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Measuring material well-being within the System of National Accounts

Jorrit Zwijnenburg (OECD)

Paper prepared for the IARIW-Bank of Korea Conference

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Session 1: New Perspectives on Measuring Well-being from National Accountants

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[1] The views expressed in this paper are those of the author, and should not be considered as representing the official views of the OECD or of its member countries.

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Abstract

The past years have seen an increased interest in the measurement of well-being. This has led to several initiatives to develop indicators in addition to GDP, to provide more insight in how households are faring. The paper provides an overview of the most relevant developments that have been undertaken within the field of national accounts. It presents the recently developed OECD's Household Economic Well-being Dashboard, followed by an overview of the ongoing work to breakdown the household sector into more detailed household groups, fully aligned to the system of national accounts. Furthermore, the paper discusses satellite accounts that address the measurement of well-being and sustainability more broadly, such as a satellite account on unpaid household activities, education and training, human capital, and environmental-economic accounting. For all these initiatives, the paper briefly discusses the methodology, presents some (experimental) results, and focuses on remaining challenges. It can be concluded that these initiatives are important steps forward in better capturing household well-being, and that more work is still needed to further develop guidance and improve the methodology to arrive at consistent and comparable datasets for a larger range of countries.

Keywords: Households, Well-being, National Accounts, Satellite Accounts

1. Introduction

1. The past years have seen an increased interest in the measurement of well-being, also in the field of economic statistics. It is well acknowledged that GDP only provides partial insight in economic performance and that additional statistical information is needed to have a more comprehensive overview of social progress and economic well-being. This was well pointed out by the Commission on the Measurement of Economic Performance and Social Progress[3] (also known as the Stiglitz, Sen and Fitoussi commission, hereinafter referred to as the Stiglitz-report) which formulated twelve recommendations in order to better capture current well-being as well as the sustainability of well-being[4]. Whereas some of these recommendations specifically address subjective quality-of-life indicators (such as the evaluation of happiness and satisfaction) which may be captured in the domain of social statistics, several address objective indicators that can be derived from economic statistics, amongst others from the System of National Accounts. In that regard, this paper presents the most relevant developments that have been undertaken in the area of national accounts to better address well-being.

2. First, the paper discusses the OECD household dashboard that has been developed and launched in 2016 to put more emphasis on the household sector, in line with recommendation 2 of the Stiglitz-report. The primary goal of this dashboard is to provide an overview of changes in material well-being of households, using graphical representations of various indicators, like GDP, household disposable income, consumer confidence, household saving, and unemployment. Such a joint analysis of indicators leads to a better overview of how households are faring, also in line with recommendation 1 (to look at income and consumption rather than production in evaluating material well-being) and recommendation 3 (to consider income and consumption jointly with wealth) of the Stiglitz-report.

3. Subsequently, the paper discusses the ongoing work on developing methodology to derive breakdowns of household income, consumption and savings into household groups, in line with national accounts totals on the basis of micro data sources. This relates to recommendation 4 of the Stiglitz-report to "give more prominence to the distribution of income, consumption and wealth" and also addresses one of the recommendations that have been formulated as part of the so-called G-20 Data Gaps Initiative[5]. The paper discusses the methodology and main challenges in compiling these distributional results and also presents some of the experimental results for a selection of countries.

4. Whereas these first two projects make use of data that are already available in the System of National Accounts, the remainder of the paper focuses on initiatives that further extend the boundaries of this system, by means of satellite accounts, to address the measurement of well-being

[3] This Commission was launched in February 2008 by the president of the French Republic, Sarkozy, "to identify the limits of GDP as an indicator of economic performance and social progress, including the problems with its measurement; to consider what additional information might be required for the production of more relevant indicators of social progress; to assess the feasibility of alternative measurement tools, and to discuss how to present the statistical information in an appropriate way" (Stiglitz et al, 2009).

[4] An overview of the recommendations is presented in Annex 1.

[5] The Data Gaps Initiative has been set up in 2009 by the G-20 countries as a response to the global financial crisis. The aim is to further improve the availability and comparability of economic and financial statistics to support policy makers in better assessing the evolution of the economy and monitoring the related risks and possible spill-over effects. Recommendation II.9 targets the development of distributional information regarding the household sector.

and sustainability more broadly. First, the paper discusses the measurement of unpaid household activities, in line with recommendation 5 of the Stiglitz-report. Mainly, but not exclusively, for pragmatic reasons these are currently not included in the central framework of the SNA, but the inclusion of these unpaid activities may provide very relevant information, especially in times of changing labour participation rates. Subsequently, the paper describes the development of satellite accounts related to the measurement of human capital and on the interaction between the economy and the environment. These address important aspects related to the quality of life, as mentioned in recommendation 6 (on measuring current well-being), recommendation 11 (on measuring sustainability of well-being) and recommendation 12 (on the environmental aspects of this sustainability) of the Stiglitz-report, that are currently not well incorporated in the SNA or not presented at a sufficient level of detail to fully capture all aspects of well-being and its sustainability. In addition to explaining the setup of the satellite accounts, the paper presents some results and discusses some of the challenges in further developing these accounts.

5. The paper is structured as follows. Section 2 presents the work on the household dashboard, after which the work on the compilation of distributional results in line with national accounts totals is discussed in section 3. The development of satellite accounts is the subject of section 4. It starts with the work on developing measures of unpaid household activities, followed by a satellite account on human capital, and finishes with a description of the System of Environmental-Economic Accounting. The paper ends with some conclusions in section 5.

2. OECD's Household Economic Well-being Dashboard

6. Gross Domestic Product (GDP) usually gets a lot of attention as a measure of economic growth in a country. However, it does not necessarily reflect the development of the well-being of households, which may be affected by several other factors. Therefore, the OECD has developed a dashboard of indicators on households' economic well-being, including graphical visualisations. A lot of these indicators are directly available from the System of National Accounts and provide specific insight in how households are faring. These data are supplemented with a number of indicators outside the national accounts, such as the unemployment rate and consumer confidence, to obtain a more comprehensive overview.

7. In the household dashboard, that can be accessed online via the following link: http://www.oecd.org/std/na/household-dashboard.htm, a user can focus on specific aspects of well-being and select specific countries he/she wants to analyse or compare. It consists of four blocks, each presenting indicators that relate to a specific aspect of well-being: income, consumption, wealth and employment. The four blocks are explained below.

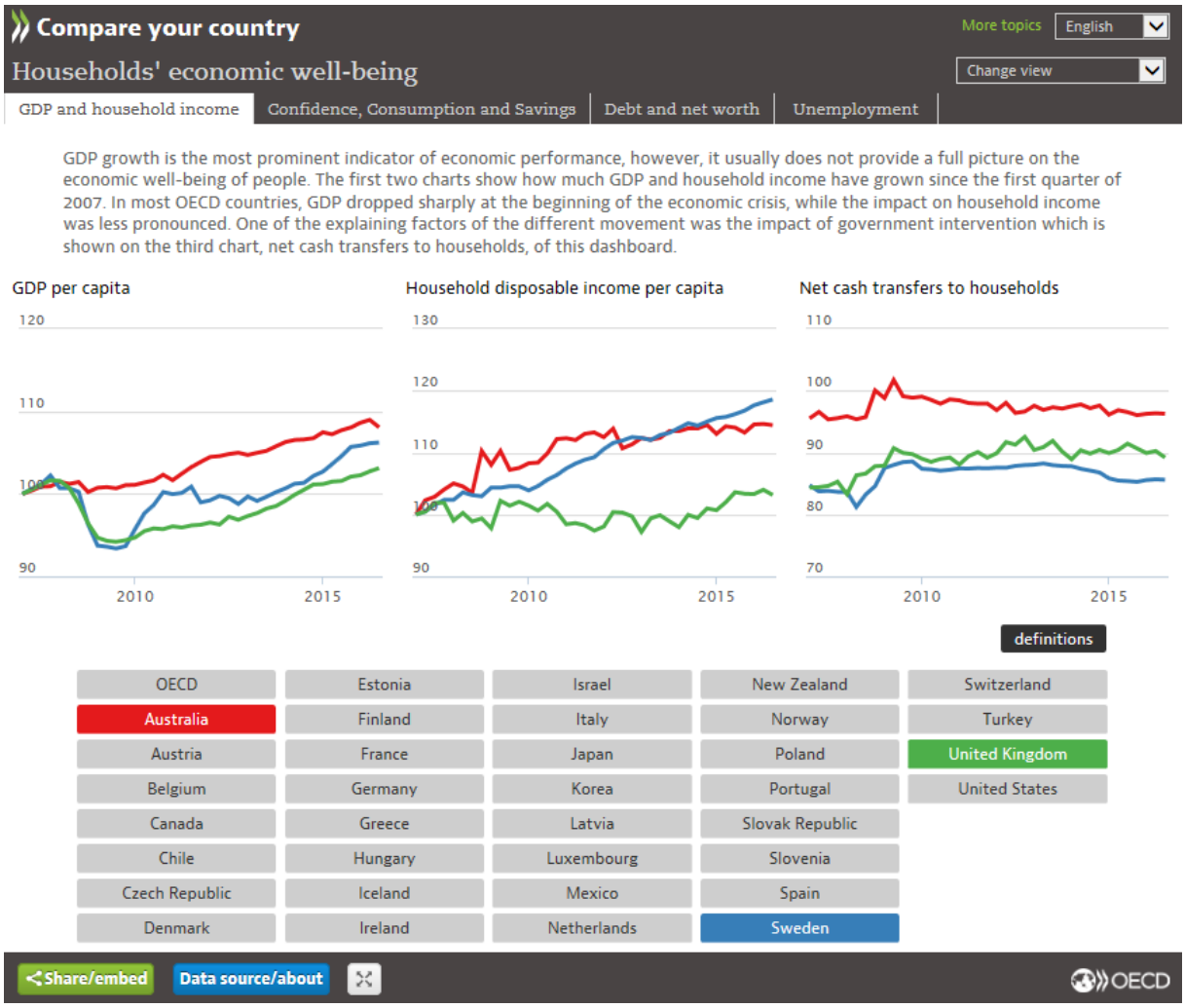
GDP and household income

8. The first block of the household dashboard provides information on *GDP and household income*. It presents the development of household disposable income (HDI) per capita in relation to GDP (both presented as an index) and net cash transfers to households (as percentage of primary income). By presenting GDP and HDI in conjunction it can be observed where trends may differ. As one of the main drivers for differences between the developments of the two is the amount of net current transfers received by households (see also box 1), the latter item is also presented in this first block. Net transfers are the results of incoming transfers such as unemployment and pension benefits, and outgoing transfers such as taxes and social contributions. These lead to a redistribution

of income and may be used in economic downturns to lower the potential impact of such downturns on household income.

9. Figure 1 provides an overview of the first block of the household dashboard with a selection of three countries, i.e. Australia, Sweden and the United Kingdom. The first two graphs show that GDP and HDI may indeed show different patterns. Especially for Sweden and the United Kingdom, that both suffered from an economic downturn in the period 2008-2009, the patterns of both indicators are quite different. This can largely be attributed to the impact of net receipts of cash transfers, which for both countries show a sharp increase in the period of the crisis, as presented in the third graph. Partly due to the impact of the increase in net cash transfers to households, household income in Sweden grew faster than in Australia over the period 2007-2016, whereas GDP growth in Australia was clearly outpacing growth in Sweden. The graphs also show that the pattern of household income in Australia turned out to be much more erratic than that of GDP which can be directly linked to the development of net cash transfers received by households.

Figure 1: Example of the first block of the household dashboard: GDP and Household Income.



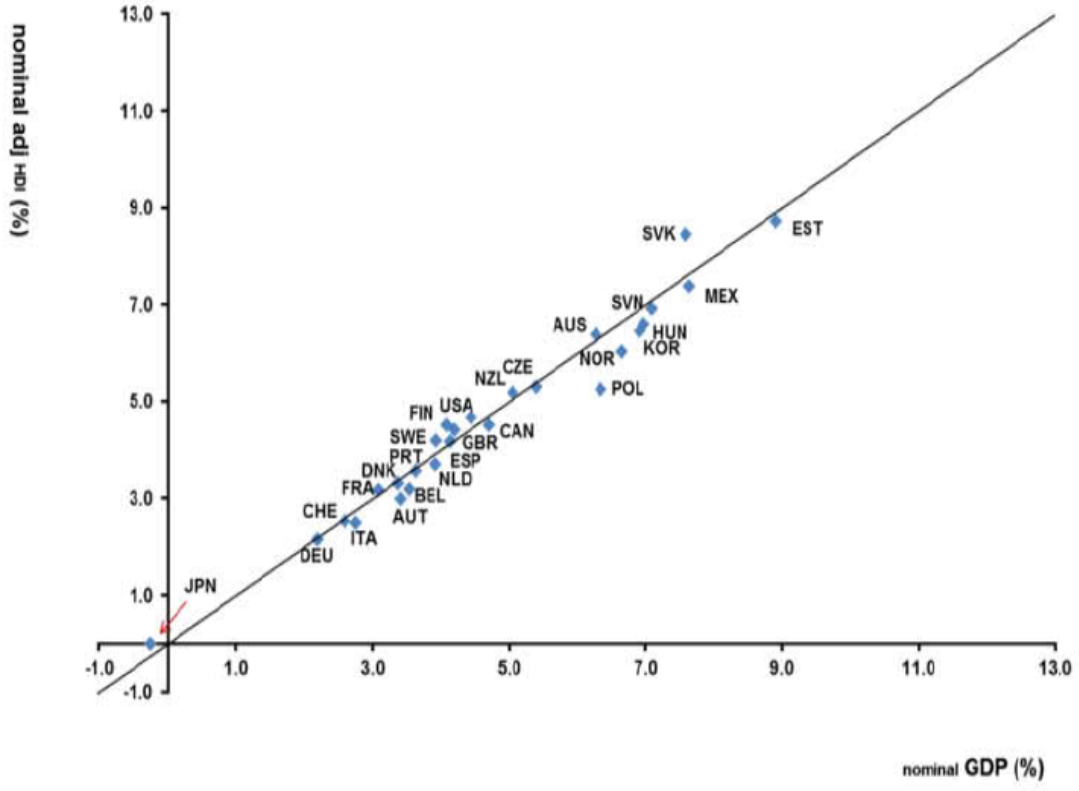
Source: OECD Household dashboard.

Box 1: Drivers of differences between GDP and household adjusted disposable income

GDP measures the value added in a country, created via the production of goods and services. Households are part of this process as suppliers of labour and capital, on the basis of which they receive income. However, as they are not the only suppliers to the production process, their income does not necessarily develop in line with GDP. Furthermore, income is usually subject to redistribution via taxation and social contributions and benefits (both in cash and in kind), which may also give rise to changes in (adjusted) disposable income[6] of households that diverge from changes in GDP. Diverging price changes for GDP and final consumption may additionally lead to differences in real growth of GDP and real growth of household (adjusted) disposable income.

A recent OECD study (see Ribarsky et al, 2015) showed that the gap between GDP growth and growth in household adjusted disposable income may be significant. Figure 2 presents differences in average annual growth rates between nominal household adjusted disposable income and nominal GDP over the period 1996-2013 for a selection of 27 countries. Although the deviations may seem small, one has to realise that a difference of 0.5%-point per year (which for example is the case for Australia) leads to an excess of growth of about 15%-points over a period of 17 years as covered in the study. Furthermore, within short periods of time, the differences may be much more substantial.

Figure 2: Nominal GDP and nominal household adjusted disposable income (average annual growth rate of 1996-2013).



Data are based on 1996-2013 with the following exceptions: 1996-2012 for Switzerland; 2000-2012 for New Zealand; 2000-2013 for Hungary, Spain, and the United Kingdom; Estonia and Poland 2001-2013; and 2004-2013 for Mexico. Japanese and Norwegian data are based on 93 SNA /ESA 95.

Source: Ribarsky et al, 2015.

Over the period as a whole, real GDP grew at a faster pace than real adjusted disposable income in a

[6] Household adjusted disposable income is equal to their disposable income plus the amount of social transfers in kind received.

majority of the countries. The study explains that one of the main drivers for differences in real growth rates is the differences in prices faced by producers and consumers. If the aggregate price that producers face develops in a different way than the aggregate price of consumer goods and services, this may already explain a large part of the difference in growth rates. Other important drivers are the change in the share of households' value added in total value added, and changes in the share of value added that flows to capital in contrast to labour. If the share of value added of households decreases, this means that a smaller part is directly earned via unincorporated enterprises (and imputed rents related to owner-occupied housing) of households, whereas the part that is allocated to value added of other sectors (i.e. corporations and government), of which households will only receive a share, will increase. Furthermore, if the share of this latter component that is allocated to capital is increasing at the expense of the labour share (i.e. compensation of employees), this will also lead to adjusted disposable income falling behind GDP growth, assuming that the labour share accrues entirely to households whereas the capital share can accrue to other sectors as well.

The study explains that differences between GDP growth and growth of adjusted disposable income may also be due to changing shares of wealth owned by households, leading to a different share of property income flowing to households, and changes in the amount of net current transfers received by households. The latter relates to government intervention which appears to be particularly important in times of crises when the government can soften the impact of a recession via changing taxation and increasing social benefits. Over longer time periods the impact of net transfers is usually more modest, but the study shows that it is still positively correlated with gaps between adjusted disposable income and GDP.

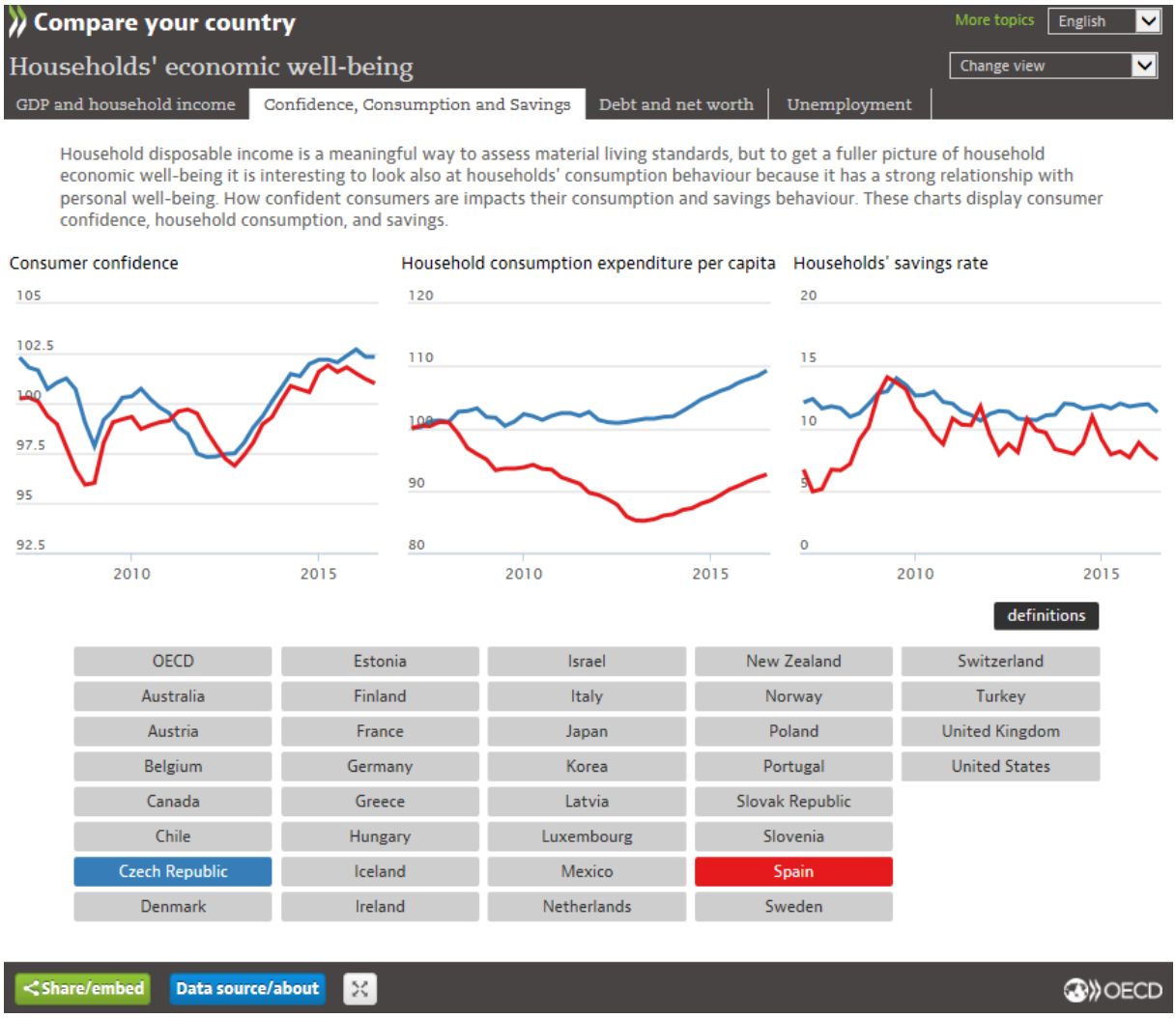
Confidence, consumption and savings

10. The second block of the dashboard focuses on *confidence, consumption and savings*. It presents consumer confidence as an index (in relation to its long term average), household consumption expenditure per capita, and the household savings rate as percentage of household disposable income[7]. These three indicators are strongly related and, together with changes in household disposable income (as presented in the first block of the dashboard), explain patterns in consumption behaviour. As consumption directly affects material living conditions, this provides another layer of personal well-being. As people tend to smooth consumption over their lifetime, consumption is sometimes regarded as a better indicator of well-being than income.

11. Figure 3 provides an overview of the second block focusing on two countries, i.e. the Czech Republic and Spain. The graphs show that in both countries consumer confidence has dropped in the period 2007 to the end of 2012 (with a short period in the middle where consumer confidence showed a slight revival). For both countries this coincides with an increase in their savings ratio that peeked in the second and third quarter of 2009. Whereas for the Czech Republic this peek was only moderate and the savings ratio returned to its earlier levels quite fast, in Spain the increase was much sharper and the trend also remained at a higher level, to only decrease gradually over time. Looking at the consumption expenditure per capita over time, it generally follows the same pattern as household income in both countries, although for Spain the consumption expenditure dropped faster in the period 2007Q2 to 2009Q2 as a result of an increasing share of income that went into savings. After 2012, both countries experienced an increase in consumer confidence which coincided with an increase in consumption expenditure. For Spain this was combined with a slowly decreasing savings ratio.

[7] Household savings include the adjustment for the change in pension entitlements.

Figure 3: Example of the second block of the household dashboard: Confidence, consumption and savings.



Source: OECD Household dashboard.

Debt and net worth

12. The third block describes *debt and net worth*. It presents results on households' indebtedness and financial net worth as percentage of household disposable income[8]. The indebtedness ratio focuses on the liabilities of the household sector in which a growing ratio may point to increasing financial vulnerability. However, as households also accrue assets an increasing debt does not necessarily lead to unsustainability of their finances. If their liabilities are mirrored by similar amounts of assets, their financial position may be more or less balanced. That is why the second indicator focuses on households' financial net worth, which looks at the balance between financial assets and liabilities. Obviously, it would be preferable to also include non-financial assets (e.g., dwellings) and to arrive at a measure of net worth, instead of net financial worth, but the current data availability does not yet allow for a presentation of this indicator for a sufficient number of countries.

13. Figure 4 presents results on the two indicators for Belgium, France and Poland. The graphs show that in 2016 Belgium and France have household indebtedness ratios that are close to 105

[8] On the basis of a four-quarter rolling sum.

percent of household disposable income. However, it turns out that Belgian households possess on average a relatively larger amount of assets than French households, as a consequence of which the net financial worth for Belgium is far higher than the French one. The graphs also show that a low indebtedness does not necessarily mean that these countries rank highest in financial net worth measures. Out of the three countries, Poland records the lowest indebtedness ratios but also the lowest net financial worth as percentage of household disposable income, implying that next to their relatively low amount of liabilities, they also possess relatively low amounts of assets.

Figure 4: Example of the third block of the household dashboard: Debt and Net worth.

Source: OECD Household dashboard.

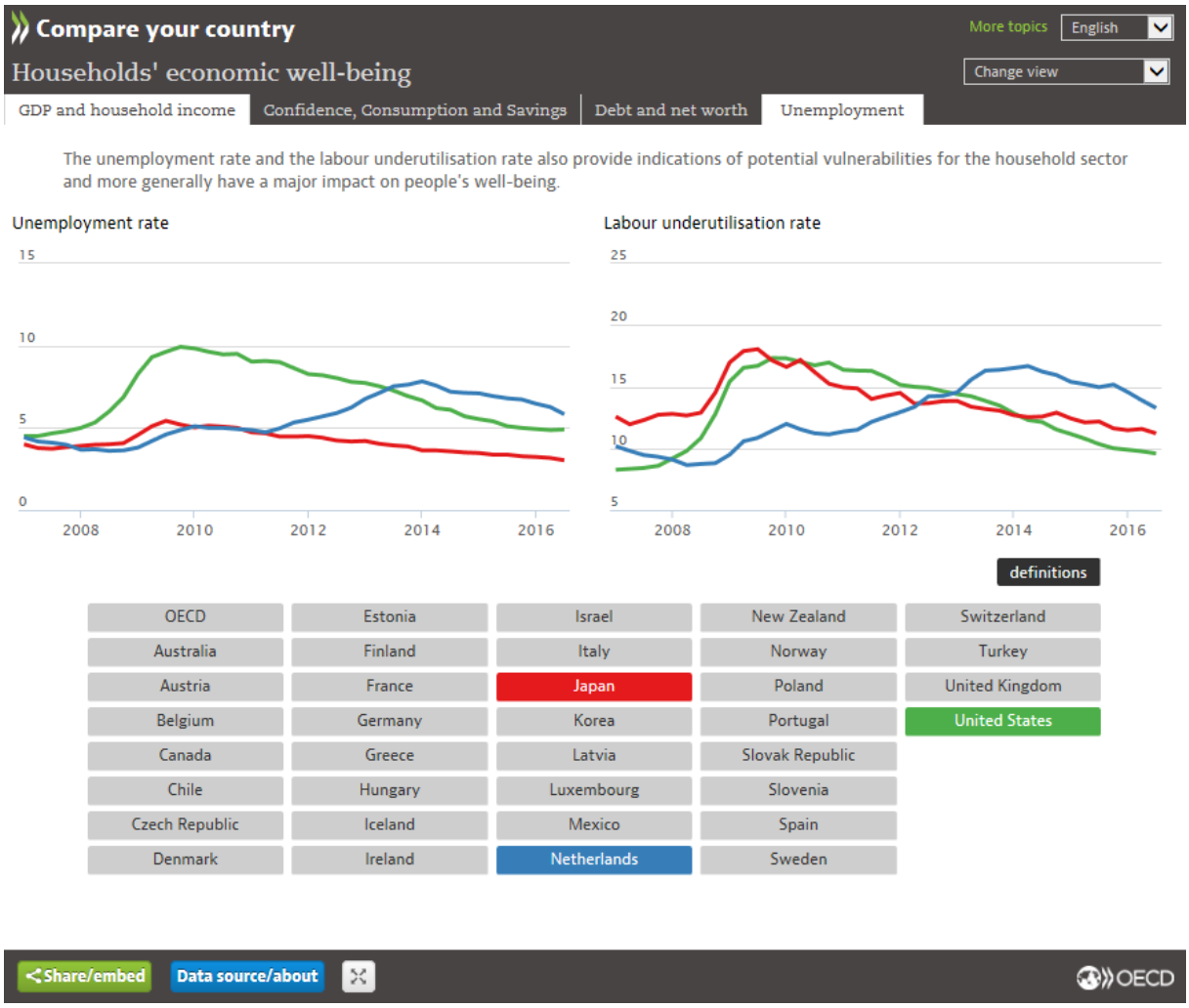
Unemployment

14. The fourth and final block of the dashboard describes *unemployment* which covers the unemployment rate and the labour underutilisation rate as percentage of the labour force. Unemployment shows how many people are currently inactive but wish to work and have looked for work during the past four weeks, whereas underutilisation also includes people that have not have been looking for work during the past four weeks, and those who are employed but work fewer hours than they would like. These two ratios also provide indication of potential vulnerabilities for the household sector and constitute important indicators for assessing their well-being.

15. Figure 5 shows developments in the unemployment rate and labour underutilisation rate for Japan, the Netherlands and the United States. It shows that whereas Japan has a lower

unemployment rate than the United States over the whole period, the underutilisation rate is higher most of the time. Furthermore, what can be obtained from the graphs is that whereas in Japan and the United States unemployment and labour underutilisation have been decreasing since the end of 2009, the Netherlands have seen a gradual increase which ended only at the end of 2013. Whereas underutilisation was lower in the Netherlands up until Mid-2012, they now record the highest ratio of the three countries.

Figure 5: Example of the fourth block of the household dashboard: Unemployment.



Source: OECD Household dashboard.

Final remarks

16. The household dashboard contains information on several indicators thus providing a broader insight in household material well-being. It does not try to capture well-being in a single indicator, but provides the opportunity to look at well-being on the basis of several underlying indicators in conjunction, in line with recommendations 1 to 3 of the Stiglitz-report. The dashboard was launched in September 2015 and in addition to the online tool, the OECD also started publishing country specific analyses that give a more detailed analysis of how households have been faring in

specific countries. Up until March 2017 country specific analyses have been published for the Netherlands, Spain, Australia, Canada, Germany, Italy and France[9].

3. Household distributional results in line with SNA

3.1 Introduction

17. In recommendation 4, the Stiglitz, Sen and Fitoussi Commission stressed the need to have more insight in how various groups within the household sector are faring. The report pointed out that average growth rates of SNA-based aggregates for household income, consumption or wealth usually do not reflect how growth is distributed among households with different characteristics, and whereas micro data may provide more information on these distributions, their trends may differ from the national accounts totals (due to differences in scope and definitions and due to measurement problems), they may not cover all relevant items, and results may not be consistent over time and comparable across countries. That is why it was advised to start looking into possibilities of breaking down the household sector in the national accounts into more detailed household groups, such as based on their level of income or socio-demographic characteristics.

18. In 2011 the OECD and Eurostat launched an expert group to carry out a feasibility study of compiling distributional measures of household income, consumption and savings across household groups within the framework of the national accounts. The expert group engaged in a first exercise in 2012, in which national experts from 16 countries performed experimental calculations, after which the work of the expert group was continued by an OECD Expert Group on Disparities in a National Accounts framework (EG DNA) to further improve the methodology and to look into possibilities to improve the timeliness of the distributional results. A second exercise was conducted by members of the expert group in 2015, the results of which have been published in a working paper early 2017 (see Zwijnenburg et al, 2017). This section briefly explains the methodology that has been developed by the expert group and presents some of the results from the recent exercise. It also discusses the main remaining challenges in order to arrive at robust methodology and other future work.

3.2 Methodology

19. The methodology for compiling distributional results within the framework of the national accounts uses a step-by-step approach combining data from national accounts and micro data. Figure 6 shows a schematic overview of this approach.

20. First, national accounts totals are 'adjusted' by excluding items that do not relate to private households resident in a country, such as: data on non-profit institutions serving households (NPISH) which may be included within the broader household sector for some countries; expenditures of non-resident households on the national territory which may be included in the national accounts data on household final consumption expenditures; and the income and consumption of people living in non-private dwellings such as prisons, retirement homes and boarding schools, which are generally not covered by micro data sources.

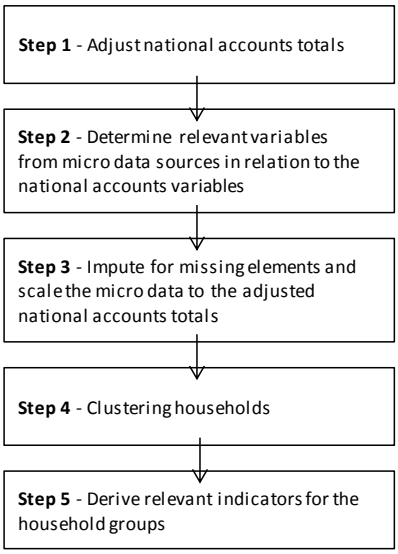
[9] The country-specific analyses as well as the household dashboard itself can be obtained via the following link: http://www.oecd.org/std/na/household-dashboard.htm.

21. Second, micro variables are identified that have an immediate counterpart with the relevant national accounts items. Different data sources may be selected in this step, depending on which source is deemed by country-experts to provide the best link for the various income and consumption items.

22. Third, the micro data totals for various income and consumption items are scaled to match the 'adjusted' national accounts totals from step 1, to make sure that the distributional results are in line with the macro aggregates. Furthermore, imputations are made on the distribution of income and consumption items that fall outside the scope of micro data. This may relate to items that are specific to the system of national accounts (i.e. imputed items, such as FISIM and investment income disbursements), but also to items that are likely to be underreported or completely missing from the micro data (such as income from the underground economy and illegal activities).

23. Finally, after imputation and alignment, households are clustered into income quintiles (on the basis of their equivalized household disposable income[10]) or into alternative groupings (for example on the basis of socio-demographic characteristics), and results are derived for the main aggregates and distributional measures.

Figure 6: Step by step approach for the estimation of distributional information.



3.3 Results

24. In 2015, members of the expert group engaged in a second exercise to compile experimental distributional results in line with national accounts totals. Twelve countries participated in the exercise, i.e. Austria, France, Israel, Japan, Mexico, the Netherlands, Portugal, Slovenia, Sweden, Switzerland, the United Kingdom and the United States. Estimates for Australia, based on the same methodology, were obtained from the website of the Australian Bureau of Statistics.

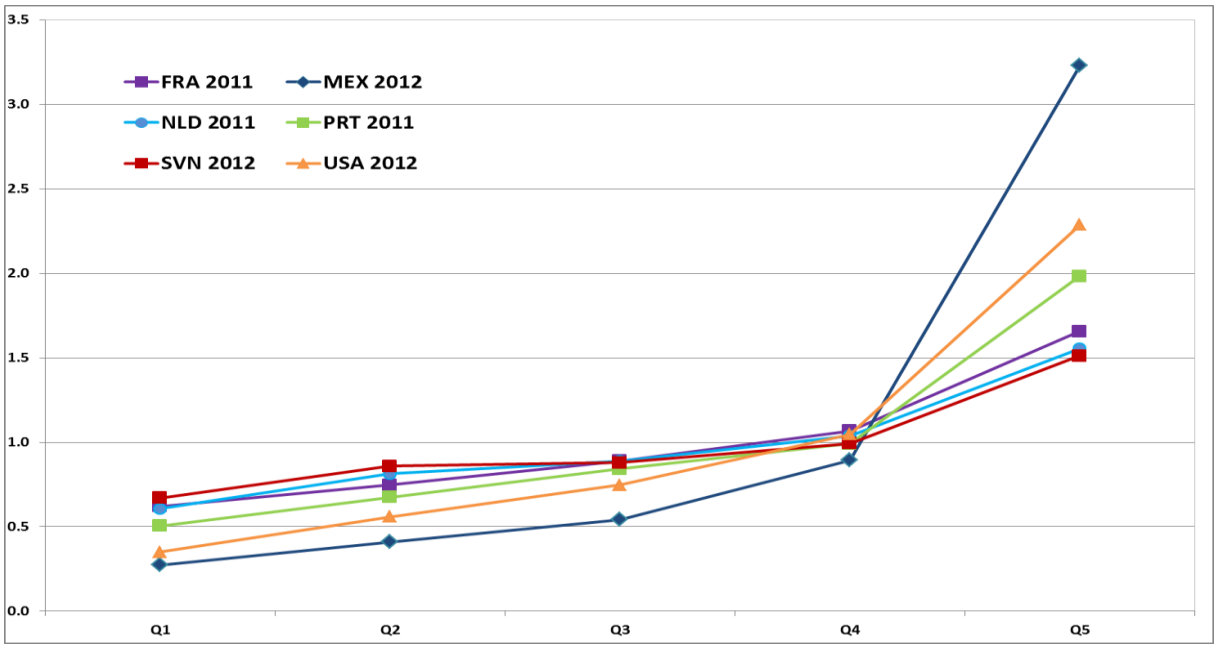
25. As part of the exercise, participating countries provided adjusted national accounts totals on the various components of household adjusted disposable income, final actual consumption and

[10] As households differ in size, they will also differ in needs. These will increase with each additional household member, although not in a proportional way due to economies of scale. To correct for the differences in needs for different compositions of households, 'equivalence scales' are used that assign a value to each household member in proportion to its needs.

savings, broken down into income quintiles, and some countries also provided breakdowns of the same aggregates by type of households[11] and by main source of income[12]. In respect of the data by income quintile, country-experts also provided socio-demographic information on the number of persons by age group, gender, labour market status and highest level of education achieved, which offered more insights in the composition of households in the various quintiles. Figures 7 to 9 present some of the key results.

26. The 'ratio to the average' (Figure 7) shows how the income level of each household quintile deviates from the average. Looking at the highest income quintile Mexico records the highest ratio followed by the United States, whereas Slovenia records the lowest. For the lowest income quintile it is the other way around. The figure also shows that Mexico and the United States record the lowest ratios for the three lowest income quintiles and that in Mexico households in the fourth quintile on average still earn an income which is below the average of the household sector as a whole.

Figure 7: Relative income of each household group compared to the average, by equivalized disposable income quintile.



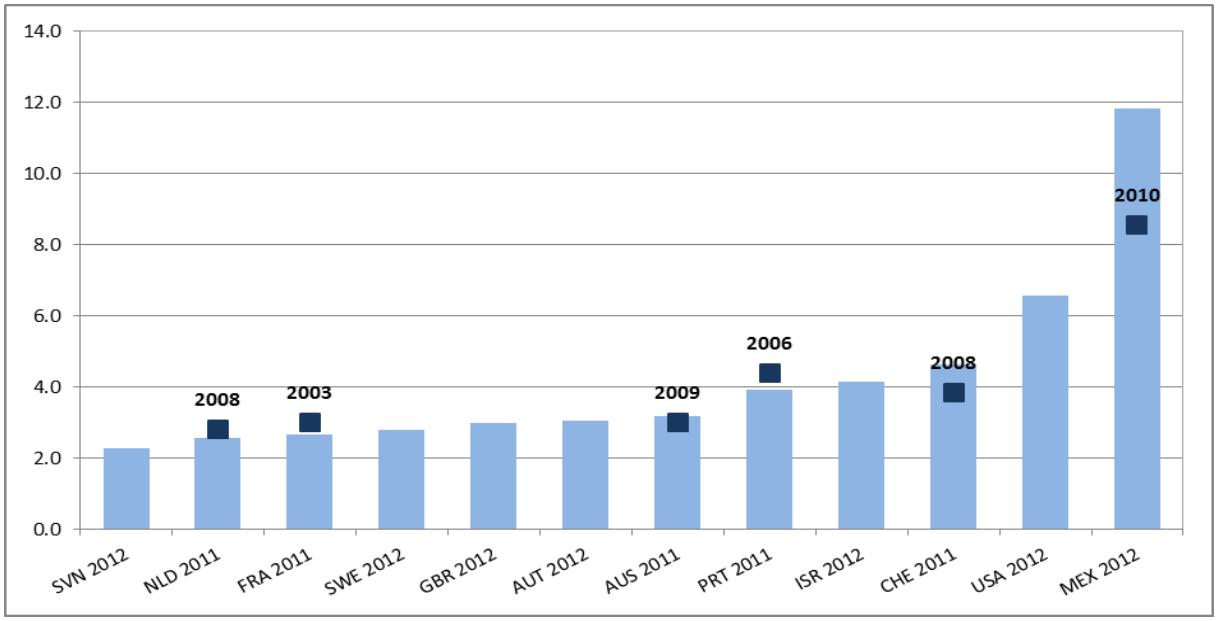
Source: Zwijnenburg et al, 2017.

27. The 'ratio of highest to lowest' (Figure 8) compares the income of households with the highest income (Q5) to those with the lowest income (Q1). With regard to this measure, Mexico records the highest ratio (11.8), followed by the United States (6.6). Disparities are lowest in Slovenia, where the ratio is 2.3, with also the Netherlands, France, Sweden and the United Kingdom recording relatively low ratios. For all these countries the ratio is below 3.0. Looking at changes since the early or mid-2000s (also shown in Figure 8), it can be observed that the ratio dropped in the Netherlands, France and Portugal, while it increased in Switzerland and Mexico, as well as in Australia, although to a lesser extent.

[11] Distinguishing eight categories on the basis of number of adults and children in the household and the age of the head of the household.

[12] Distinguishing between 'wages and salaries', 'income from self-employment', 'net property income' and 'current transfers received'.

Figure 8: Relative income position of the 20% highest to the 20% lowest income households.

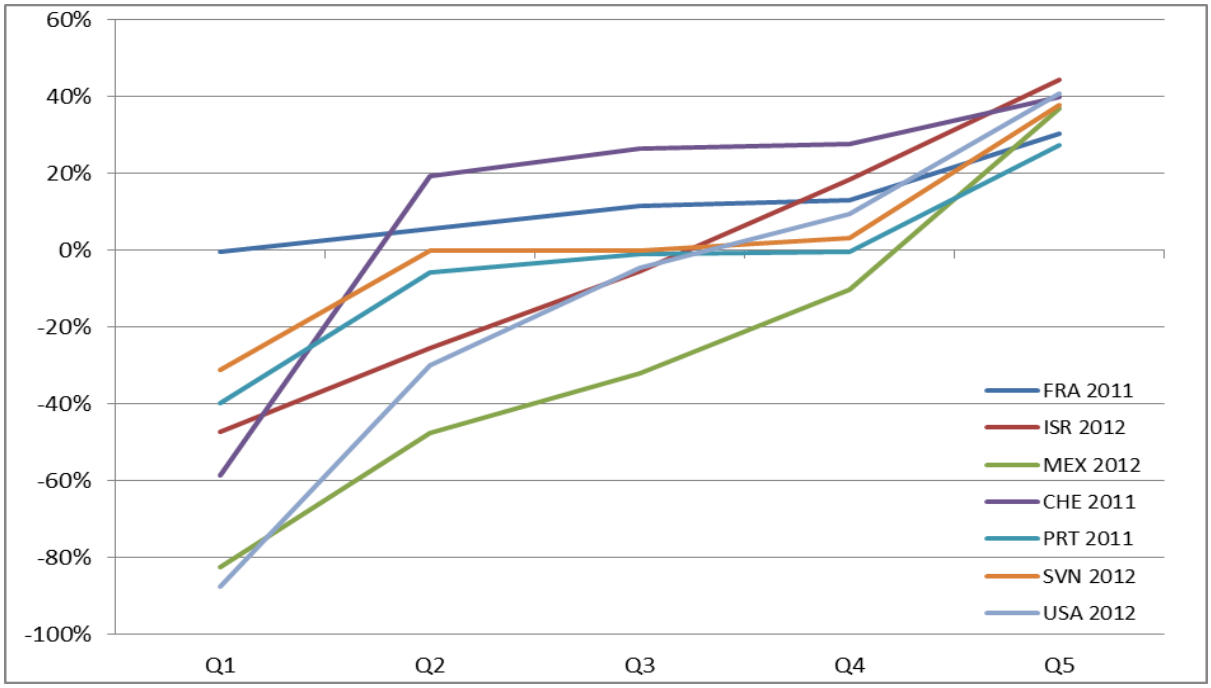


Source: Zwijnenburg et al, 2017.

28. As countries compiled distributional results for both income and consumption, also information is available on savings across the income distribution. Figure 9 presents savings results per quintile as percentage of their household disposable income for six countries. The figure shows negative savings rates for the lowest income quintile in all countries, except France, where the savings ratio of households in the first income quintile is approximately zero[13]. Households in the first income quintile record a negative savings rate of 87% in the United States, with highly negative savings rates also recorded in Mexico and Switzerland. While the Expert Group is still looking into the plausibility of these negative savings rates, possible explanations may be (temporary) negative income for self-employed persons or a high share of students and elderly people. These latter two groups are usually understood to dissave according to the life-cycle hypothesis (while households save during their working life). Negative savings rates may thus reflect these households running into debt, or otherwise running down their wealth, to support their consumption. In this respect, it should also be kept in mind that the composition of households in the various quintiles may change over time, so that households that are currently part of the first quintile, may shift to another quintile in the next period.

[13] In contrast to many of the other countries, in the micro surveys for France the consumption results are analysed in conjunction with the income results. In case the level of consumption is exceeding that of income without households mentioning that they have to reduce their financial wealth or incur liabilities, the level of income is adjusted to bring it in line with that of consumption, thereby focusing on the items that show the largest gaps between the micro and macro aggregates. In this way, part of the gap between micro and macro aggregates is solved by better aligning income and consumption results on the level of the individual households. As a consequence of the approach French distributional results show less negative savings than other countries.

Figure 9: Saving as a percentage of disposable income by equivalized disposable income quintile.



Source: Zwijnenburg et al, 2017.

Differences with micro results

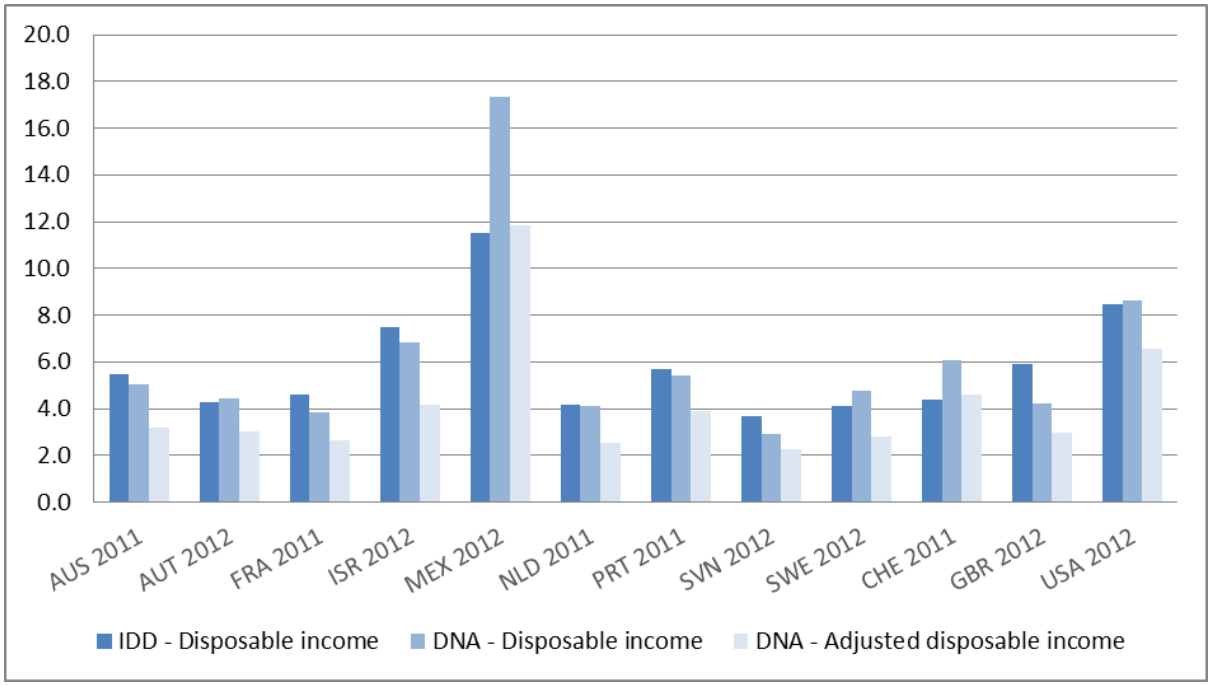
29. Due to the inclusion of several items that are not captured in micro data sources and due to the alignment of data to national accounts totals, the distributional results in line with SNA usually differ from the ones obtained via micro data sources. Figure 10 compares the relative position of the 20% highest to the 20% lowest income households by equivalized disposable income quintile, on the basis of the EG DNA exercise with those derived from the OECD Income Distribution database (IDD). This database contains information on income distribution in various OECD countries based on national micro data sources. As social transfers in kind are not included in most of the micro data sources, the ratios for IDD are based on disposable income levels, whereas for the EG DNA exercise ratios are presented on the basis of both disposable as adjusted disposable income. On the one hand this provides insight in the differences between the IDD and EG DNA results on the basis of similar income concepts, while on the other hand also explicitly showing the impact of the inclusion of social transfers in kind.

30. The figure shows that the impact of alignment to national accounts concepts differs across countries. This relates to the size of the various adjustments that have been made in the process, to impute for missing items and to align the micro data to the national accounts totals. When looking at the ratios on the basis of disposable income, some countries such as the Netherlands, Israel and the United States do not show large differences between IDD and EG DNA data, but for some other countries such as Mexico, Switzerland and the United Kingdom larger differences can be observed. For Mexico and Switzerland the EG DNA exercise leads to higher ratios in comparison with the IDD database, whereas for the United Kingdom it is the other way around.

31. The inclusion of social transfers in kind has a lowering effect on inequality in all countries; EG DNA ratios based on adjusted disposable income levels are below the ratios based on disposable income for all countries. These ratios are also below IDD results (based on disposable income) for most countries, implying that the alignment to national accounts concepts has a lowering effect on

inequality measures for almost all countries. Only for Mexico and Switzerland the alignment leads to slightly higher ratios. These results lead to the conclusion that in analysing distributional results, it indeed matters which measure is used.

Figure 10: Relative position of the 20% highest to the 20% lowest income households, by equivalized disposable income quintile.



Source: Zwijnenburg et al, 2017.

3.4 Remaining challenges and future work

32. Although some countries have already started to publish distributional results on the basis of the methodology developed by the EG DNA (i.e. Australia, the Netherlands and the United Kingdom), the expert group is still working on further improvements to arrive at more robust methodology. One of the issues that the group is looking into is how to best deal with gaps between the aggregated micro data and the national accounts totals for the various income and consumption components. As these gaps need to be distributed across household groups, the quality of the final distributional estimates is highly dependent on the size of these gaps and on how these gaps are allocated to the relevant groups. The Expert Group already developed a framework via which countries can attribute gaps to their most likely cause and subsequently allocate it to the relevant household groups (see Zwijnenburg, 2016), but will continue applying this framework for a broader set of items to arrive at broader guidance on how to deal with these gaps. In that regard, the expert group is also looking into expanding its guidance for allocating amounts for items for which no distributional information is available from micro data sources. This guidance will be included in a handbook that will combine all knowledge built up so far on how to compile distributional results in line with national accounts totals.

33. In addition to further improving the methodology, the expert group is also exploring possibilities to set up a regular data collection and to start publishing the results on a voluntary basis. Furthermore, together with Eurostat and the ECB, the expert group is looking into possibilities to further extend the country coverage, and to also include information on the distribution of

wealth. Finally, the Expert Group is exploring nowcasting techniques to arrive at more timely distributional results, combining distributional information for previous years with newly available information. Up until now, it has only been possible to test a small test of techniques due to limited availability of data, but as more information is likely to become available in the coming years, the expert group will start exploring some alternative techniques as well, hoping to arrive at a broad toolbox that may be applied to compile more timely distributional results.

4. Capturing well-being in satellite accounts

4.1 Introduction

34. While the household dashboard and the compilation of distributional results fully respect the agreed principles of the 2008 SNA, other initiatives concern the (further) development of satellite accounts to address the measurement of well-being and sustainability more broadly, taking into account specific activities, relationships, and trade-offs between various aspects that contribute to well-being and sustainability. Satellite accounts provide the opportunity to include aspects that are (still) beyond the scope of the System of National Accounts and to focus on specific topics combining economic information from this system with other type of information that relates to these topics, but that may not necessarily be economic in nature.

35. The last couple of years have seen an increased interest in the development of satellite accounts. Some of these satellite accounts address specific aspects of material well-being that are currently not addressed within the System of National Accounts. One of these caveats concerns the measurement of unpaid household activities. As the provision of services by households may serve as an alternative to purchasing these services on the market, it is deemed important to assess its impact on the economy and to monitor its development over time. Another issue that is important to monitor from the viewpoint of (the sustainability of) well-being, is the creation and valuation of human capital. This constitutes a very important asset in the production of goods and services and its development is likely to impact economic growth as well as future income flows for the household sector. Finally, the relation between the economy and the environment has received increasing interest in the last decades. On the one hand the economy is dependent on the availability of various national resources and on the other hand the environment is affected by various externalities caused by economic production. Because of their importance in assessing material well-being, satellite accounts are being developed on these three subjects. This section discusses the main methodology used for their compilation, shows some of the (experimental) results and also discusses some of the future work in further advancing these satellite accounts.

4.2 Unpaid household activities

4.2.1 Introduction

36. Recommendation 5 of the Stiglitz-report relates to the current exclusion from the System of National Accounts of most of the services provided within households. Although they conceptually meet the production boundary, household services produced for own final use are currently excluded from the central framework, with the exception of owner-occupied housing and the production of domestic and personal services by employing paid domestic staff. The main reasons are mentioned in 2008 SNA paragraph 6.30: "*the relative isolation and independence of these*

activities from markets, the extreme difficulty of making economically meaningful estimates of their values, and the adverse effects it would have on the usefulness of the accounts for policy purposes and the analysis of markets and market disequilibria". Looking at these arguments they seem to be more related to practical considerations than motivated by conceptual arguments.

37. The Stiglitz-report explains that this non-recognition ignores an important part of economic activities within a country and may lead to incorrect assessments of economic developments in times of changing labour participation. For example, in times of increasing labour participation, it may lead to an overestimation of GDP growth, as this often coincides with a shift from services being provided within households to purchasing them on a market. Therefore, the Stiglitz-report recommends that income measures in the national accounts should be broadened to include unpaid household activities, although possibly not in the central framework but in a satellite account. Several studies have already been conducted to compile numbers related to (the inclusion of) these activities and this section describes results from recent studies by Ahmad and Koh (2011) and Van de Ven and Zwijnenburg (2016).

4.2.2 Creating a satellite account on unpaid household activities

38. A first step in the creation of a satellite account on unpaid household activities is to include information on the amount of hours worked on the production of unpaid household services, in relation to hours spent on other activities (such as hours worked in paid employment, hours spent on education and training, hours spent on personal care, and leisure time). Although this information would be denominated in number of hours (whereas the traditional part of the supply-and-use tables would be in monetary terms), this would still provide very useful insights in the importance of and trends in these activities. Information on the amount of unpaid work (including underlying activities) as well as on other activities can be derived from the OECD database on time use surveys amongst others.

39. The satellite account can be further extended by adding a monetary value to these unpaid activities. In that case, instead of only presenting time use information at the bottom of the supply-and-use tables, additional breakdowns could be added to the columns in the supply-and-use tables[14] to record the amounts related to these activities. Furthermore, in determining the contribution of unpaid household activities, it would also be necessary to separately distinguish the inputs that are needed for the production of these services. This concerns intermediary goods and services used in the production of unpaid household services, such as ingredients for preparing a meal, as well as the use of consumer durables, such as transport vehicles and equipment for cleaning or preparing meals. In the traditional supply-and-use tables, these amounts are recorded as final consumption expenditure, but the intermediary goods and services used in the production of household services should in the satellite account be recorded as intermediate consumption, whereas the purchases of consumer durables should be recorded as gross fixed capital formation. The consumption of fixed capital related to the use of these durables in the production process, as well as a return on this capital, should also be included in the supply-and-use tables and will add to the output of unpaid household activities.

[14] This can be done by either adding one column on 'activities of households as employers' or by including the relevant non-market activities in the columns of related market activities, such as transport and storage, accommodation and food service activities, and social work activities.

40. In deriving the monetary value of unpaid household activities, one has to arrive at an appropriate market-equivalent price for the production of the related services. This is usually done by applying a type of costs-based approach, assuming that the value of the output is equal to the sum of costs related to the inputs of labour, capital and intermediate goods and services. These components are explained below.

Valuing labour input

41. The first component in the cost-based approach relates to the input of labour. As no actual payments are made for this input, a value will need to be imputed. For that purpose, information is needed on the time that households spent on various activities and an assessment of the hourly wage for these activities.

42. Time use survey data may provide input on the amount of time that households engage in household activities (as was explained above). Depending on the survey it may also provide information on the underlying types of activities. However, one has to be aware that the accurate measurement of the time spent on various activities is not always straightforward[15]. Furthermore, the quality of time survey data is currently rather poor and seems to provide results that are not consistent over time and comparable across countries. Furthermore, the frequency with which time use data become available, as well as their timeliness is currently rather poor, without international harmonisation on the timing, further hampering the compilation of comparable data across countries.

43. As is the case with correctly measuring the amount of time spent on specific activities, also the valuation of time spent on a specific activity may be complicated. This mainly relates to assessing the productivity of the labour input and the quality of the output that is being produced across households in relation to market output. Looking at productivity differences, the care taking by grandparents of two grandchildren will not be equal to the nursery of ten children by a professional care taker. With regard to the quality of the output, it may also be expected that a meal prepared by a professional chef will be of a different quality than that of a home-made meal. In addition, the professional chef is expected to prepare meals for multiple groups of people at the same time, whereas a household will usually prepare the meal for the household itself.

44. With regard to valuing the time spent, currently three basic methods are distinguished:

- The replacement cost approach, where an average post-tax, hourly wage, representative of the broad range of activities covered in the production of household non-market services, is constructed (ideally at a very detailed level of activities). This relates to arriving at a price similar to obtaining the service in the market.
- The opportunity cost approach which takes the average post-tax hourly wage across the whole economy, thus trying to estimate the market income foregone as a result of spending time on non-market activities at home. For that purpose background information on the respondents of the time use surveys would be needed.
- The minimum wage approach in which a post-tax hourly minimum wage rate is applied to value the labour input.

[15] First, it may be difficult to allocate travelling time to the relevant underlying activity. Furthermore, the distinction between the various categories is not always very clear, for example between unpaid activities and leisure time. Whereas some people regard gardening as a hobby, other will regard it as a necessary task. Finally, some activities may take place at the same time, such as preparing a meal while taking care of children.

45. Although the opportunity cost approach is often criticized for making the value of the labour input dependent on the person that does the work rather than on the work itself, Schreyer and Diewert (2014) explain that the preferred measure may depend on the purpose of valuing the time spent. The question is whether you want to include unpaid household activities to capture full consumption (a welfare-related concept) or whether you only want to capture the value of own-account household production. In the latter case the replacement cost approach would be the most appropriate method, whereas in the former case, it will depend on whether the household is constrained in their allocation of time or not. For households that are constrained in their allocation of time (i.e. when they are unemployed or retired) the replacement cost method would still provide the best estimates, but for unconstrained households they explain that it would be best to apply the opportunity cost approach.

46. Looking at how the inclusion of the compensation for labour input related to unpaid household activities will affect the accounts, it has to be borne in mind that in addition to the inclusion of this value in the output (and value added) of household services, it will also feed into mixed income of the household sector, as a result of which GDP will increase significantly. It is decided to record this compensation for labour input as mixed income (instead of operating surplus), as the overall compensation will also include a return on capital related to the use of consumer durables in the production process (see the next step).

Valuing capital services

47. As the production of some of the unpaid household services will require the use of consumer durables (such as household appliances, motor vehicles and some types of furniture), costs of using these durables should also be included in the value of unpaid household services. This means that part of the consumer durables should be reclassified as capital stock (and their purchases recorded as gross fixed capital formation instead of final consumption expenditure) and that the costs related to using this capital should be included in the calculation of the value of these services. These costs consist of the depreciation costs of the relevant equipment and a return on the capital used. The first component can be estimated on the basis of the so-called Perpetual Inventory Method (PIM)[16]. This method will also provide the value of the stock of capital used in the production process. Return to invested capital can be derived by multiplying this stock by an interest rate, for instance the interest rate on debt securities issued by general government.

48. Looking at the impact on the accounts, depreciation costs will be recorded as consumption of fixed capital. Together with the return on invested capital, they will feed into the value of the household services (derived as the sum of costs) and into (gross) mixed income of the activities in which the consumer durables are used. Whereas the shift from consumption to investment will not affect GDP, the introduction of consumption of fixed capital and the return on invested capital will have an upward effect on GDP, reflected in the increase of mixed income of the household sector.

Sum of intermediary costs

49. Several unpaid household activities, such as preparing meals or cleaning the house, will require intermediate goods and services in their production process. These will normally already be included in the supply-and-use tables, as final consumption expenditure of households. To include

[16] According to this method, the gross capital stock is calculated as the sum of past purchases, adjusted for price changes and also adjusted for the retirement of the durables after the end of their service life. The net capital stock is set equal to the gross capital stock minus the accumulated depreciation.

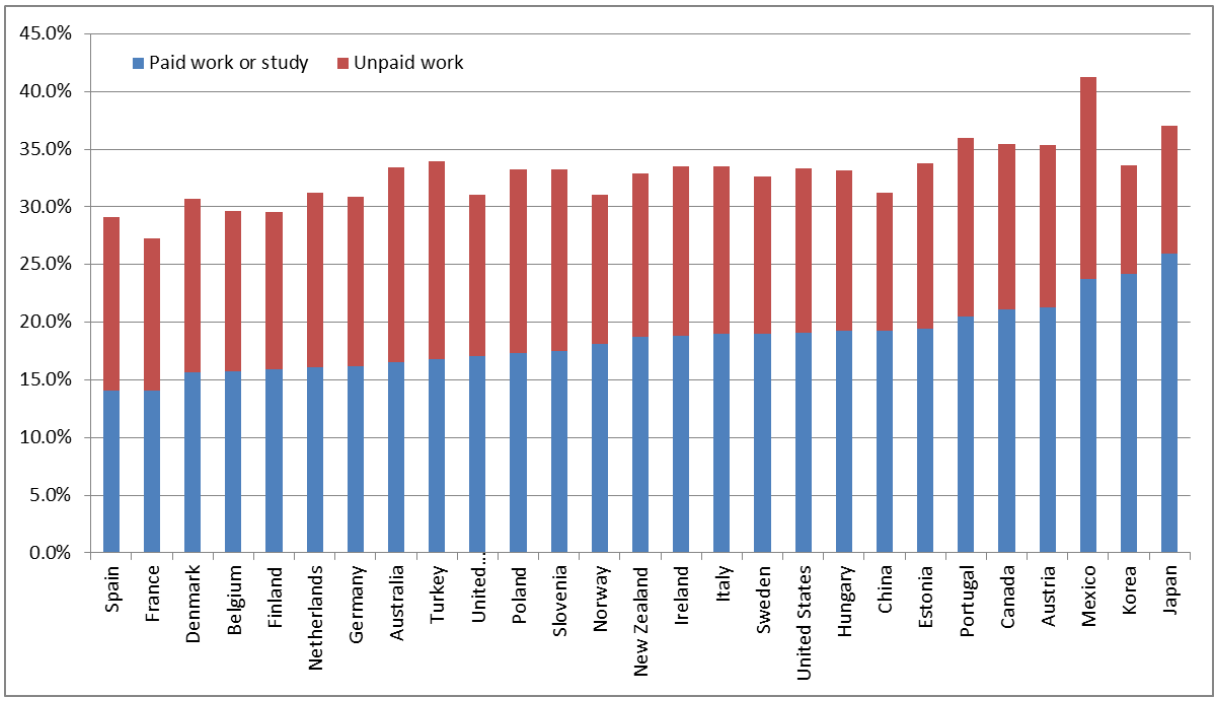
them in the measurement of the value of unpaid household activities requires a shift of the relevant amounts from final consumption expenditure to intermediate consumption related to the production of the relevant unpaid household services. The first-order effect will be a decrease of GDP (less final consumption and more intermediate consumption), but this will be offset by an increase of output by the household sector, as the value of unpaid household services is compiled as the sum of costs, which includes intermediate consumption.

4.2.3 Results

50. Ahmad and Koh (2011) conducted experimental calculations to asses the impact of the inclusion of household activities on GDP, looking at the replacement cost approach and the opportunity cost approach. These results have been updated by Van de Ven and Zwijnenburg (2016) who also included the minimum wage approach. This subsection presents some of these results.

51. Figure 11 presents average time spent by households on paid work or study and on unpaid activities across a number of OECD member countries and China. It shows that time spent on paid work or study ranges between 14% and 26%, whereas time spent on unpaid activities ranges between 9% and 18%. For most countries the percentages are very close to one another and for three out of the 27 countries, the average time spent on unpaid household activities even exceeds the time spent on paid work or study. This is the case for Australia, Spain and Turkey.

Figure 11: Percentage of total time spent on unpaid household activities and paid work or study.*



Source: Van de Ven and Zwijnenburg (2016).

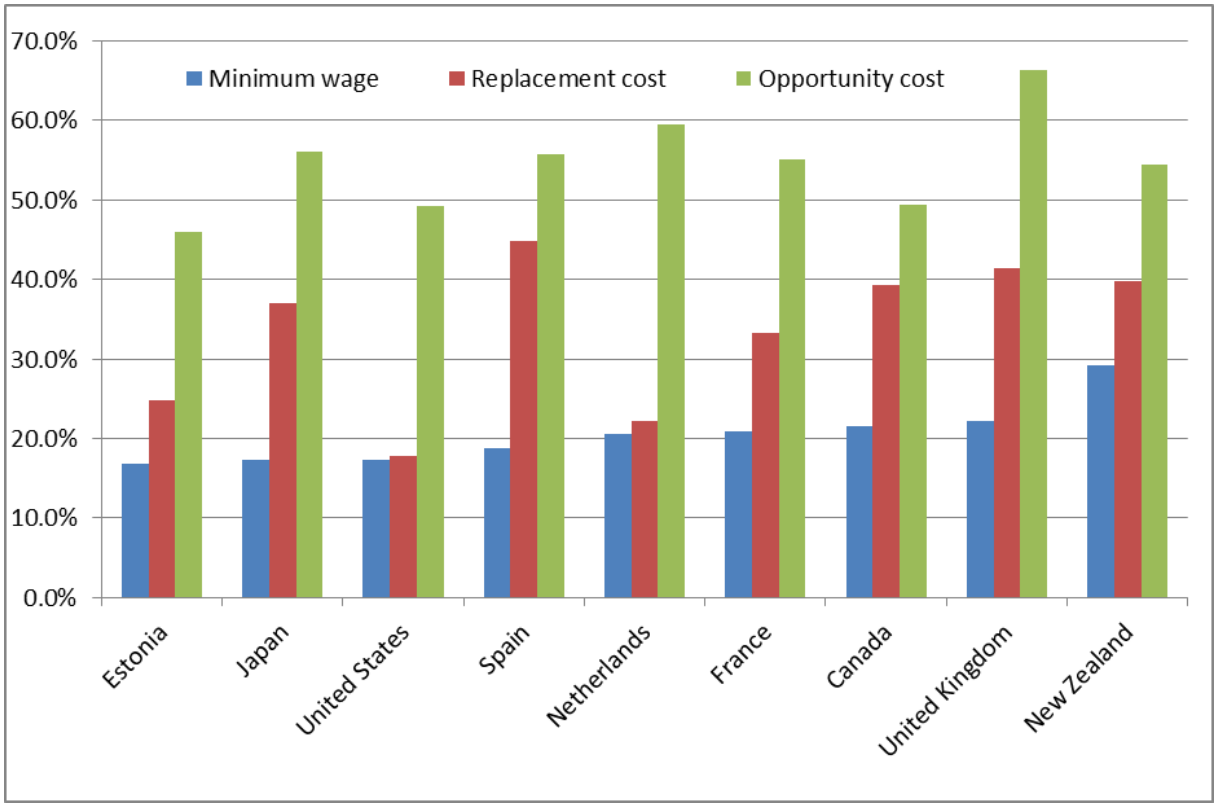
* Data are based on the latest time use survey data available: Australia (2006); Austria (2008-09); Belgium (2005); Canada (2010); China (2005); Denmark (2001); Estonia (2009-10); Finland (2009-10); France (2009); Germany (2001-02); Hungary (1999-00); Italy (2008-09); Ireland (2005); Japan (2011); Korea (2009); Mexico (2009); Netherlands (2005-06); New Zealand (2009-10); Norway (2010); Poland (2003-04); Portugal (1999); Slovenia (2000-01); Spain (2009-10); Sweden (2010); Turkey (2006); United Kingdom (2005); and United States (2010).

52. Figure 12 shows the value of unpaid household activities as percentage of original GDP (i.e. before including these activities in GDP). As was explained before, the value of these unpaid household activities consists of two parts, i.e. the compensation for the labour input in the production of household services, and the imputation of consumption of fixed capital and a capital

return on the use of consumer durables in the production process. As there are three ways to value the labour component, the figure shows results using the minimum wage costs, the replacement costs, and the opportunity costs.

53. The results show that the inclusion of unpaid household activities would significantly affect levels of GDP. The minimum wage approach would have the smallest impact, with the value of unpaid household activities ranging from 16.8% in Estonia to 29.1% in New Zealand. For the replacement cost approach the impact would be higher, the imputed monetary value ranging from 22.2% of GDP for the Netherlands to 44.9% for Spain. The impact would be most significant when applying the opportunity cost approach, with the highest impact recorded for the United Kingdom. For the United Kingdom the value of unpaid household activities amounts to 66.3% of GDP.

Figure 12: Value of unpaid household activities as % of original GDP.



Source: Van de Ven and Zwijnenburg (2016), updated to also include the value of capital services.

54. Although the inclusion of unpaid household activities increases the level of GDP, the studies by Ahmad and Koh (2011) and Van de Ven and Zwijnenburg (2016) showed that in general it does not seem to affect the relative ranking of countries. The maximum impact in the recent study was a relative increase of per capita income for Estonia (in comparison to the United States) when using the opportunity cost approach with 14.3%, followed by Spain with a relative increase of 12.4%. For the other countries the impact only ranged between 1.4% and 9.2%. The impact would be even lower when using the minimum wage or the replacement cost approach, thus having a smaller impact on the relative ranking of countries.

55. Finally, the studies also looked at the impact of the inclusion of household non-market services on GDP growth rates. Results showed that the inclusion generally leads to a lowering of the growth numbers. So where increasing labour participation, especially related to the participation of women on the labour market, since the 1970s had an upwards effect on economic growth, this

would have been tempered if unpaid household activities would also have been taken into account, as the increasing labour participation was accompanied by a decrease of time spent on unpaid household activities.

4.2.4 Remaining challenges and future work

56. The results in this section show that the inclusion of unpaid household activities in economic analysis provides relevant insights in household well-being, particularly when comparing results over time. However, it is also clear that some issues still need to be resolved to arrive at robust data that are better comparable across countries and over time. For that purpose, the quality of time use survey data should be improved, striving for more granularity in activities, better consistency and comparability over time and across countries, and arriving at increased frequency of available data as well as at better timeliness. At the same time, the supply-and-use tables should focus on additional breakdowns with regard to goods and services, and with regard to activities, to better assist compilers in making the necessary adjustments to the traditional supply-and-use tables to properly account for unpaid household activities. As described in Van de Ven and Zwijnenburg (2016) this relates to more granular breakdowns of categories that include intermediary products used in the production of household services (such as food products and travel services) and to a more granular breakdown of the types of consumer durables. The establishment of a dedicated UNECE Task Force, which recently produced a first draft on the "Guide on Valuing Unpaid Household Service Work", is a very important step forward in this respect.

4.3 Human capital

57. Labour constitutes an important production factor, and the size and composition of the labour force may significantly influence economic growth. That is why there is a growing interest in a satellite account on human capital to acquire more insight in its role in the economy, the factors that contribute to its accrual and decrease, and on who is benefiting. 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). This is a very broad definition which captures both economic and non-economic benefits. When looking at capturing human capital in economic accounts, the focus is usually on the economic part, trying to capture which value human capital is adding to the economic process. Measuring this value is the main aim and main challenge in constructing a satellite account on human capital.

58. Traditionally human capital has been kept outside the asset boundary of the System of National Accounts. The main reasons for this were that it is not transferable and that it is not subject to ownership rights[17]. However, it has also been acknowledged that the measurement of human capital may provide relevant insights in the drivers of economic growth, and the sustainability of a country's economic growth path. For that reason, several studies have been dedicated to the measurement of human capital, and in 2014 a UNECE Task Force on Measuring Human Capital was established to construct experimental human capital satellite accounts based on common methodology, and to agree on methodological and data related issues.

59. On the basis of their work, the Task Force published a draft Guide in 2016 which discusses the setup of two types of satellite accounts which are discussed in this section. The first one relates

[17] Chapter 2 of the Guide on Measuring Human Capital raises some questions with regard to the validity of these arguments.

to a satellite account on education and training which focuses on more detailed information on the expenditures on, and financing of, these two forms of human capital creation. The second one encompasses a full-fledged satellite account capturing all aspects of human capital, including its valuation as an asset, the treatment of its building up as investments, and flows that derive from the use of human capital.

4.3.1 Satellite account on education and training

60. To obtain more insight in human capital, a first step would be to look at the current expenditures related to education and training as important factors adding to its creation, and at who is paying for these flows and who is benefiting from them. If this could be combined with other indicators on human capital such as proportions of students enrolled by gender, age and education level, this would provide policy makers with more insight in the contribution of education to the economy.

61. This specific focus on education and training would not imply large changes to the system of national accounts as most of the data is already available within the system. The only more substantial change is that it would treat in-house training provided by employers as a separate output of educational services instead of treating it only as current costs as is the case in the central framework. If human capital would be regarded as produced asset, this would imply that also in-house training would add to its creation and should be included within the production boundary. Although this would imply a slight expansion of the production boundary, it would not change GDP as intermediate consumption would increase by the same amount.

62. The first table of the Satellite Account on Education and training (SAE) is a supply-and-use table with additional information on education and training. The output of the education industry would be broken down into type of producer (market or non-market), and into education and training services with much more detail than in generic supply-and-use tables, amongst others into level of education. The use table would, in addition to the various uses of the detailed education and training services, also show a more detailed breakdown of labour input by level of education at the bottom of the table. This provides more insight in the demand for the various types of labour by the various industries and may show some mismatches that may arise between the demand for and supply of certain types of labour. Table 1 gives an overview of this first table of the SAE.

Table 1: Supply and use table from Satellite Account on Education and training.

SUPPLY

		Output by Industry (ISIC rev.4)						Total output (at base prices)	Imports (f.o.b.)	Taxes less subsidies on products	Total supply at purchaser's prices
		Agriculture forestry and fishery	.....	Education services			...				
				Total	*Market producers*	*Non-market producers*					
Agriculture, forestry anad fishery											
.....											
Education services	**Total**										
	Formal Education/training - Total (EP1-EP3)										
	ISCED 0 -1 (EP1)										
	ISCED 2 -3 (EP2)										
	ISCED 4-8 (EP3)										
	Non formal education/training (including training of employees by their employers) (EP4)										
	Ancillary services (EP5)										
....											
Total output											
Market output											
Non-market output											

USE

		Inputs by Industry (ISIC rev.4)						Total intemediate consumption	Final consumption					Export of goods and services	Gross capital formation	Total use at purchaser's prices
		Agriculture forestry and fishery	....	Education services			....		Households	Government		NPISH	Total			
				Total	*Market producers*	*Non-market producers*				Collective	Individual					
Agriculture, forestry anad fishery																
.....																
Education services	**Total**															
	Formal Education/training - Total (EP1-EP3)															
	ISCED 0 -1 (EP1)															
	ISCED 2 -3 (EP2)															
	ISCED 4-8 (EP3)															
	Non formal education/training (including training of employees by their employers) (EP4)															
	Ancillary services (EP5)															
....																
Total (intermediate and final) use																
Gross value added																
Compensation of employees																
Other net taxes on production																
Gross operating surplus /Gross mixed																
Net operating surplus/Net mixed																
Consumption of fixed capital																
Total output																

Supplementary information															
Gross fixed capital formation															
Labour input by level of education -															
- ISCED 0-1															
- ISCED 2-3															
- ISCED 4-8															

Source: Guide on Measuring Human Capital, 2016.

63. The second table of the Satellite Account on Education and training is a resources/uses table. The resources table breaks down the total production of education and training services per institutional sector or type of training into income/financing resources. This can be done on the basis of current transfers (e.g. public revenues that are attributed to education), capital transfers (e.g. donations), income from sales (payments for the education services provided), and other incomes such as interest and dividend receipts on financial investments. As these funds are not always specifically earmarked for this purpose (especially regarding the attribution of public funds), the estimation of the relevant amounts may turn out to be quite complicated. The table on the uses looks at the various cost elements (various intermediate consumption elements, compensation of

employees, taxes and subsidies, and consumption of fixed capital) and the use of and investment in capital related to producing education and training services. Table 2 provides an example of a resources/uses table.

Table 2: Supply and use table from Satellite Account on Education and training.

	Central/State Government (S.1311)	Local Government (S.1313)	Financial/Non-financial corporations (S.11/S.12)	NPISHs (S.15)	**TOTAL (EP1-EP5)**
RESOURCES					
Current transfer from financing agents (FA)					
- Central/State Government (S.1311)					
- Local Government (S.1313)					
- Financial/Non-financial corporations (S.11/S.12)					
- NPISHs (S.15)					
- Households (S.16)					
- Rest of the world					
Income from sales					
Capital transfers from financing agents (FA)					
- Central/State Government (S.1311)					
- Local Government (S.1313)					
- Financial/Non-financial corporations (S.11/S.12)					
- NPISHs (S.15)					
- Households (S.16)					
- Rest of the world					
Other incomes (from capital, insurance, rents)					
USES					
Intermediate consumption					
Compensation of employees					
Wages and salaries					
Employers' social contributions					
Taxes on production and imports					
Less Subsidies					
Consumption of fixed capital					
Total current expenditure/output					
Gross fixed capital formation					

Source: Guide on Measuring Human Capital, 2016.

64. The Satellite Account on Education and training can be further supplemented with tables covering non-monetary data, such as information on the resident population broken down by gender, age group and educational attainment; numbers of students broken down by gender and level of education; number of adults in vocational training, permanent education or other types of non-formal education, all providing more background information which may be useful in analysing trends with regard to the creation of human capital.

4.3.2 Satellite account on human capital

65. Whereas the setup of a satellite account on education and training would be a first step to acquire more information on human capital, the setup of a full-fledged satellite account on human capital would provide far more insight, but would also imply considerable changes to the current system of accounts. First of all, it would require an appropriate valuation of the investments and stocks of human capital. As there are multiple viewpoints on how to value human capital, taking into account both methodological and practical considerations, this is not an easy task. Secondly, the recording of human capital as an asset would require the need to have a look at how to depreciate human capital. Whereas there is quite some knowledge on how to do that for material assets, not a lot of information is yet available on how this may be applied to human capital. Thirdly, when human capital is regarded as an asset that is used in production, the owners may be seen as producers of human capital services which are sold to producers instead of employees earning compensation of employees. This would also imply a major change to the system. Furthermore, the creation of human capital as produced asset will impact various accounts and balancing items such as GDP and household disposable income, depending on the preferred treatment of this creation of human capital. Below, some of these issues are further explained.

66. Looking at the valuation of human capital and its creation, two approaches are currently used, i.e. the 'cost-based approach' (Kendrick, 1976) and the 'lifetime income approach' (Jorgenson and Fraumeni, 1989, 1992a and 1992b). In the first approach the costs that are used as input for building up human capital, such as education and training, schoolbooks and other training equipment, and time spent on studying, are the basis of the valuation of investment in human capital. The stock of human capital is then derived on the basis of applying a perpetual inventory method. In the second approach, the total stock of human capital is calculated as the net present value of future earnings. In that approach investments are equal to the changes in the estimated capital stock as a result of the gross additions to the stock. Whereas the first approach would have to rely on assumptions regarding the measurement and the valuation of time spent on studying, the second approach would mainly involve assumptions about expected lifetime income for various groups in the population. In general, the second approach is understood to lead to substantially higher estimates for output, investments and capital stocks than the first approach.

67. The treatment of human capital as produced asset would imply some changes throughout the sequence of accounts. The way in which the accounts will be affected, depends on the way the production of human capital is regarded. First of all, it can be regarded as capital output produced by the household sector on the basis of "intermediate inputs" provided by corporations, government or NPISHs, while also households add to this creation themselves by spending their own time on study and training. The costs related to the formal education system and the training provided by employers are thus viewed upon as output of the relevant producing sectors which are used, as intermediate consumption, by households in the process of creating human capital. As these inputs are often provided for free, concomitant current transfers from the producers to the households need to be recorded, to balance the accounts.

68. Secondly, the schooling and training activities could be regarded as production of capital output by the sector paying for the produced services. In that regard, households will combine time spent on education with direct expenditures to produce human capital, whereas enterprises, government entities and NPISHs will create human capital by direct and indirect expenses related to education and training. All the human capital produced outside the household sector will in the

accounts be recorded as a transfer of assets to the household sector, as they are in the end regarded as the owners of human capital. The concomitant transfer will then be recorded as a capital transfer in kind. This second option would lead to lower disposable income and savings levels for the household sector than the first option, because part of the creation of human capital will now be recorded outside the household sector.

69. Regardless which of the two options is used to record the production of human capital, the treatment of expenditures on human capital as investments will increase the level of GDP. This is due to the imputation of a compensation for time spent on education and training by the household sector which will increase their mixed income, and due to the inclusion of in-house training in the production boundary of the SNA, which will lead to an increase of gross operating surplus as the related costs will now be directly reflected as a separate output, no longer being recorded as current costs related to the other outputs.

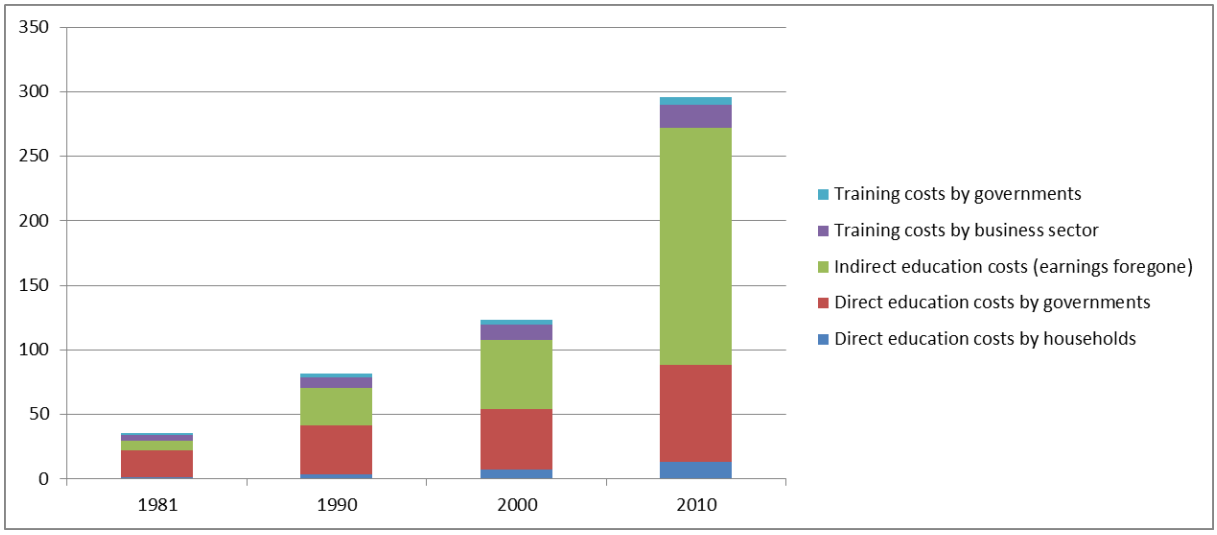
70. The impact on the current and capital accounts will depend on the option chosen for the production process of human capital. If this is regarded as being produced by the household sector (as in the first option described above) the education and training outputs produced by the various sectors are recorded as intermediate inputs by households to produce human capital, with concomitant current transfers in kind from the other sectors to the household sector. Furthermore, as explained above, the imputation for time spent on education and training will increase the mixed income of the household sector. Overall, disposable income of the household sector will increase by the value of additional output related to the creation of human capital in the household sector. Gross saving will increase by the same amount. As this full amount will be recorded as gross fixed capital formation of human capital, their net lending/borrowing will not be affected. Finally, the balance sheet will also be affected, now containing a value for human capital.

71. If human capital is assumed to be produced by the sector undertaking the education and training expenses, the impact on the production account of the household sector is more moderate. The only change on the production account comes from the addition of imputed labour compensation for time spent on education and training, and a reclassification of final consumption on education to intermediate consumption to produce human capital. On the other hand, whereas human capital is largely created outside the household sector (and will only affect disposable income and savings of the household sector to a limited extent), (consumption of) human capital will be fully reflected in the household sector, as they are considered as the owners of all human capital in a country.

4.3.3 Results

72. The Guide on Measuring Human Capital contains an example of a Human Satellite Account for Canada on the basis of the cost-based approach. It is explained how estimates are derived for indirect and direct costs of education and training on the basis of survey information combined with assumptions. Figure 13 present the results on the costs of education and training for 1981, 1990, 2000 and 2010. It can be observed that the costs of education and training have increased significantly in Canada (total costs of education and training increased from 9.7% of GDP in 1981 to 17.8% in 2010) and that particularly the share of indirect costs, related to the time spent by working age students on education, has increased significantly over time. This relates to an increased amount of students enrolled in studies and to an increase in the hourly wage they could have earned.

Figure 13: Costs of education and training in Canada (billions of current dollars).



Source: Guide on measuring human capital (2016)

73. To have an overview how the treatment of these education and training costs as investment would affect the various accounts, table 3 presents an overview of some of the balancing items before ('original') and after ('adjusted') inclusion of the relevant amounts.

Table 3: Impact of treating costs on education and training as investment on economic aggregates for 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				
Gross operating surplus	460.7	478.3	17.6	3.8
Gross mixed income	193.4	377.4	184.0	95.2
Uses of income account				
Resources				
National disposable income, gross	1,627.2	1,828.6	201.6	12.4
o.w. household disposable income, gross	1,004.0	1.287.1	283.1	28.2
Uses				
Consumption	1,305.1	1,210.7	-94.4	-7.2
Gross saving	322.1	618.1	296.0	91.9
Capital account				
Uses				
Gross capital formation	388.1	684.1	296.0	76.3
Net lending/borrowing	-65.0	-65.0		

Source: Guide on measuring human capital (2016)

74. The table shows that the capitalisation of expenditures on education and training significantly increases GDP and national disposable income. Both increase by more than 12 percent. This is mainly due to the increase of gross mixed income (as a consequence of the inclusion of imputed labour compensation for time spent on education by students) and to a lesser extent to the increase of gross operating surplus (as a consequence of the inclusion of costs related to in-house training). Household disposable income increases even more, because of the imputed current transfers to "compensate" for the receipts of education and training services from other sectors,

which are subsequently used and recorded as intermediate inputs in the production of human capital (with a concomitant increase of output) by households. So in addition to the increase in gross mixed income, the household sector also benefits from an increase in current transfers of 99.0 billion dollars, leading to an increase of household disposable income of more than 28 percent. Another consequence of treating these costs as investments is a decrease of final consumption expenditure, and a very significant increase of gross fixed capital formation. The latter increases by more than 76 percent, whereas final consumption expenditure is reduced by 7.2 percent.

75. Looking at the impact on wealth estimates, Table 4 presents results for capital stock broken down into human capital and other capital stock for Canada for 1990, 2000 and 2010. The results show that the inclusion of human capital leads to a significant increase in the value of capital stock. In 1990 it led to an increase of 36.9% whereas in 2010 it led to an increase of 46.8%. That means that the share of human capital in total capital stock has increased to approximately one third in 2010.

Table 4: Total wealth in Canada, in 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
Resident 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

Source: Guide on measuring human capital (2016)

4.4 System of Environmental-Economic Accounting (SEEA)

76. The economy not only depends on labour and capital input, but is also very dependent on natural resources, such as water, timber, energy, minerals, fish and land. Furthermore, well-being very much depends on the sustainability of ecosystems. These latter are “dynamic complexes of plant, animal and microorganism communities and their non-living environment interacting as a functional unit” (paragraph 2.21 of the SEEA). Conversely, the environment is often affected by economic activities, such as by pollution, waste and depletion, in that way also directly affecting (the sustainability of) well-being. To have more insight in the interactions between the economy and the environment, the international statistical community started to develop guidance for the compilation of satellite accounts for environmental-economic accounting almost twenty-five years ago, the first version of the framework being published in 1993. Since then, work has evolved and two updated versions of the handbook have been released, of which the latest version, published in 2012, was recognized as an international statistical standard. This subsection describes the main aspects of the System of Environmental-Economic Accounting (SEEA), and how it may provide more insight in well-being.

4.4.1 Set up of the current system

77. The main strength of the SEEA framework is that it combines information with regard to the environment in both monetary terms and physical terms. It shows changes in the use and availability of natural resources, the extent of emissions and discharges to the environment resulting from economic activity, and the amount of economic activity undertaken for environmental purposes.

Some of the related flows and assets, like environmental taxes and subsidies or the value of mineral and energy resources, are already recorded within the central framework of the national accounts, but the satellite accounts also combine the macro-economic data of national accounts with (mainly) physical data on environmental issues like emissions of pollutants to air and water, material flow accounts, etc. How to measure and combine data on the use of services from ecosystems, including its degradation through economic activities, is still an area under development. First trials are being made in the context of a handbook on Experimental Ecosystem Accounting.

78. The full system of the SEEA consists of three main sections, focusing on various aspects of the link between the economy and the environment. This specific setup facilitates the gradual implementation of a SEEA by countries via a modular approach.

79. The first section concerns an extended form of supply-and-use tables that, in addition to traditional goods and services, also contains information on physical environmental data, such as the supply and use of energy, ecosystem inputs, and outputs of residuals (such as discharges to air, water et cetera) as a results of economic activities. By showing these amounts in a supply-and-use framework, it can be shown to which extent various activities affect the environment and how this compares to its production activities. An example of a hybrid supply-and-use table, taken from the 2008 SNA, is presented in Table 5.

80. The second block of the SEEA concerns functional accounts, identifying those monetary transactions in the system of National Accounts that directly relate to the environment, such as environmental taxes and subsidies, expenses related to environmental protection, and the delineation of environmental goods and services. In comparison to the central framework, it often requires more detailed breakdowns to be able to clearly distinguish the flows that relate to environmental aspects and to attribute the relevant amounts to the specific sectors and subsectors. This may for example concern more detailed breakdowns of taxes and subsidies to clearly distinguish the ones related to environmental issues (e.g. energy taxes, subsidies on green energy), as well as of specific costs categories to distinguish costs that benefit the environment.

81. The third and last block of the SEEA concerns an extension of the system of national accounts in the sense that it aims to measure capital stocks of natural resources and ecosystems, including their depletion or degradation, in both physical units and monetary values. This is a complicated process that often involves discussion on the exact delineation of natural resources and ecosystems, and requires several assumptions to accurately value the relevant flows and stocks. With regard to natural resources, such as mineral and energy resources that are used in production processes, information is often available from markets that may serve as input in the calculation of the value of capital stock and depletion. As a result, many countries already compile estimates on stocks and flows with regard to natural resources. The main difficulty for these types of assets often remains with regard to their correct delineation and what to include and exclude. For ecosystems, on the other hand, the valuation itself still poses a major challenge to data compilers. As it is very complicated to arrive at a value of the capital stock of these systems, the focus is currently on deriving a value for its degradation. One approach that is currently distinguished to value this degradation is the maintenance costing approach in which the question is asked what the costs would be to maintain the same level of quality of the ecosystems. A second approach, the greened economy modelling, focuses on the question what level of GDP could be achieved if steps were taken to internalize maintenance costs. Both methods require several assumptions and discussion is

still ongoing on the pros and cons of these two approaches. When looking at this third block of the SEEA, it can be concluded that it is the most complex of the three and has to be regarded as the most experimental.

Table 5: Example of a hybrid supply and use table from the SEEA.

		Economy					Total economy	Residuals		9. Material balance	Total use
		1. Products (Physical / Monetary)	2. Industries	3. Consumption	4. Capital	5. ROW (products)		10. National destination	11. ROW destination		
Economy	1. Products (Physical)		Products used by industry	Products used for consumption	Products used for capital	Products used by ROW (exports)				0	701
	1. Products (Monetary)		442	39	119	101					
			664	*506*	*146*	*403*	*1 719*				
	2. Industries	Products supplied by industry					Residuals generated by industry		Residuals generated by industry in ROW	0	831
		551 *1 356*					275 *1 356*		5		
	3. Consumption						Residuals generated by consumption		Residuals generated by consumption in ROW	Net material accumulation by consumption	65
							47		1	17	
	4. Capital						Residuals generated by capital			Net material accumulation by capital	145
							73			72	
	5. ROW (products)	Products supplied by ROW (Imports)					Residuals generated by non-residents			Net material accumulation by ROW economy	104
		150 *363*					6 *363*			- 52	
Natural resources	*Value added*		*692*				*692*				
	Total economy	*1 719*	*1 356*								
	6. National environment		Natural resources supplied to industry	Natural resources supplied to consumption		Natural resources extracted by ROW				Net accumulation of natural resources in the national environment	0
			256	1		1				- 258	
	7. ROW origin		Natural resources supplied to industry	Natural resources supplied to consumption						Net accumulation of natural resources in the ROW	0
			5	1						- 6	
Ecosystem inputs	8. National environment		Ecosystem inputs to industry	Ecosystem inputs to consumption		Ecosystem inputs to ROW economy				Net accumulation of ecosystem inputs in the national environment	0
			118	23		2				- 143	
	9. ROW origin		Ecosystem inputs to industry	Ecosystem inputs to consumption						Net accumulation of ecosystem inputs in the ROW	0
			3	1						- 4	
Residuals	10. National origin		Residuals re-absorbed by production		Waste to landfill sites				Cross boundary residual out-flows	Net accumulation of residuals in the national environment	409
			7		26				4	373	
	11. ROW origin							Cross boundary residual in-flows		Net accumulation of residuals in the ROW	9
								8		1	
Total supply		701	831	65	145	104		409	9	0	2 264

Source: 2008 System of National Accounts.

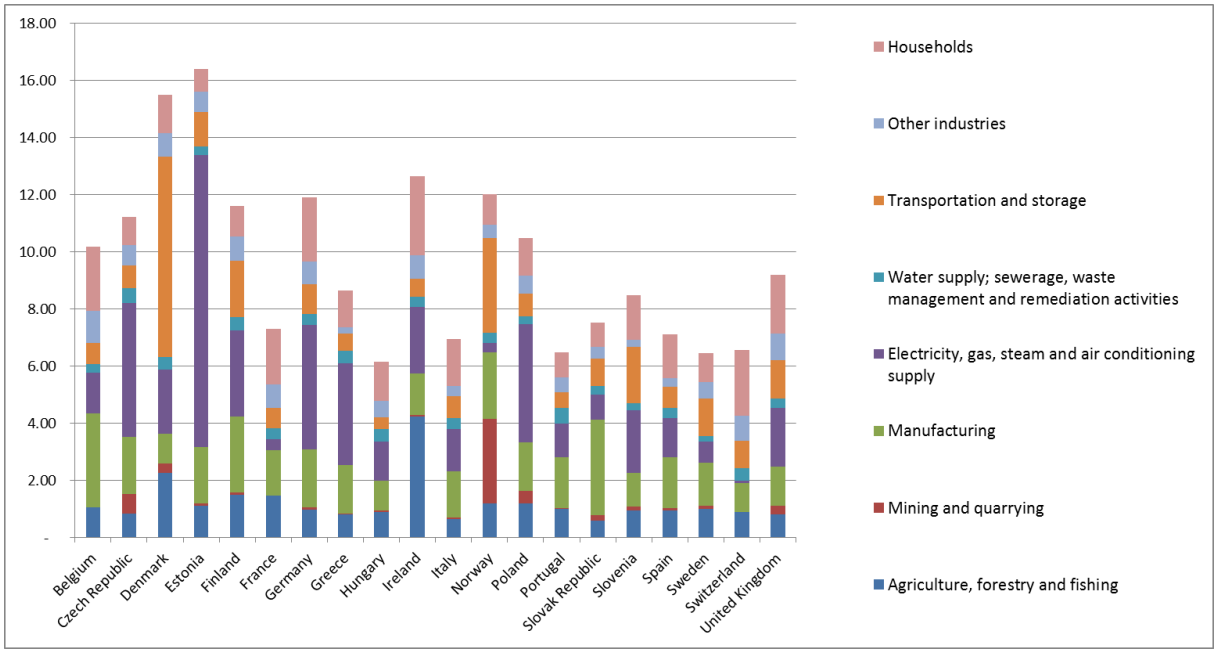
4.4.2 Results

82. Several countries already compile environmental accounts consistent with the SEEA 2012 guidelines. As the SEEA is set up according to a modular approach, the modules that are implemented may differ across countries. Within the OECD and Eurostat data are collected on several of these modules. This subsection presents some of these results.

83. Figure 14 presents results for a range of countries based on air emissions accounts. These accounts record emissions to the atmosphere of six greenhouse gases as well as five other air pollutants, in tonnes of emissions per capita broken down into main industries and the household sector. The figure shows to what degree countries are currently exposed to greenhouse gasses and which industries are mainly responsible for these emissions, in that regard negatively contributing to the environment and to (the sustainability of) well-being of households in general.

84. Results show that Estonia and Denmark record the largest per capita greenhouse gas emissions, which is mainly caused by the transportation and storage industry in Denmark and by electricity, gas, steam and air conditioning supply in Estonia. This latter category turns out to be the largest contributor to greenhouse gas across countries, followed by manufacturing. On the other hand, the figure also shows that households are an important contributor to greenhouse gas emissions in most of the countries, mainly related to the consumption of energy products for transport and housing.

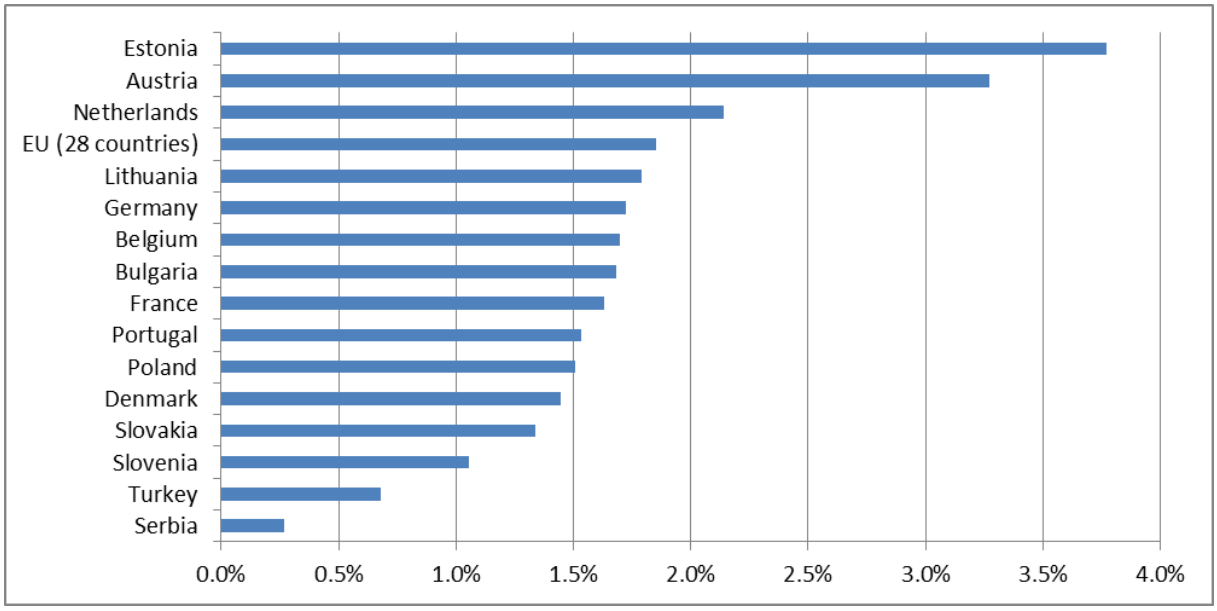
Figure 14: Per capita greenhouse gas emission per industry, 2014 (in tonnes of CO2 equivalent).



Source: Air emission accounts from OECD.stat

85. To have more insight in measures that are being taken by countries to protect the environment and therewith to improve well-being, data is also collected within the SEEA on how much countries spend on environmental protection. Figure 15 shows these expenditures as percentage of GDP for a number of European countries. It turns out that within the European Union expenditures on environmental protection amount 1.9% of GDP on average. Estonia, Austria and the Netherlands spend above average amounts, whereas the share of GDP that goes to environmental expenditure is relatively low in Serbia and Turkey.

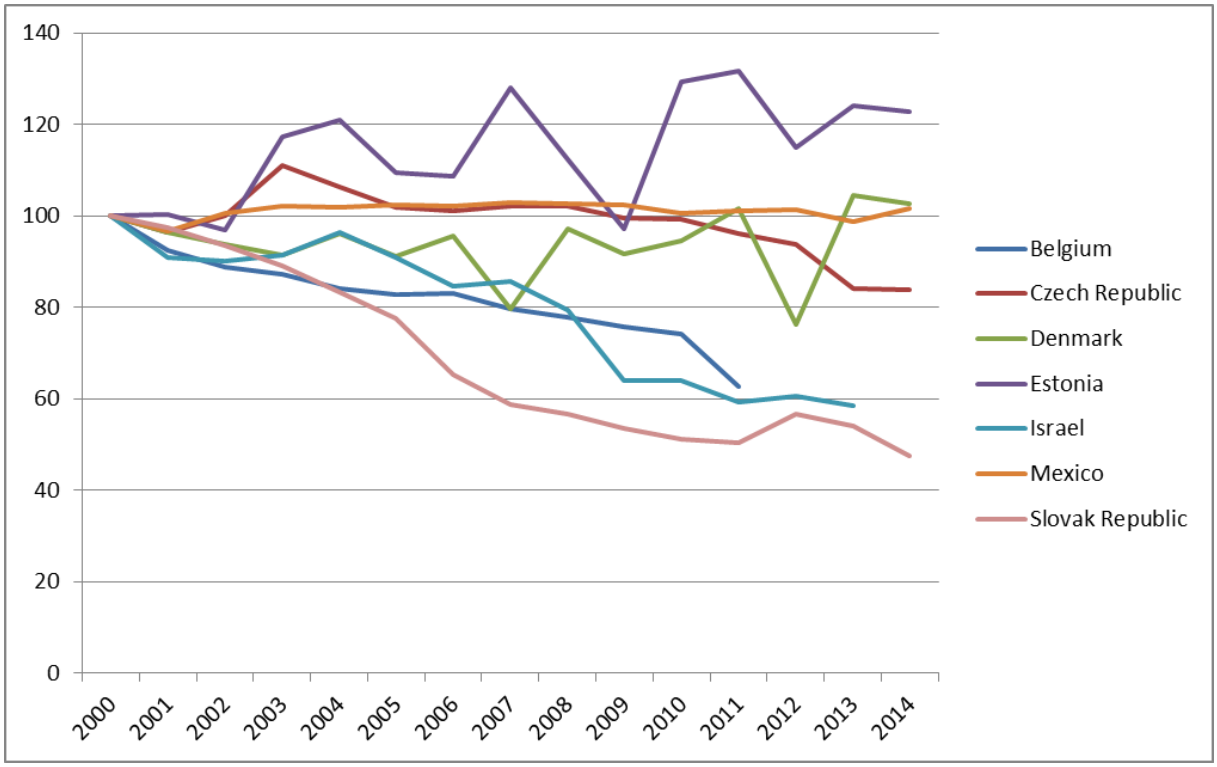
Figure 15: Environmental expenditure as percentage of GDP, 2013.



Source: Eurostat.

86. Finally, information is also collected on the degradation of natural resources and ecosystems. For the time being, this is mainly done on the basis of physical flow data. Figure 16 shows an example for developments in the abstraction of freshwater resources, related to use for irrigation, industrial processes and cooling of electric power plants. As these form major pressures on freshwater resources, it is important to monitor their developments over time. The figure shows that for the period 2000-2014 most countries experienced either a reduction or a stabilization of their abstractions from freshwater resources, with the exception of Estonia where the level in 2014 was more than 20 percent higher than in 2000. On the other end, it can be observed that the Slovak republic almost halved its freshwater abstraction over the 14 year time period, whereas also Israel and Belgium experienced large reductions. Although it has to be borne in mind that the absolute abstraction levels may show much variation across countries, the figure clearly shows that the trend for most countries is downwards.

Figure 16: Freshwater abstractions in m^3 (index with 2000 = 100).



Source: Freshwater abstractions from OECD.stat.

4.4.3 Remaining challenges

87. Although a lot of progress has already been made on developing guidance on how to construct the various modules of the environmental-economic accounts, some challenges still remain. For example, discussion is continuing on the valuation of natural assets and their depletion. Although some guidance is already available for these types of assets, it shows to be quite complicated to arrive at an internationally comparable set of data, using similar data sources and methodologies. In this respect, further guidance is being developed, amongst others by the OECD. One of the most challenging issues, however, relates to the proper valuation of assets and flows related to ecosystems. It turns out to be very difficult to assign a monetary value to these specific types of assets and to their degradation. As stated before, experimental guidance is being developed. But even if one may be able to make adequate estimates on, for example, the degradation of ecosystems, combining these results with traditional national accounts remains a profound conceptual challenge.

88. In addition to developing further guidance, more (national) efforts are needed to further expand the coverage of the environmental-economic accounts, on which there remains hardly any conceptual debate. Whereas some countries are already quite advanced in compiling environmental-economic accounts including a considerate level of detail, some other countries have just recently started working on the compilation and still need to look into further broadening the number of modules, the level of detail in their accounts, as well as into the length of their time series. Therefore, in order to arrive at a broader coverage of environmental accounts, it is also important that countries continue investing in the compilation of their SEEA in the years to come.

5. Conclusions

89. This paper discussed several initiatives that have been conducted over the last couple of years to provide more information on how households are faring and to better capture material well-being and sustainability within the system of national accounts. Some of these initiatives start from information that is already available within the national accounts, presenting them in a different way to put more emphasis on the household sector (the household dashboard) or to focus on specific aspects related to well-being (satellite account on education and training), or trying to break them down into more granular data to provide more insight in developments for various household groups (the work on compiling distributional results on household income, consumption and savings). Other initiatives focus on further expanding the boundaries of the system of national accounts to also include aspects that directly affect (the sustainability of) well-being of households but are not captured within the central framework (satellite accounts on unpaid household activities, human capital, and environmental-economic accounting). As they all take the system of national accounts as their starting point, it ensures harmonization and consistency of methodology, as well as comparability of results across countries, which is an important requirement for the usefulness of these data.

90. These initiatives can be regarded as important steps forward and some of them have already led to national and international publications. The household dashboard is updated on a regular basis with country analyses being released a couple of times a year, and also at the country level, as well as by Eurostat, similar initiatives are being employed. Furthermore, various countries already publish data for parts of the SEEA (also made available via international databases), and some countries have started to publish distributional results in line with national accounts totals, as well as satellite accounts for education and training. However, it also has to be borne in mind that a lot of these initiatives are ongoing work of which the results still have an experimental status. More work is needed to further develop guidance and to further improve the methodology to arrive at consistent and comparable datasets for a larger range of countries. In that respect, it is encouraging to see that a lot of effort is put into the further development of these initiatives and that a significant number of countries contribute by providing knowledge and expertise, as well as by engaging in the compilation of experimental results.

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Annex 1. Recommendations of the Commission on the Measurement of Economic Performance and Social Progress

Recommendation 1: When evaluating material well-being, look at income and consumption rather than production.

Recommendation 2: Emphasise the household perspective.

Recommendation 3: Consider income and consumption jointly with wealth.

Recommendation 4: Give more prominence to the distribution of income, consumption and wealth.

Recommendation 5: Broaden income measures to non-market activities.

Recommendation 6: Quality of life depends on people's objective conditions and capabilities. Steps should be taken to improve measures of people's health, education, personal activities and environmental conditions. In particular, substantial effort should be devoted to developing and implementing robust, reliable measures of social connections, political voice, and insecurity that can be shown to predict life satisfaction.

Recommendation 7: Quality-of-life indicators in all the dimensions covered should assess inequalities in a comprehensive way.

Recommendation 8: Surveys should be designed to assess the links between various quality-of-life domains for each person, and this information should be used when designing policies in various fields.

Recommendation 9: Statistical offices should provide the information needed to aggregate across quality-of-life dimensions, allowing the construction of different indexes.

Recommendation 10: Measures of both objective and subjective well-being provide key information about people's quality of life. Statistical offices should incorporate questions to capture people's life evaluations, hedonic experiences and priorities in their own survey.

Recommendation 11: Sustainability assessment requires a well-identified dashboard of indicators. The distinctive feature of the components of this dashboard should be that they are interpretable as variations of some underlying "stocks". A monetary index of sustainability has its place in such a dashboard but, under the current state of the art, it should remain essentially focused on economic aspects of sustainability.

Recommendation 12: The environmental aspects of sustainability deserve a separate follow up based on a well-chosen set of physical indicators. In particular there is a need for a clear indicator of our proximity to dangerous levels of environmental damage (such as associated with climate change or the depletion of fishing stocks.)