						
Disposable income, gross	$+E^H(I)$		$+ HC^C =$ OJT^C		$+ HC^C$ $+E^H(I)$	+VHI
Consumption of fixed capital	$-CFC^{HC}$					
Disposable income, net	$+E^H(I)$ $-CFC^{HC}$		$+ HC^C =$ OJT^C		$+ HC^C$ $+E^H(I)$	+VHI

			$-CFC^{HC}$		$-CFC^{HC}$	
Use of income account						
Resources						
Disposable income, gross	$+E^{H}(I)$		$+HC^{C}$		$+ HC^{C}$ $+E^{H}(I)$	+VHI
Uses						
Final Consumption	$- E^{H} (D)$	$-E^{N}(D)$ $- OJT^{N}$		$-E^{G}(D)$ $- OJT^{G}$	$-E(D) - OJT^{N}-$ OJT^{G}	
Gross saving	$+HC^{H}$ $(=E^{H}(D)$ $+E^{H}(I))$	$+HC^{N}$ $(=OJT^{N}$ $+E^{N}(D))$	$+HC^{C}$ $(=OJT^{C})$	$+HC^{G}$ $(=OJT^{G}$ $+E^{G}(D))$	$+HC^{H}$ $+ HC^{N}$ $+ HC^{C}$ $+ HC^{G}$	+VHI
Consumption of fixed capital	$-CFC^{HC}$					
Net saving	$+HC^{H}$ $(=E^{H}(D)$ $+E^{H}(I))$ $-CFC^{HC}$	$+HC^{N}$ $(=OJT^{N}$ $+E^{N}(D))$	$+HC^{C}$ $(=OJT^{C})$	$+HC^{G}$ $(=OJT^{G}$ $+E^{G}(D))$	$+HC^{H}$ $+ HC^{N}$ $+ HC^{C}$ $+ HC^{G}$ $-CFC^{HC}$	+VHI
Capital account						
Resources						
Gross saving	$+HC^{H}$ $(=E^{H}(D)$ $+E^{H}(I))$	$+HC^{N}$ $(=OJT^{N}$ $+E^{N}(D))$	$+HC^{C}$ $(=OJT^{C})$	$+HC^{G}$ $(=OJT^{G}$ $+E^{G}(D))$	$+HC^{H}$ $+ HC^{N}$ $+ HC^{C}$ $+ HC^{G}$	+VHI
Capital transfers						
-Payable		$+HC^{N}$	$+HC^{CI-}$	$+HC^{N}$	$+HC^{N}$ $+HC^{C}$ $+HC^{G}$	
-Receivable	$+HC^{N}$ $+HC^{C}$ $+HC^{G}$				$+HC^{N}$ $+HC^{C}$ $+HC^{G}$	
Uses						
Gross fixed capital formation	$+HC=+ E^{H} (D)$ $+MHC^{N}$ $+MHC^{C}$ $+MHC^{G}$ $+ E^{H}(I)$				$+HC=$ $E^{H} (D)$ $+MHC^{N}$ $+MHC^{C}$ $+MHC^{G}$ $+ E^{H}(I)$	+VHI
Net lending/net borrowing						

Table 4
Costs of education and training in billions of current dollars

	1981	1990	2000	2010
Total costs of education and training	35.5	81.4	123.5	296.0
Total costs of education	29.9	70.7	107.7	272.2
Direct costs by households	1.5	3.6	7.6	13.0
Direct costs by governments	20.4	37.8	46.7	75.2
Earnings foregone	8.0	29.3	53.4	184.0
Total costs of training	5.7	10.7	15.8	23.8
by business sector	4.2	7.9	12.1	17.6
by governments	1.5	2.8	3.7	6.3

Table 5
Costs of education and training as percent of GDP

	1981	1990	2000	2010
Total costs of education and training	9.7	11.8	11.2	17.8
Total costs of education	8.1	10.2	9.8	16.4
Direct costs by households	0.4	0.5	0.7	0.8
Direct costs by governments	5.6	5.5	4.3	4.5
Earnings foregone	2.2	4.2	4.9	11.1
Total costs of training	1.5	1.5	1.4	1.4
by the business sector	1.1	1.1	1.1	1.1
by governments	0.4	0.4	0.3	0.4

Table 6
Economic accounts of Canada in 2010, billions of current dollars

	Official	Adjusted	Abs. change	% change
Generation of income account				
Resources				
Value-added	1,662.8	1,864.4	201.6	12.1
Uses				
Compensation of employees	839.4	839.4		
Gross operating surplus	460.7	478.3	17.6	3.8
Gross mixed income	193.4	377.4	184.0	95.2
Taxes less subsidies on production	170.4	170.4		
Statistical discrepancy	-1.1	-1.1		
Redistribution of income account				
Resources				
National income, gross	1,630.5	1,832.1	201.6	12.4
Uses				
Net current transfer to non-residents	3.3	3.3		
National disposable income, gross	1,627.2	1,828.8	201.6	12.4
Use of income account				
Resources				
National disposable income, gross	1,627.2	1,828.8	201.6	12.4
Uses				
Consumption	1,305.1	1,210.7	-94.4	-7.2
Gross saving	322.1	618.1	296.0	91.9
Capital account				
Resources				
Gross saving	322.1	618.1	296.0	91.9
Plus: national net capital transfers	-0.1	-0.1		
Uses				
Capital formation, gross	388.1	684.1	296.0	76.3
Net lending/net borrowing	-65.0	-65.0		

Note: A blank in the cells represents no changes when human capital is included in the SNA. Value added/gross domestic product differs from gross national income a result of net receivable from abroad in compensation of employees and property income, which can be shown in the primary distribution of income account.

Table 7
Household sector account in 2010, billions of current dollars

	Official	Adjusted	Abs. change	% change
Redistribution of income account				
Resources				
Household primary income, gross	1,125.4	1,309.4	184.0	16.4
Current transfer	167.8	266.9	99.0	59.0
Uses				
Current transfer	289.2	289.2		
Household disposable income, gross	1,004.0	1,287.1	283.1	28.2
Use of income account				
Resources				
Household disposable income	1,004.0	1,287.1	283.1	28.2
Uses				
Consumption	915.3	902.3	-13.0	-1.4
Gross saving	88.8	384.8	296.0	333.5
Capital account				
Resources				
Gross saving	88.8	384.8	296.0	333.5
Capital transfer	-2.0	-2.0		
Uses				
Capital formation, gross	134.5	430.5	296.0	220.1
Net lending/net borrowing	-47.7	-47.7		

Note: A blank in the cells represents no changes when human capital is included in the SNA.

Table 8
Corporate sector account in 2010, billions of current dollars

	Official	Adjusted	Abs. change	% change
Redistribution of income account				
Resources				
Corporate primary income, gross	290.2	307.8	17.6	6.1
Current transfer	0.6	0.6		
Uses				
Current transfer	58.4	76.0	17.6	30.1
Corporate disposable income, gross	232.4	232.4		
Use of income account				
Resources				
Corporate disposable income	232.4	232.4		
Uses				
Consumption				
Gross saving	232.4	232.4		
Capital account				
Resources				
Gross saving	232.4	232.4		
Capital transfer	3.8	3.8		
Uses				
Capital formation, gross	172.9	172.9		
Net lending/net borrowing	63.3	63.3		

Note: A blank in the cells represents no changes when human capital is included in the SNA.

Table 9
Government sector account in 2010, billions of current dollars

	Official	Adjusted	Abs. change	% change
Redistribution of income account				
Resources				
Government primary income, gross	213.5	213.5		
Current transfer	335.8	335.8		
Uses				
Current transfer	183.2	264.7	81.5	44.5
Government disposable income, gross	366.1	284.7	-81.5	-22.2
Use of income account				
Resources				
Government disposable income	366.1	284.7	-81.5	-22.2
Uses				
Consumption	366.3	284.9	-81.5	-22.2
Gross saving	-0.2	-0.2		
Capital account				
Resources				
Gross saving	-0.2	-0.2		
Capital transfer	-3.3	-3.3		
Uses				
Capital formation, gross	78.5	78.5		
Net lending/net borrowing	-81.9	-81.9		

Note: A blank in the cells represents no changes when human capital is included in the SNA.

Table 10
Total wealth in Canada, (billions of current dollars)

	1990	2000	2010
Total capital stock	3,081	4,849	9,336
Non-human capital stock	2,251	3,351	6,358
Residential structures	560	861	1,746
Non-residential structures	596	775	1,364
Machinery and equipment	180	272	312
Intellectual property products	49	93	191
Consumer durables	222	333	489
Inventories	142	187	232
Weapons systems	5	5	7
Land	497	825	2,017
Human capital stock	830	1,498	2,977
Addendum			
Ratio of human to nonhuman capital stock	0.37	0.45	0.47

Table 11
Income-based estimate of investment in education and training and changes to GDP in Canada

	1981	1990	2000	2005
Estimates in billions of current dollars				
Investment in human capital, income-based estimate	248.2	451.6	438.4	489.7
Investment in human capital, cost-based estimate	35.5	81.4	106.2	206.4
GOS/mixed income for human capital investment	212.6	370.2	332.2	283.3
Official GDP	366.6	690.8	1,001.8	1,410.7
GDP adjusted for cost estimate of investment in human capital	378.7	727.9	1,052.6	1,542.5
GDP adjusted for income estimate of investment in human capital				
Estimates as a ratio of official GDP				
GDP adjusted for cost estimate of investment in human capital	1.03	1.05	1.05	1.09
GDP adjusted for income estimate of investment in human capital	1.61	1.59	1.38	1.29
Income estimate of investment in human capital	0.68	0.65	0.44	0.35
Cost estimate of investment in human capital	0.10	0.12	0.11	0.15