EURONA

EUROSTAT **R**EVIEW
ON **N**ATIONAL **A**CCOUNTS
AND MACROECONOMIC
INDICATORS

1/2019

eurostat

EUROSTAT REVIEW ON NATIONAL ACCOUNTS AND MACROECONOMIC INDICATORS

1/2019

Printed by Imprimerie Bietlot in Belgium
Manuscript completed in June 2019

Luxembourg: Publications Office of the European Union, 2019

Theme: Economy and finance
Collection: Statistical books

Print	ISSN 2443-7832	Cat.: KS-GP-19-001-EN-C
PDF	ISSN 1977-978X	Cat.: KS-GP-19-001-EN-N

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Aims and scope

EURONA is an open access, peer-reviewed, scholarly journal dedicated to National Accounts and Macroeconomic Indicators. EURONA aims at providing a platform for researchers, scholars, producers and users of macroeconomic statistics to exchange their research findings, thereby facilitating and promoting the advancement of National Accounts and Macroeconomic Indicators.

EURONA publishes empirical and theoretical articles within the scope of National Accounts and Macroeconomic Indicators, as well as articles on important policy uses of these statistics. They may relate to both users' and producers' interests, present subjects of general relevance or investigate specific topics.

EURONA is non-partisan and applies the highest standards to its content, by emphasising research integrity, high ethical standards, validity of the findings and cutting edge results. EURONA gives room to all viewpoints.

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Editors

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Editorial

The 50th session of the United Nations Statistical Commission, held in March 2019, welcomed the establishment of three dedicated work streams to review the relevance of the 2008 System of National Accounts (SNA) for measuring new economic and social developments. The three work streams concern digitalisation, globalisation, and well-being and sustainability. Work on these topics will determine the directions to be taken in the next iteration of the SNA.

The four articles presented in this issue of EURONA contribute to the work on these streams. In the first article, Peter van de Ven discusses the measurement of sustainability and well-being in the SNA, with a particular view to the future. He also touches upon the impact of digitalisation on well-being in the annex. He argues that expanding the system of national accounts with a standard set of inter-related accounts on, for example, the environment, health, education and time use, will provide consistent information on economic, social and environmental aspects, allowing policymakers to go beyond GDP as a yardstick for defining success.

The other three articles are globalisation-related. The authors of the second article, Mushtaq Hussain, Rami Peltola and Sanjiv Mahajan, discuss the organisation of statistical data collection on multi-national enterprises (MNEs). They emphasise the importance of a coordinated approach, both within and between countries, in order to ensure a complete and consistent recording of the activities of MNEs. The establishment of so-called large cases units in national statistical offices can be instrumental to this.

Isabelle Rémond-Tiedrez, Juan Manuel Valderas-Jaramillo, Antonio F. Amores and José Manuel Rueda-Cantuche present, in the third article, an analysis of the direct and indirect impact of exports on employment in the EU, on the basis of the data compiled in the 'Full International and Global Accounts for Research in Input-Output Analysis' (FIGARO) project. The paper demonstrates the power of using these data for analysing the impacts of globalisation.

Also related to trade and international relations, Robert Obrzut proposes, in the final article of this issue, a scoreboard of indicators that measure the consistency between national accounts and balance of payments data. This scoreboard can be a tool to monitor improvements that are expected to be made over time, for example during the upcoming benchmark revisions of both statistical systems in 2019 and 2020.

The four articles thus cover four different subjects, which have in common that they are very topical and relevant for the upcoming debate on the future of the SNA. I hope you will enjoy reading them.

Paul Konijn

Editor of EURONA

1 Measuring economic well-being and sustainability: a practical agenda for the present and the future

PETER VAN DE VEN [1]

Abstract: Gross domestic product (GDP) is the most widely used indicator from the system of national accounts. Although often interpreted as an indicator for (economic) well-being, it first and foremost monitors economic activity, and falls short of reflecting broader measures which try to capture well-being of people and sustainability. In 2009, the Stiglitz-Sen-Fitoussi Commission, in its *Report on the Measurement of Economic Performance and Social Progress*, put forward a number of recommendations to address this apparent disconnect. The report has been an important driver of the statistical agenda of the Organisation for Economic Cooperation and Development (OECD).

This paper provides an overview of the main initiatives at the OECD in the context of national accounts. First it discusses work *within* the current system of national accounts, by giving more prominence to households. Going beyond the current system of national accounts, the paper addresses issues related to the impact of unpaid household activities on traditional measures of economic activity and to sustainability, tackled by implementing the System of Environmental Economic Accounts (SEEA). The paper ultimately proposes a broader accounting framework that goes well beyond the traditional macroeconomic framework of national accounts and that tries to establish a link with well-known initiatives to monitor well-being at large via for example the OECD Better Life Index.

JEL codes: E01, E61, I30, I31, M41, Q50

Keywords: (economic) well-being, environmental-economic accounting, GDP, national accounts, sustainability

(1) Peter van de Ven is Head of National Accounts at the Organisation for Economic Cooperation and Development (OECD). The views expressed herein are those of the author and should not be attributed to the OECD. The author is accountable for any mistakes in this paper.

1. Introduction

GDP is an indicator of a society's standard of living, but it is only a rough indicator because it does not directly account for leisure, environmental quality, levels of health and education, activities conducted outside the market, changes in inequality of income, increases in variety, increases in technology, or the — positive or negative — value that society may place on certain types of output ([2]). *Critics have long argued that GDP is a flawed metric of global development: (a) it fails to capture much of what we want to know about human well-being; (b) it registers as a positive achievement some economic activities that are detrimental to well-being; (c) it measures increases in economic activity that occurs within a nation but it fails to reflect how much of that economic gain stays within that country; and (d) in its emphasis on the maximization of per capita GDP it fails to take into account the distribution of the economic benefits within that country* ([3]). According to Philipsen (2015), GDP is quality-blind, people-blind, justice-blind, ecosystem-blind, complexity-blind, accountability-blind, and purpose-blind. Reading all of this literature, it is possible to get the feeling that was best reflected by someone — who shall remain anonymous — who stated, when discussing an article in the Financial Times on David Pilling's book *The Growth Delusion: Wealth, Poverty and the Well-Being of Nations* (Pilling (2018)): *In the article, the author forgets to mention that GDP does not measure the distance between the planet earth and the moon, nor the depth of the Atlantic ocean and the quality of water in it.*

The above quotes are some examples from a vast and growing literature on what could be referred to as 'GDP-bashing', or more neutrally formulated, GDP-criticism to dethrone economic growth as the ultimate objective for economic analysis and related government policy. It is not the goal of this paper to counter this GDP-criticism, but at the start I would like to shortly mention three basic flaws in this sometimes quite heated and outspoken debate.

First of all, although often used and also interpreted as such, economic growth cannot be put on a par with changes in (economic) well-being, or welfare, and sustainability ([4]). This is also well recognised in paragraph 1.75 of the System of National Accounts 2008 (2008 SNA; United Nations et al. (2009)): *GDP is often taken as a measure of welfare, but the SNA makes no claim that this is so and indeed there are several conventions in the SNA that argue against the welfare interpretation of the accounts*. In this sense, David Pilling (2018), quoting Terry Ryan, the chairman of the National Bureau of Statistics in Kenya, hits the nail on the head: *(GDP) … is not a meaningless indicator, but you have to understand what its meaning is*. As an indicator of (monetary) economic activity, GDP actually does a pretty good job, but when it comes to monitoring welfare or the well-being of people, it has many fallacies and caveats. Perhaps statistical offices should start to add a standard warning when publishing news releases on the latest growth numbers, stating that inappropriately interpreting economic growth can be damaging to your mental health.

([2]) Kahn Academy; see https://www.khanacademy.org/economics-finance-domain/macroeconomics/gdp-topic/circular-econ-gdp-tutorial/a/how-well-gdp-measures-the-well-being-of-society-cnx.
([3]) FEW Resources.org; see https://www.fewresources.org/gdp--well-being.html.
([4]) Various terms and definitions are used interchangeably for these broader measures of progress. In this paper, the term 'economic well-being' or 'well-being' is used to reflect material living conditions, which determine people's consumption possibilities and their command over resources. For more details, see Chapter 2 of OECD (2013).

Secondly, the system of national accounts is often put on a par with (the volume growth of) GDP. National accounts however provide a complete, consistent and systematic overview of all (monetary) transactions in an economy. As such, it is an extension of the double entry method of bookkeeping first developed and applied by 14th century merchants in Venice (Gleeson-White (2011)) ([5]). It actually is a beautiful and elegant system from which a variety of macroeconomic indicators can be derived, not only GDP but also, among many others, gross national income (GNI), household (adjusted) disposable income, household final consumption and saving, corporate profits and balance sheets. GDP may be the most widely used indicator, but that does not necessarily mean that it is the most important indicator from the system of national accounts when it comes, for example, to tracking household material well-being.

Thirdly, it may not be possible to find what is considered by some as the holy grail, one catch-all indicator that provides a perfect monitoring instrument for welfare or well-being, which also takes into account the present-day losses (or gains) in the possibilities to generate future well-being. The pursuit of such an indicator may lead to a dead end road. Well-being is a multi-faceted phenomenon that may only be captured by a dashboard of indicators. An attempt could be made to put a price tag on each aspect contributing to the overall goal of increasing well-being for all, but in a way this also means 'economising', and thereby devaluing, everything that is considered important in life. Taking care of a person's own children, for example, is much more than just providing services similar to day-care services provided by the market economy (although admittedly, for some, raising children is considered to be hard work, with an emphasis on the last word). Putting a considerable price tag on the lives of endangered species simply does not do justice to the importance of biodiversity and the morality of providing opportunities for all species to survive.

One of the most influential initiatives to have a better understanding of well-being is the *Report by the Commission on the Measurement of Economic Performance and Social Progress* by Joseph Stiglitz, Amartya Sen and Jean-Paul Fitoussi (Stiglitz et al. (2009)). The report contains various recommendations, among which the first five are directly related to macroeconomic statistics, as follows:

- 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.

([5]) As both parties entering into an economic transaction are recorded in the system of national accounts, it is normal to refer to the quadruple entry method. Each transaction is recorded four times, in other words, two times, as in bookkeeping, for each party. This also gives multiple opportunities to check and validate the exhaustiveness of the estimates.

The main thrust of these five recommendations is not only to look at (developments in) GDP, but also at household disposable income, the distribution of income, consumption and wealth, and the free services provided by unpaid household activities (taking care of children and elderly people, cooking meals at home, cleaning, and so on). This requires, among other things, the linking of income and finance to the process of production and income generation and giving much more attention to other indicators than economic growth alone.

Importantly, the report does not contain a recommendation to capture well-being objectively in a single metric, by for example monetising all aspects that have a positive or negative impact on well-being. The same holds for trying to capture (environmental) sustainability, by monetising all negative externalities from economic activities on the environment. The report considers well-being as a multi-dimensional phenomenon, and preference is given, at least for the time being, to define the various aspects that affect well-being, and to then select indicators for monitoring developments for each of these aspects.

This paper first provides an overview of the main initiatives at the OECD to better represent (economic) well-being in the context of national accounts. First it discusses, in Section 2, work within the current production and asset boundary of national accounts, by giving more prominence to households. The analysis of the drivers of differences between developments in real GDP versus real household (adjusted) disposable income is part of this project. Furthermore, an on-line dashboard of households' economic well-being and a regular news release on differences between GDP and household disposable income have been introduced to inform the public at large as to the importance of looking at households, and also to make them (more) aware of the richness of the system of national accounts. Arriving at more granular distributional information on income, consumption, saving and wealth of households, consistent with the already available national accounts aggregates for households, is yet another important feature of this project.

Section 3 follows with initiatives that go beyond the current production and asset boundary of national accounts. Estimates have been made of the quantitative impact of including unpaid household activities on traditional measures of economic activity. Some of the practical problems in arriving at suitable estimates are addressed in this section as well. The issue of how to account for free goods and services, which has gained considerable attention in the recent discussions on the potential welfare implications of the digital transformation of the economy and the society at large, is discussed in a separate annex to this article. Section 3 also deals with the way in which sustainability issues can be tackled by implementing the System of Environmental Economic Accounts (SEEA), and thus arriving at a better monitoring of for example the negative externalities from the emission of pollutants, and an improved measurement of (the depletion of) natural resources.

Section 4 discusses a possible future agenda, by looking at the challenges of linking the macroeconomic framework of national accounts (including related satellite accounts ([6])) to well-known initiatives to monitor well-being at large via for example the OECD Better Life Index. Section 5 summarises and concludes.

([6]) The term 'satellite accounts' may lead to negative connotations, as being less important, certainly if used in combination with core accounts or the central framework. Several proposals for an alternative terminology have already been made. See also Section 4.

2. Measuring (material) well-being within the system of national accounts

UK economy posts worst quarterly GDP figures for five years (The Guardian). *Disaster for Theresa May as economic growth slumps to tiny 0.1 % — the worst for five years* (The Sun). *US Economy continues to fly high amidst rising trade tensions* (The Conference Board). *The worst four years of GDP growth in history: Yes, we should be worried* (Forbes).

These are only a few citations from news media on economic growth. For many decades, volume growth of GDP has received considerable media attention. It is also a primary focus of economic policy and economic research. Yet its meaning and its limitations are not particularly well understood, not only by the media and the public at large but also by quite a number of economic researchers. High levels of (growth in) GDP are simply put on a par with developments in the purchasing power of resident households or even broader concepts of welfare or well-being. This supposed linkage between economic growth and economic well-being may actually have held during certain periods of time. For example, in the decades after the Second World War, growth in GDP went hand in hand with growth in employment, increasing income levels for large parts of society, and the possibility to acquire new, well-being enhancing consumer goods like refrigerators, indoor toilets, heating, washing machines, telephones, cars and TVs. The additional income also provided government with the ability to improve education and health nationwide, and to establish financial support programmes for people temporarily unemployed, people having a disability, and retired people. In this sense, the welfare state can be considered as a child of high levels of sustained economic growth.

But it is also clear that this link between continuous increases of GDP and enhanced purchasing power or, more generally, improved (economic) well-being are more and more questioned, debated or considered totally flawed. Although closer aligned to GDP, even the former alignment between GDP and purchasing power does not hold. Take, for example, the Irish growth numbers in 2015, which were highly affected by reallocations of certain activities by multinational enterprises without having a concomitant increase in the incomes of Irish households. Several studies also show a disconnect between GDP growth and changes in median income of people. GDP is far too often pursued as a policy goal, also due to its misinterpretation as a measure of well-being, whereas it is a measure of economic activity. If anything, GDP growth can be interpreted as potentially contributing to the pursuit of increasing well-being, but, certainly in these times of increasing worries about the negative impact of climate change on the sustainability of current growth patterns, it is at best at odds with the goal of (environmental) sustainability and future possibilities to generate well-being. GDP may be instrumental to well-being, but it should not be regarded as a policy goal *per se*.

In this section, some initiatives are discussed which may address this problem of primarily focusing on economic growth. However, what is being discussed in this section is fully consistent with the current production and asset boundary of national accounts. The various initiatives included here do not question the main principles of the current international standards, the 2008 SNA. Other initiatives which go beyond the 2008 SNA are the subject of the next section. Very much in line with Stiglitz et al. (2009), the initiatives described below relate to giving more prominence to indicators on households, and compiling distributional data consistent with national accounts aggregates.

It's about households, stupid!

One small step in the right direction would be to emphasise household disposable income (either as an aggregate or as a ratio per capita or per household), instead of looking at GDP. This indicator, which can be derived from the very same system of national accounts, provides a much better indicator for monitoring the economic well-being of resident households. An even more appropriate indicator would be household *adjusted* disposable income, which also takes into account the (implicit) income related to individual services provided by government for free or at prices that are not economically significant, health and education being the most widespread examples. Alternatively, household final consumption expenditure, or — including the above mentioned individual services provided by government — household *actual* final consumption could be looked at.

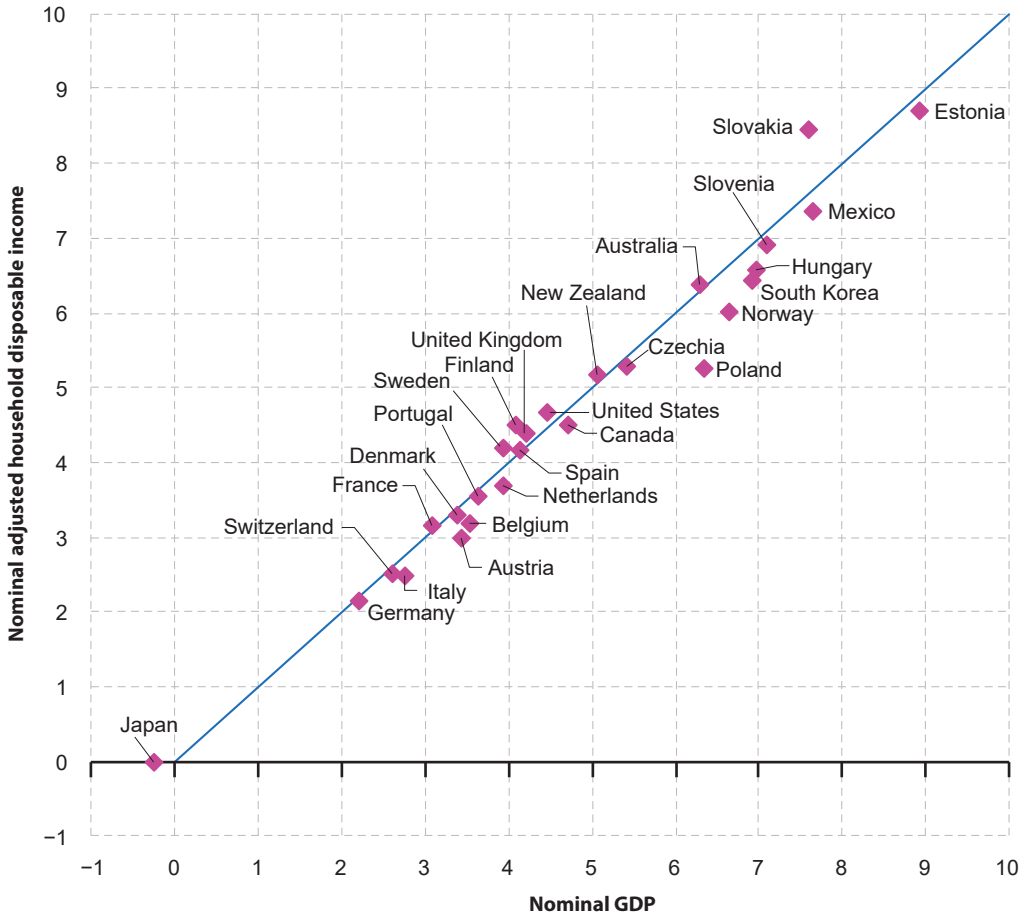
The main drivers of differences between the developments of real GDP and real household disposable income are related to (i) the shares of compensation of employees and income from self-employed and unincorporated corporations in the value added generated through the production process; (ii) the redistribution of income by government policy; and, in some more exceptional cases, (iii) quite distinct movements between the price change of GDP and the price change of household final consumption. The latter has happened, for example, in resource-rich countries where increasing energy prices materialised into relatively high nominal changes of GDP and household income which were not matched by equivalent changes in consumption prices.

Figure 1 below presents a comparison between average nominal growth rates of GDP versus household adjusted disposable income for the period 1996-2013 for a selection of 27 countries, as derived from an OECD study (Ribarsky et al. (2016)). Although the deviations may seem small, a difference of 0.5 percentage points per year (for example in Australia) leads to an excess of growth of about 15 percentage points over a period of 17 years. Furthermore, within shorter periods of time, the differences may be much more substantial. Certainly in the case of economic shocks, such as the 2008-2010 financial and economic crisis, quite divergent patterns can be observed, where the sudden drop in economic activity did not affect household disposable income in the first years after the crisis, mainly because governments mitigated the adverse impacts of increased unemployment on income. Only later did austerity programmes have a negative impact on household income, thereby aligning long-term developments of GDP and household disposable income.

Analyses like the one above are useful to have, as they are important to understand the link between GDP and household disposable income. But if the attention of the media, policymakers, politicians and the public at large is to be redirected away from this almost exclusive focus on economic growth, policies with respect to dissemination and communication also need to change. Here, two changes have been introduced at the OECD. First of all, the OECD dashboard of households' economic well-being went live in 2015. Secondly, although economic growth still features most prominently in the OECD's news

Figure 1: Average annual rate of change of nominal GDP and nominal household adjusted disposable income, 1996-2013

(%)



Note: 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: OECD study (Ribarsky et al. (2016))

releases for national accounts aggregates (sorry, we are not there yet), it was decided to replace one of the standard releases on GDP growth (the one on contributions of expenditure categories to growth) by a news release on household disposable income. In addition, *OECD statistical insights* are being produced and disseminated on household economic conditions. These initiatives are shortly discussed below, after which some recent, more general data compilation initiatives are also presented.

The OECD dashboard of households' economic well-being ([7]) consists of four blocks of two or three indicators, which are updated quarterly, with a delay of approximately four months after the reference quarter. Each block of indicators presents a certain aspect of economic well-being, as follows:

- income — GDP per capita, household disposable income per capita, and net cash transfers (mainly from government) to households;
- final consumption — consumer confidence, household consumption expenditure per capita, and households' saving rate;
- wealth — households' indebtedness, and households' financial net worth;
- employment — the unemployment rate, and the labour underutilisation rate.

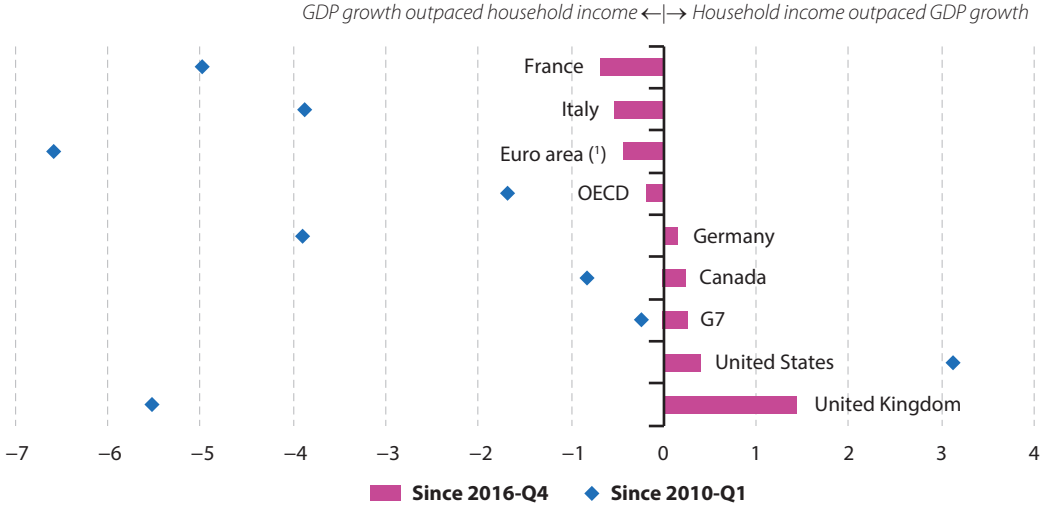
In some cases, the preferred indicator has been sacrificed on the altar of data availability. For example, as noted above, it would have been preferable to include household *adjusted* disposable income, instead of household disposable income, but this would seriously limit the (timely) country coverage. The same holds for households' financial net worth, where total net worth, in other words, including non-financial assets, would be the preferred measure.

Secondly, at the beginning of 2018, the OECD started to put further emphasis on household income developments, by disseminating quarterly news releases on *OECD growth and economic well-being*. The objective of this new series of news releases is to show whether economic growth has actually led to improvements in household income, both in the most recent quarters and over a longer period of time. Figure 2 shows, for example, that since the first quarter of 2010 economic growth has outpaced growth in real household disposable income in most OECD countries, the United States being the exception for those countries presented in the figure. In the euro area as a whole, the differences were most significant, with GDP growth outpacing the growth of household income by a total of 6.6 percentage points since the first quarter of 2010.

Another example of trying to promote alternative indicators to a larger public is the use of *Statistical Insights*, an OECD dissemination channel that resembles a blog. At the end of 2016, a *Statistical Insight* was published to show, among other things, level comparisons of GDP per capita versus household adjusted disposable income per capita across countries; see Figure 3. The latter indicator can have a significant impact on the ranking of some countries. For example, Ireland, Norway and Switzerland, and to a lesser extent Denmark and the Netherlands, have a relatively lower ranking for household income, as compared with GDP per capita. Other *Statistical Insights* have addressed issues like household debt and financial resilience, economic vulnerability of households, and so on.

([7]) See http://www.oecd.org/std/na/household-dashboard.htm.

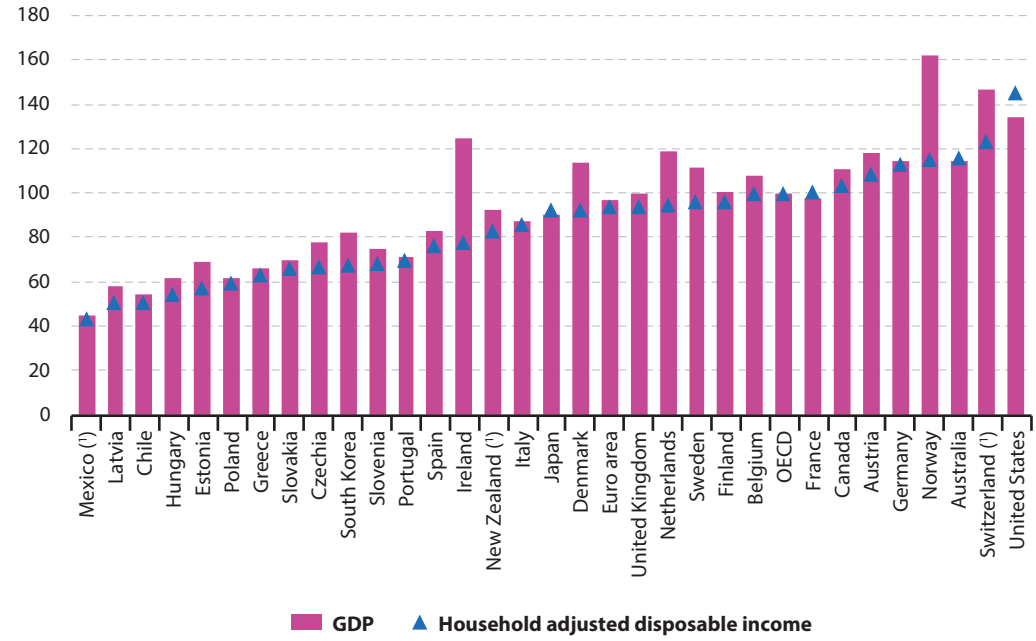
Figure 2: Comparison of growth in GDP and growth in household income, 2018-Q4
(percentage points difference in cumulative growth rates of real household income per capita and GDP per capita)



Note: the difference in cumulative growth rates of real household income per capita and GDP per capita since 2010-Q1 for the euro area is significantly impacted by the relocation to Ireland of economic activities of a limited number of multinationals over this time period (see for more information the following link). When excluding the results for Ireland, the gap in growth rates since 2010-Q1 for the euro area would have been -5.4.

Source: OECD news release (7 May 2019)

Figure 3: GDP per capita and household adjusted disposable income per capita, 2014
(current price US dollar PPPs, OECD = 100)



(1) Household adjusted disposable income: 2013.

Source: OECD Statistical Insight (6 October 2016)

More generally, there is nowadays much more attention to compiling a fully-fledged system of national accounts, including institutional sector accounts, which provide an overview of all incomes and expenditures, financial transactions and balance sheets for the main institutional sectors of the economy: non-financial corporations, financial corporations, general government, households, non-profit institutions serving households (NPISHs), and transactions and positions with the rest of the world ([8]).

Three main developments have caused this gradual shift in focus from production to income and wealth. The first one concerns the well-being agenda, reinforced by Stiglitz et al. (2009), as mentioned above. The second longer term development having caused this shift relates to the increasing impact of developments in (financial) wealth on the real economy and *vice versa*. Developments in finance can affect economic growth and employment for longer periods of time. The most dramatic example of this increasing role of finance is what constitutes the third reason for the shift: the 2008-2010 financial and economic crisis. Although filling data gaps would probably not have prevented the crisis, the crisis did lead to a thorough reflection of data needs for policy and research: the G-20 Data Gaps Initiative (DGI) ([9]). This G-20 DGI has put forward 20 recommendations for improving statistics, grouped together into four main categories: (i) better capturing the build-up of risk in the financial sector; (ii) improving data on international financial network connections; (iii) monitoring the vulnerability of domestic economies to shocks; and (iv) improving the communication of official statistics. The core recommendation under the third category relates to having timelier, more detailed and high quality data on institutional sector accounts, including financial accounts and balance sheets. Apart from getting more and better data on households across countries, such data would also make it possible to have an improved analysis of the interactions between the real economy and the financial economy. They also provide the statistical backbone for the analysis of potential vulnerabilities at sector level, for example the build-up of unsustainable debt levels.

Distribution of income, consumption, saving and wealth

Every American should have above average income, and my Administration is going to see they get it is assumed to have been said by an American president on a campaign trail. That may be very hard to achieve, but it is clear that the distribution of income, consumption, saving and wealth is very high on the policy agenda, certainly after the best-seller *Capital in the Twenty-First Century* by Thomas Piketty (Piketty (2014)). Looking at it from an economic well-being perspective, (growth in) absolute levels of income and wealth may matter a lot, especially when starting from low levels, but it is also clear that income and wealth relative to others in the group affects the well-being, and most certainly the perceived well-being of people, to a significant degree. Distributional issues are important not only in terms of income and wealth, but also in other areas such as access to health and education. The current dissatisfaction of large parts of the population in developed countries may well be caused by a substantial part of the income growth generated by higher levels of production ending up in the pockets of the rich and advantaged and not trickling down into improvements of income for the median income earner and households in the lower income quintiles. The main policy question here is how to arrive at economic growth that benefits all people in society: how to arrive at a more inclusive growth.

([8]) In practice, households and NPISHs are often combined due to lack of source data, but this usually does not have a major impact on the monitoring and analysis of the household sector.
([9]) In the meantime, the G-20 DGI has entered into a second phase. For further information, see Bese Goksu and Van de Ven (2015) and Heath and Bese Goksu (2016).

Within the system of national accounts, it is relatively easy, from a conceptual point of view, to incorporate distributional information by disaggregating the households' sector into various subgroups, be it on the basis of relative income levels, household composition, or main type of income, and so on. Annex 1 of the 2008 SNA includes a substantial number of different subsectors for corporations and government (there are 97 different subgroupings for financial corporations), yet for households it only contains one sub-classification of seven subgroups according to the main type of income households receive. However, the word 'conceptual' should be emphasised here. In practice, major data inconsistencies occur, and it is not at all straightforward to get relevant distributional statistics containing information on the level of individual households aligned to the macro aggregates reported in the system of national accounts ([10]).

In national accounts, data on the households' sector, at least the level estimates for income, consumption and wealth, are often compiled as a residual of the transactions and positions of other sectors, whose source information is generally considered more reliable. For example, government data are used to estimate receipts of social benefits and payments of taxes and social contributions by households. Similarly, data from financial corporations are used to estimate interest payments and receipts of households. On the other hand, micro statistics containing granular information on the distribution of income, consumption and wealth across households are typically compiled using direct sources, either surveys or administrative data. As a consequence, aggregates from microdata on households diverge from the equivalent aggregates from national accounts, creating problems as to how to link and align the two datasets. The relevant gaps can be quite substantial, as shown in Figure 4 for the main income items across a number of countries. While in most countries the coverage rate for compensation of employees, taxes, social contributions and social benefits are generally acceptable, the same does not hold for mixed income ([11]), distributed income of corporations (dividends) and interest. In the case of consumption and wealth, similar patterns in the coverage of micro statistics as compared with the relevant national accounts aggregates can be observed.

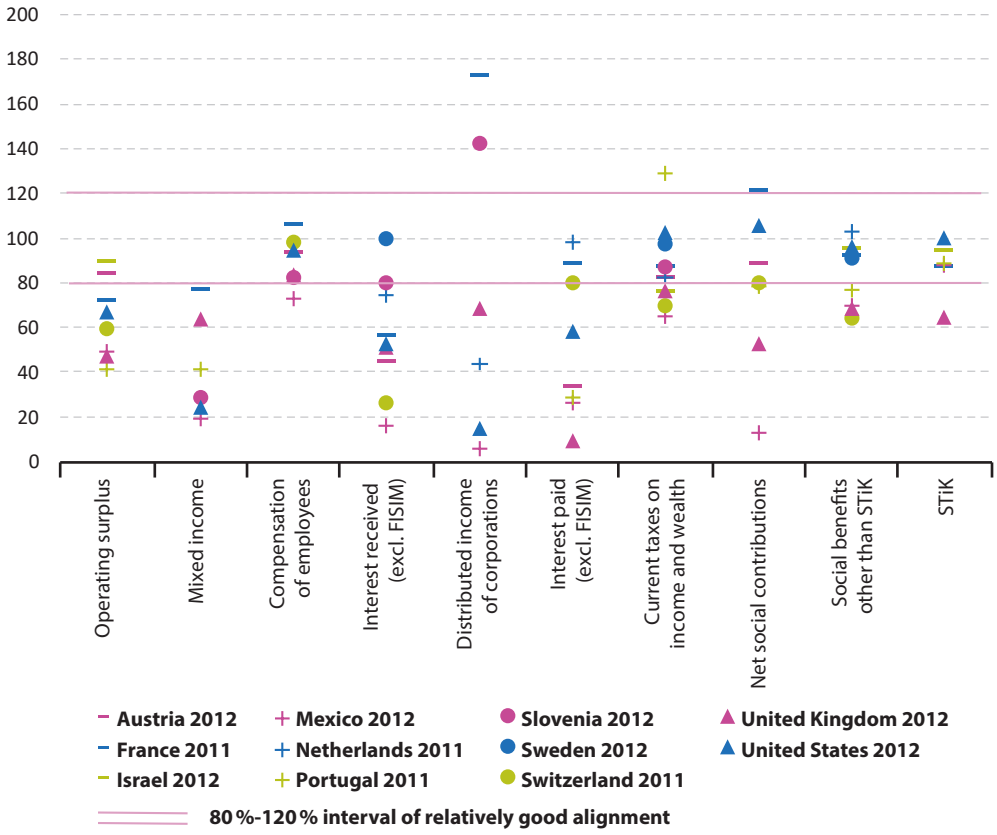
The main problems are thus how to match the relevant data and how to allocate the gaps between the two estimates to the various household subgroups ([12]). Considerable work has been done and is currently being done in this area, both nationally and in international organisations, such as the European Central Bank (ECB), Eurostat and the OECD. In the past, this type of work of trying to reconcile micro and macrodata on income, consumption and wealth was often done in the context of compiling social accounting matrices, not only for developed countries but even more so for developing countries; see for example (Kazemier et al. (1999)), (Keuning (1995)) and (Timmerman and Van de Ven (1994)). But only recently it received much more attention after the 2008-2010 financial and economic crisis, reinforced by the publication of the Stiglitz-Sen-Fitoussi Report and the best-seller by Thomas Piketty.

([10]) Note that in the statistics underlying the research and analysis in Piketty (2014), the whole of gross domestic product (GDP), instead of household disposable income and its components, is allocated to household groups. This means that in Piketty's methodology various (additional) imputations had to be made to allocate income that — in reality — has not been received by households, for example non-distributed profits of corporations, government surplus/deficit, and so on. For an evaluation of the methodology described in this paper and the methodology applied by the Piketty research team, reference is made to Zwijnenburg (2018).

([11]) Mixed income refers to the income of self-employed persons and the income from owning and running an unincorporated enterprise. In addition to the operating surplus of these enterprises, mixed income also includes an implicit compensation for the labour input of the owner and/or family members.

([12]) Alternatively, a decision to revise the macro estimates from national accounts may be needed.

Figure 4: Coverage rates for the main income components
(micro aggregates divided by the adjusted national account totals)



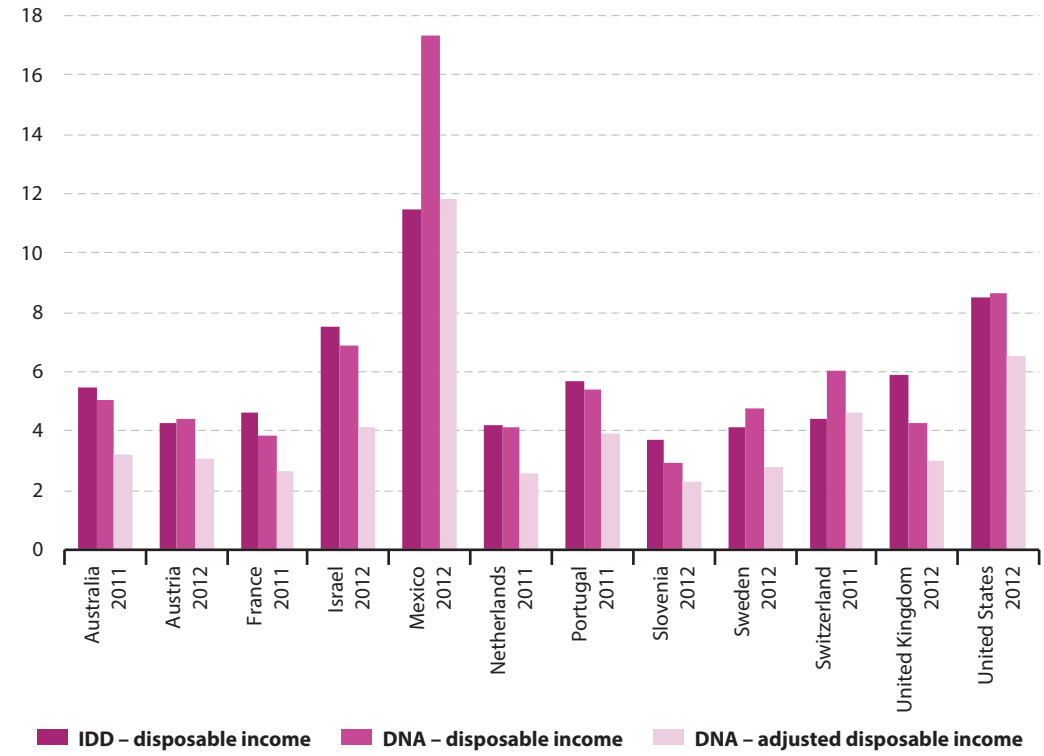
Source: Zwijnenburg et al. (2017)

In 2011, Eurostat and the OECD launched an expert group, with the goal to carry out a feasibility study on the compilation of distributional measures of income, consumption, saving and wealth across household groups consistent with national accounts data. A first round of estimates on the distribution of income, consumption and saving by income quintile was published in 2013, followed by a second round in 2015 ([13]); see Zwijnenburg et al. (2017) for a more detailed description of the sources, methods and results of the second exercise. Apart from discussing ways to allocate the gaps to different household groups, the group also agreed on the allocation of social transfers in kind, in other words the goods and services provided for free or at significantly reduced prices by government, predominantly consisting of health and education. While education can be allocated on the basis of actual use, such a procedure leads to very counterintuitive results in the case of health. Disposable income and final consumption would explode in a period that someone becomes very ill. Therefore, preference is usually given to an allocation based on the insurance cost method, in other words what would a person with certain characteristics typically pay for a health insurance.

([13]) At the time of drafting this paper, a new round has just been finalised.

One of the problems related to the above exercises is that the distributional results will differ from the numbers that have been disseminated up to now using only micro statistics. Figure 5 presents the impact of aligning microdata to the system of national accounts for a number of countries, by looking at the relative position of the top 20 % of households with the highest incomes to the bottom 20 % of households with the lowest incomes. It shows that the impact differs across countries, with some countries showing higher disparities using data aligned to national accounts (DNA — disposable income), as compared with the original microdata (IDD — disposable income). More substantial differences, with aligned data showing higher disparities, can be found for Switzerland and especially Mexico. In Mexico, the underrepresentation of the rich and wealthy in micro surveys is considered a major issue, as a consequence of which it has been decided to allocate the very substantial gaps in mixed income and property income in a disproportional way to the highest income quintile. On the other hand, the results for the United Kingdom show a smaller disparity for national accounts data. Looking at the results after adjusting disposable income for social transfers in kind, the lowering impact of these transfers on income disparities can be easily seen. In absolute terms, the relevant transfers are often relatively equally distributed across households, thus having a much more substantial impact in relative terms on the income levels of the lower income quintiles.

Figure 5: Relative position of the 20 % highest to the 20 % lowest income households, by equivalised disposable income quintile
(S80/S20 disposable income quintile share)



Source: Zwijnenburg et al. (2017)

As these alignment procedures call into question, if only implicitly, the quality of the distributional statistics disseminated up to now, the whole exercise is looked upon with some scepticism by parts of the statistical community. Apart from arriving at two alternative estimates for the distribution of income, consumption, saving and wealth, some argue that it is simply impossible to allocate the gaps to the various household groups adequately, especially when it concerns transactions and positions for which the differences between micro and macro data are relatively large. This is a red herring. It may be argued that these issues cannot be solved and that they have to be endured, but it is also clear that statistical offices momentarily publish two diverging and sometimes contradicting datasets on household disposable income and household final consumption, indicators which relate to one of the most important policy issues. In this respect, it should also be realised that not only can levels be quite different, but that developments in income and consumption may also diverge substantially. In Pinkovskiy and Sala-i-Martin (2015), for example, it is mentioned that in some developing countries growth of consumption per capita according to national accounts was over 100 % between 1994 and 2010, while micro surveys showed an increase of only 29 % in this period. Obviously, this has massive implications for policy and research. Current official statistics also tend to ignore the discrepancies between often quite independently conducted micro surveys on income, consumption and wealth, leading to implausible results for savings, and/or inconsistencies between savings and changes in balance sheet positions.

On the positive side, it has to be acknowledged that more and more countries are doing in-depth research into bridging the gaps between micro data and macro aggregates, also leading to improvements in the system of national accounts. At the time of drafting this paper, several countries have already started to publish the results of their research on compiling distributional information consistent with the national accounts aggregates for income, consumption and wealth (Australia, Canada, France, and the Netherlands), for income and consumption (New Zealand, Slovenia and the United Kingdom), and for financial wealth (the United States), while others have more or less advanced plans to disseminate (extended) results (Sweden and the United States).

The next steps in the project are fourfold. First of all, the goal is to further improve the methodology, and to arrive at improved distributional results. In addition to further exploring the potential for applying more sophisticated methodologies to allocate the gaps between micro and macro data, this also concerns a more in-depth analysis of the results for saving, in other words the difference between disposable income and final consumption expenditure, by household group. The relevant numbers are sometimes remarkable, to say the least. Most countries show substantial negative saving rates for the lowest income quintile, with one country having negative rates up to the fourth income quintile. The question is whether this is economic reality or a statistical artefact. Here, having longer time series would allow for a more structural analysis of the saving rates.

Secondly, current exercises were 'limited' to income, consumption and saving. To have this extended to cover wealth would be a highly desired objective, as it would not only significantly enrich the dataset, but it would also enhance the possibilities to cross-check the results on saving and the data on changes in wealth.

Thirdly, the more general target of the exercise is to have distributional data for as many countries as possible and that these data are as timely as possible. In the case that countries — for a variety of reasons — do not yet wish to participate in the exercise, research will be done into the development of standardised methodologies to extend the dataset by making own estimates, either from Eurostat or from the OECD, which could subsequently be put to the relevant countries for validation.

Finally, methodologies to produce more timely estimates will be explored by combining less timely structural information from micro surveys and the latest available information from macro statistics such as national accounts, labour force surveys, and so on.

3. Going beyond the current system of national accounts

In the near future it is unlikely that there will be a major update of the international standards for compiling national accounts and as a consequence the definition of GDP is also unlikely to be substantially revised to include, for example, unpaid household activities and/or degradation of ecosystem assets. It has to be accepted that for the time being official GDP numbers are first and foremost to be considered as indicators of income or economic activity, which may be instrumental to the greater good of well-being but should not to be put on a par with (economic) well-being. That is not to say that nothing can or should be done. There is a great need to establish a much closer link between the SNA and the work on well-being and sustainability. Ways to get away from perceiving and analysing the economy as a self-contained and isolated system should be investigated, to try to embed it into the broader framework of ecosystems and societal developments with which the economy interacts and on which it fully depends. Without being able to arrive at a path of environmental sustainability and without using the opportunities to establish a stable and just social environment, there simply is no future for the economy.

In my opinion, the most promising avenue, certainly with enhanced technical capabilities nowadays, is to create a suite of interrelated accounts (and related aggregates and indicators), thereby linking the central framework of national accounts with a number of aspects which are considered important for monitoring progress in environmental sustainability and societal well-being. If it would also be possible to create enhanced linkages between this broader meso–macro information base and various micro datasets, such a system would provide excellent opportunities for analysing trade-offs and win–wins between various aspects of well-being. It could also be instrumental for enhancing sustainability and well-being functions. All of this may take some time, but it would be a perfect starting point for guiding developments and redesigning official statistics.

In this section, two specific examples are described that pertain to recent work carried out at the OECD and also by countries and other international organisations. The point of departure is the current framework of national accounts and the way in which the most substantial and

consistent criticism could be addressed. The vision for the future, which would encompass a broader framework of accounts in which the economy will only reflect part of an overall set of indicators as alluded to above, is the subject of Section 4. The two issues discussed here relate to the recording and measurement of unpaid household activities and accounting for environmental issues. Some of the issues that are currently being debated when it comes to the digital transformation and its potential impact on well-being are addressed in a separate annex in order to avoid a disruption of the main storyline.

Unpaid household activities

One of the most fundamental criticisms when it comes to current international standards for compiling national accounts concerns the non-recognition of unpaid services provided within households as being part of the production boundary. The latter boundary defines which productive activities should (not) be accounted for, and the production of which goods and services do (not) add to output, value added and GDP. By excluding unpaid household activities, the level of GDP is supposedly underestimated, while GDP growth is overestimated in times of increasing labour market participation (which often coincides with a substitution of unpaid household activities, such as preparing meals and taking care of children, with purchasing the relevant services on the market).

When it comes to the production boundary, the 2008 SNA defines a general production boundary, and a more specific boundary to be applied in the actual compilation of national accounts. The general boundary is defined as follows (paragraph 6.24 of the 2008 SNA): *Economic production may be defined as an activity carried out under the control and responsibility of an institutional unit that uses inputs of labour, capital, and goods and services to produce outputs of goods or services. … A purely natural process without any human involvement or direction is not production in an economic sense. For example, the unmanaged growth of fish stocks in international waters is not production, whereas the activity of fish farming is production.*

According to the general production boundary, it is clear that unpaid household activities, such as preparing meals, taking care of children and/or the elderly, as well as cleaning, are part of production. However, the 2008 SNA standards prescribe a more restrictive boundary, specifically in relation to these unpaid services produced within and between households. The production of goods within households, the main example of which relates to subsistence farming ([14]), should always be included, while the production of unpaid services is excluded with the exception of owner-occupied housing and the production of domestic and personal services by employing paid domestic staff. The main reasons for the exclusion of the main part of unpaid household services produced within households are summarised in paragraph 6.30 of the 2008 SNA: *…, the reluctance of national accountants to impute values for the outputs, incomes and expenditures associated with the production and consumption of services within households is explained by a combination of factors, namely 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.*

It could be added that the inclusion of unpaid household activities may also hamper the interpretability of some headline indicators that can be derived from the framework of national

([14]) For other examples of goods production for own final use, see paragraph 6.32 of the 2008 SNA.

accounts. It would lead, for example, to an equivalent increase of household disposable income, which would thus deviate substantially from the common perception of income, including income definitions that are being used in micro surveys and administrative data on households. Some would argue against this point by stating that the SNA already includes various imputations, among which goods produced within households and services of owner-occupied dwellings, but on the other hand it could be stated that there is a substantial difference in terms of consensus on the *economic* relevance of these items, their exact delineation and valuation, and the reliability of estimates ([15]). Moreover, the sheer magnitude of the adjustments needed to include unpaid household services is much larger. Whereas services of owner-occupied dwellings typically stay (well) below 10 % of GDP in OECD countries, the addition of other unpaid household services would lead to a change in the level of GDP in the range of 15-70 %, depending on the country and the methodology applied.

Whatever the case, the above arguments underlying the current production boundary in the central framework of national accounts seem to be more related to practical considerations than motivated by conceptual arguments. On the other hand, when addressing … *the extreme difficulty of making economically meaningful estimates of their values* … , this also concerns problems of appropriately delineating unpaid services produced within households that are to be included. Stiglitz et al. (2009) list a number of these issues, for example the allocation of travelling time and the allocation of eating and drinking time, or the delineation with leisure time more generally. Some will consider gardening as a chore, while others will view this activity as a way to spend their leisure time. As noted by Stiglitz et al. (2009), *many view cooking — and then eating — as a most enjoyable leisure activity, not a chore that is easily substitutable with a meal in a fast food restaurant*. A similar line of reasoning could be applied to taking care of children. Yet another issue concerns the proper allocation of simultaneous activities, such as taking care of children while cooking or cleaning.

Apart from the above more conceptual and theoretical considerations, an important aspect that cannot be overlooked has to do with possible data concerns in relation to the underlying statistics needed to compile estimates of unpaid household services, certainly when taking into account the magnitude of the estimates in comparison with traditional national accounts aggregates. Having high quality data on time use, the typical starting point for compiling estimates for unpaid household activities, is a *sine qua non* to arrive at good estimates of unpaid household services, both in physical and in monetary terms. Looking at the current situation, it would definitely be preferable to have time use data with more granularity in terms of the types of activities and various groups of respondents, for example to further analyse the impact of digitalisation, or to monitor the impact of policies related to an ageing society on the demand for people's time spent on informal care. Furthermore, surveys are conducted quite irregularly, with intervals between consecutive surveys often of five years or longer and with no alignment across countries, as a consequence of which an international comparison for a given benchmark year is not without its complications. They often also lack consistency over time, as a consequence of which developments over time may be compromised to a significant degree. Furthermore, the timeliness of the data is rather poor, with time lags of several years not being exceptional, whereas the first national accounts estimates are typically produced within 30-45 days after the end of the quarter.

([15]) In this respect, purchasing a house usually involves an outright comparison between paying rent and the costs related to taking out a mortgage loan and/or investing own funds. In some countries, the imputed value of the income generated through occupying an own dwelling can be observed as part of taxable income.

All in all, it may be possible to derive some long-term structural developments on the use of time for producing unpaid household services, although with some caveats given the discontinuities of the surveys over time, but most certainly, it is not possible to get more insights on the short-term, cyclical changes over time. For example, there may be great interest in the impact of the 2008-2010 financial and economic crisis, with quickly increasing levels of unemployment, which in most countries is nearly impossible with the current state of affairs.

When integrating data on unpaid household activities into the system of national accounts, it is important firstly to link the number of hours spent on these activities as well as those on leisure time, to the (already available) number of hours spent on paid employment. Such integrated physical measures have a value added in their own right, by providing the ability to monitor shifts between paid employment and various other activities better. To arrive at estimates for the *value* of unpaid household activities, attempts are typically made to establish market-equivalent prices for the relevant services. Two basic options can be distinguished: (i) taking the market price of equivalent services transacted on the market; and (ii) using a cost-based approach. In practice, almost all available studies apply the second approach, as it may be quite difficult to put unpaid household services on a par with similar marketed services (for example cooking meals) and/or to arrive at a proper appreciation of the exact services provided under the various time use categories, while also taking into account differences in quality. In this approach, the level estimates of unpaid household activities are based on the costs of labour input and the capital services derived from consumer durables ([16]).

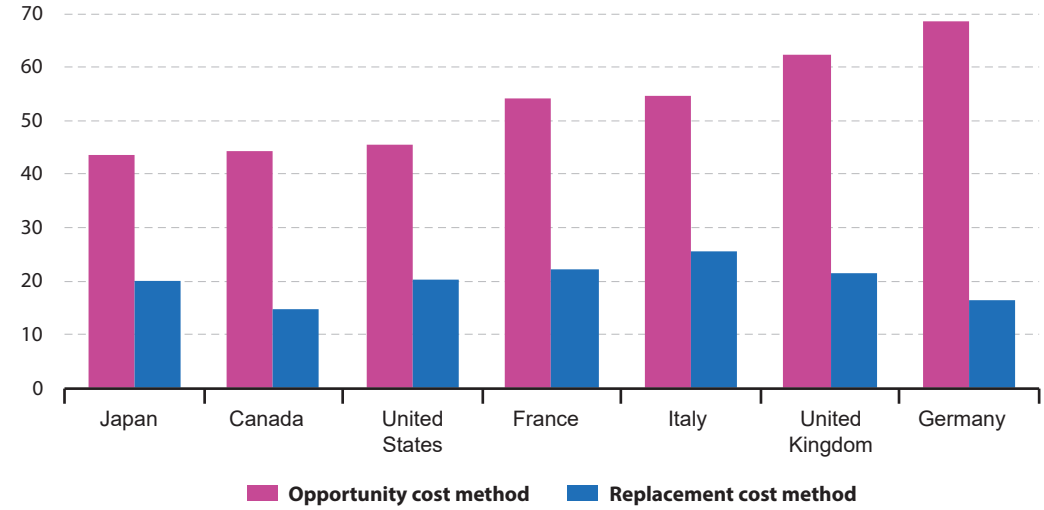
In applying the cost-based approach, the use of either the replacement costs or the opportunity costs for valuing labour input has a substantial impact. In the replacement cost approach — which tries to replicate the costs of the services if they were to be purchased on the market — an average post-tax, hourly wage, representative of the broad range of activities covered in the production of unpaid household services, is constructed. In the opportunity cost approach, the average post-tax, hourly wage across the whole economy is used to try to estimate the market income foregone as a result of spending time on unpaid household activities. The opportunity cost method tends to result in significantly higher numbers for the value added generated by unpaid household activities. Usually the replacement cost method is preferred, as it tries to approximate a market-equivalent price. However, if for some reason a household does not have a choice between purchasing the service on the market and producing the services themselves, the opportunity cost method may be appropriate as well. Another method which uses information on 'experienced well-being during various activities' gives results somewhat in between replacement costs and opportunity costs ([17]).

([16]) To arrive at full output estimates, intermediate goods and services should also be included, such as the ingredients for cooking meals. Often, these are ignored, not only because it is difficult to capture them, but also because it does not affect value added generated by these activities. This also holds for the estimates from Van de Ven et al. (2018).

([17]) For more information, reference is made to Box 2 in Van de Ven et al. (2018). For the countries for which data are available to construct estimates according to this alternative method, the United States exceptionally shows results which are very close to replacements costs.

Figure 6 shows the latest results on the impact of including unpaid household activities for G7 countries, as derived from Van de Ven et al. (2018). When applying the replacement cost approach, it shows that the imputed monetary value ranges from 14.7 % of GDP for Canada to 25.6 % for Italy. The results for the opportunity cost method are substantially higher, and range from 43.7 % for Japan to 68.6 % for Germany.

Figure 6: Own-account production of unpaid household services, 2015
(% of GDP)



Note: data on time use are based on the latest available time use surveys. Canada (2015); France (2009-2010); Germany (2012-2013); Italy (2013-2014); Japan (2016); the United Kingdom (2014-2015); and the United States (2016). Data refer to the population aged 10 years and over for Germany and Japan; to the population aged 11 years and over for France, Italy and the United Kingdom; and to the population aged 15 years and over for Canada and the United States.

Source: OECD Time Use Database (http://stats.oecd.org/Index.aspx?DataSetCode=TIME_USE), OECD SNA tables (http://stats.oecd.org/Index.aspx?DataSetCode=SNA_TABLE1 and http://stats.oecd.org/Index.aspx?DataSetCode=SNA_TABLE5) and OECD, *Taxing Wages*.

Estimating the impact on real growth rates of GDP is seriously affected by the scarce availability of sufficiently long and consistent time series of time use data. However, for a couple of countries, this analysis can be performed, although the results should be interpreted with some care. Including unpaid household activities generally leads to a lowering of the official growth numbers ([18]). Since the 1970s, in quite a number of countries female labour participation has (significantly) increased, as a consequence of which time spent on unpaid household activities has decreased compared with the time spent on paid activities, and unpaid household services

([18]) Note that no allowance has been made to changes in labour productivity in compiling results on the production of unpaid household services over time. For example, a productivity change equivalent to the developments in relevant market activities could be assumed. This would then lower the divergence between economic growth numbers including and excluding unpaid household activities, at least for the periods in which official economic growth is higher than the adjusted one.

have been substituted by services provided by the market. For Canada ([19]), for example, official annual average growth rates between 1981 and 2015 are lowered, on average, by 0.14 percentage points when applying the replacement cost approach. The decrease is 0.43 percentage points for the opportunity cost method, ranging from 0.26 to 1.03 percentage points for the various periods distinguished before 2005 ([20]). Interestingly, adjusted growth rates are higher than official growth rates in the period 2005-2010, the impact ranging from 0.21 to 0.43 percentage points, depending on the valuation methodology. It may be assumed that this is, at least partly, related to the effects of the financial and economic crisis. The picture for the United States ([21]) between 1975 and 2016 is similar to that for Canada, as the inclusion of unpaid household activities on the basis of the replacement cost method lowers annual GDP growth by 0.34 percentage points on average, while the impact using the opportunity cost method decreases official growth rates by 0.65 percentage points on average. Here too, a positive impact of the adjustments on official growth rates for the period 2008 to 2010, during the financial and economic crisis, can be observed. In the period 2010 to 2014, the impact returns to its normal pattern of lowering official growth rates, although in the latest period, 2014 to 2016, growth rates including unpaid household activities are again higher.

Taking the environment into account

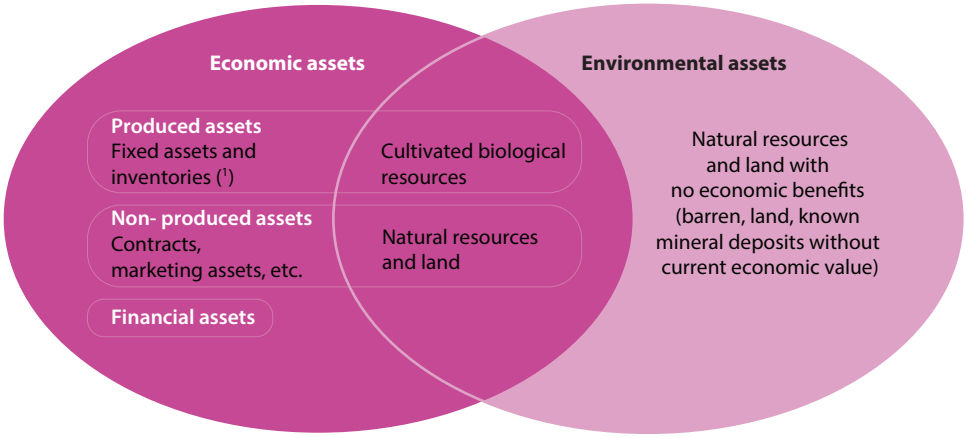
It is clear that the 2008 SNA deals poorly with issues relating to environmental sustainability. There may be some accounting for the stocks and flows of natural resources, but this is limited to those assets that fall within the SNA asset boundary. From an environmental perspective, this is a serious limitation. In the 2008 SNA, assets are only recognised and recorded if they concern …*a store of value representing a benefit or series of benefits accruing to the economic owner by holding or using the entity over a period of time* (paragraph 3.5 of the 2008 SNA). Ownership and generating benefits to the owner are core characteristics to this delineation. Mineral and energy reserves will normally qualify as assets. Also biological resources yielding repeat products in the future, such as dairy cows and forests, are included as assets if the natural growth and regeneration are under the direct control, responsibility and management of people. Some non-cultivated biological resources may be recognised as assets as well, but only those … *that are currently, or are likely soon to be, exploitable for economic purposes* (paragraph 10.182 of the 2008 SNA). Water resources are again only taken into account when it concerns …*surface and groundwater resources used for extraction to the extent that their scarcity leads to the enforcement of ownership or use rights, market valuation and some measure of economic control* (paragraph 10.184 of the 2008 SNA). In this respect, it should be noted that, although the 2008 SNA clearly includes the accounting of stocks and flows for these assets, not that many countries actually compile data for them.

Thus it can be concluded that stocks and flows relevant for monitoring environmental sustainability are simply not accounted for in the system of national accounts. Instead, a separate accounting framework has been developed and endorsed as an international statistical standard: the System of Environmental-Economic Accounting (SEEA) 2012 — Central Framework (United Nations et al. (2014a)), with the objective of providing a *multipurpose*

([19]) The intertemporal developments of time use data may be affected by changes in the reference population. For the countries mentioned in this paper, this holds for the developments in Canada between 1971 and 1981, and the developments in the United States before 2003.
([20]) Note that the impact on growth rates also depends on the valuation method applied, with the impact on growth rates being larger when the applied wage rate and therefore the weight of the imputed unpaid household services is higher.
([21]) See footnote 15.

conceptual framework that describes the interactions between the economy and the environment, and the stocks and changes in stocks of environmental assets (paragraph 1.1 of SEEA 2012). SEEA 2012 has a broader definition of assets, at least in physical terms. It also includes natural assets which do not have a monetary value, such as uncultivated land, forests and water resources which are not exploitable for economic purposes. Figure 7 provides a simple overview of the differences between the asset boundaries of the 2008 SNA and the SEEA 2012.

Figure 7: Relationship between environmental and economic assets



(1) Other than cultivated biological resources.

Source: SEEA 2012 Central Framework, pp. 139

In addition to an extended accounting for natural assets, and perhaps more importantly from a monitoring perspective, the central framework of SEEA 2012 includes a set of physical flow accounts in which natural inputs, products and residuals are linked to economic activities. Physical supply and use tables are included for energy, water, and various material flows (emissions to air, emissions to water, and solid waste). Another part of the framework concerns more prominent accounting for environmental activity, by identifying economic transactions within the system of national accounts which mainly relate to … *economic activities whose primary purpose is to reduce or eliminate pressures on the environment or to make more efficient use of natural resources* (paragraph 1.30 of SEEA 2012). Another set of accounts details environmental taxes, subsidies and similar transfers.

The uptake of implementing SEEA-consistent accounts has been relatively good, with currently 69 countries having programmes on environmental-economic accounting. The goal for 2020 is to have at least 100 countries with ongoing, well-resourced programmes in line with SEEA 2012 – Central Framework. Within the European Union (EU), the compilation of a number of SEEA-based accounts is even mandatory through a set of regulations. Furthermore, global databases are being developed, with priority given to accounts for air emissions, energy, material flows, land, and possibly water. At the OECD, a programme has started to build up databases for emissions to air, mineral and energy reserves, and, in the near future, environmental taxes. These accounts will gradually be extended, by collecting national data and by including own estimates for missing countries.

The endorsement and implementation the SEEA 2012 – Central Framework can be considered as a major step forward. It will make it possible to monitor and analyse better the externalities of production and consumption activities in the form of emissions; it will also enable an improved monitoring of, for example, the uptake of environment-friendly activities. Furthermore, enhanced accounting for mineral and energy resources would make it possible to calculate a value for net domestic product (NDP) which is not only adjusted for the depreciation of produced assets, but also adjusted for the depletion of natural resources.

However, much more needs to be done. The economy and the society at large are embedded in and depending on the limitations provided by the planet Earth. From a sustainability perspective, the most important assets are ecosystem assets. Paragraph 2.31 of SEEA 2012 — Experimental Ecosystem Accounting (SEEA-EEA; United Nations et al. (2014b)) defines ecosystems as … *spatial areas comprising a combination of biotic and abiotic components and other characteristics that function together.* These assets provide ecosystem services and benefits used in economic and other human activity, a rather euphemistic formulation for services on which human and other life depends. In SEEA-EEA, three main types of services are distinguished: (i) provisioning services (for example timber from forests); (ii) regulating services (for example forests proving carbon sinks); and (iii) cultural services (for example the pleasure of visiting a national park).

To arrive at a statistical framework for ecosystem accounting, SEEA-EEA contains a set of experimental guidelines, as an important first step for their further development. As noted on page v of SEEA-EEA, it …*offers a synthesis of the current knowledge in this area and serves as a platform for the development of ecosystem accounting at national and subnational levels. It provides a set of terms, concepts, accounting principles and classifications; and an integrated accounting structure of ecosystem services and ecosystem condition in both physical and monetary terms. In SEEA Experimental Ecosystem Accounting, it is recognized that spatial areas must form the basic focus for measurement.*

Accounting for ecosystems is not straightforward at all. In physical terms, consensus has more or less been achieved on the way forward, although how to capture the condition and capacity of ecosystem assets has not yet been completely solved. Accounting for the monetary value of the stocks of ecosystem assets and their degradation over time is another story. Notwithstanding the complexity, much progress has been made in recent years, and work is ongoing to further improve methodologies. In the future, all this work will hopefully lead to the compilation of physical and monetary estimates for stocks and degradation of ecosystems.

It should be noted, however, that from a conceptual point of view there is a significant difference between ecosystem assets and other natural resources. Whereas in the case of, for example, mineral and energy reserves, a clear ownership of these assets can be observed, with an economic agent receiving the resource rents and bearing the depletion

costs of exploiting the assets, ecosystem assets often do not have such a clear structure of ownership. The allocation of the benefits derived from ecosystem assets and the use of these benefits either for the production of goods and services or for direct final consumption can be quite problematic. It is often not possible to allocate ecosystem assets to industries and sectors, or even to countries. Furthermore, the loss of future ecosystem services, or the costs of degradation of ecosystem assets, often goes without any monetary costs for the relevant producers and consumers, as a consequence of which the recording of these costs raises concerns about consistency in accounting terms. It is therefore not possible to simply deduct the loss of ecosystem services from value added and GDP in order to arrive at macroeconomic indicators of economic activity that are adjusted for depreciation, depletion *as well as degradation of ecosystems*. If economic agents actually had to bear these costs, a completely different combination of economic activities would have been observed, and thus a completely different level of GDP.

As an alternative to fully integrating ecosystem assets, including the recording of the costs of degradation as a result of economic activities and other human and non-human interventions, the proposal put forward by Vanoli (2017) could be considered. He proposes to add the monetary value of (net) degradation of ecosystems as 'unpaid ecological costs' to the final expenditures, thus arriving at final consumption and gross fixed capital formation at 'total costs'. The unpaid costs would feed as a negative into saving, which would subsequently add to a new liability category, 'ecological debt of the economy'. It may not be feasible to allocate these costs to sectors or industries, in some cases it may actually be non-trivial to allocate such costs to countries, but certainly recording the degradation of ecosystems in such a way would make the accounts much more transparent in showing the externalities caused by economic activities.

4. A vision for the future

Kenneth Boulding once remarked that *anyone who believes exponential growth can go on forever in a finite world is either a madman or an economist* ([22]). Among others, Philipsen (2015) shows the ridiculousness of continuously pushing for a 3 % growth rate per annum for world GDP, which would result in a doubling of the world economy every quarter of a century and lead to a world economy which by the end of the 21st century would be eight times larger than today. Adding another century would lead to a 128-fold multiplication of the current level of economic activity. All of this is not to say that compiling national accounts is pretty much useless. Clearly, monitoring and analysing economic activities are important in their own right, for example to support policies for designing a financially sustainable economy. But that should not lead to policies that continuously and exclusively beat the drum for

([22]) United States Congress, House (1973) Energy reorganization act of 1973: Hearings, Ninety-third Congress, first session, on H.R. 11510, pp. 248.

unconditionally higher GDP. For what purpose? For whom? Economic growth cannot be the ultimate objective of a society. As many have said, a better navigation system is needed that guides policy towards the enhancement of the well-being of people, without jeopardising the sustainability of well-being for future generations to come. But often voices become much softer, or even silent, when it comes to specific alternatives which could provide clearer guidance for the future direction of societal developments, have a rigorous and conceptually sound underlying measurement framework, and — last but not certainly least — are easy to communicate.

It is therefore important to develop metrics that cast a wider net on the monitoring of well-being of people, which go well beyond traditional economic indicators. As (sustainable) well-being is a multidimensional phenomenon, it may not be possible to capture it in one all-encompassing indicator, and thus there has to be agreement and reliance on a set of indicators which monitor the most relevant aspects of well-being. An important example of this way of capturing well-being is the OECD Better Life Index (see http://www.oecdbetterlifeindex.org/), in which 11 areas are monitored by a dashboard of indicators. The following areas and indicators are distinguished:

- housing — housing expenditure, dwellings with basic facilities, rooms per person;
- income — household financial wealth, household net adjusted income;
- jobs — job security, personal earnings, long-term unemployment rate, employment rate;
- community — quality of support network;
- education — years in education, student skills, educational attainment;
- environment — water quality, air pollution;
- civic engagement — stakeholder engagement for developing regulations, voter turnout;
- health — self-reported health, life expectancy;
- life satisfaction — self-reported life satisfaction;
- safety — homicide rate, feeling safe walking home at night;
- work-life balance — time devoted to leisure and personal care, employees working very long hours.

In each of these aspects, regional and interpersonal distributions are considered to be of the utmost importance. Clearly, if inequalities of say income, wealth, health, education, and so on coincide, the impact on well-being for the people at the bottom of the distribution can be very detrimental.

However, to take it a step further and to make it even more useful and relevant for policy purposes, in my opinion it would be a very welcome addition to design and populate an underlying framework which links the various aspects of well-being and sustainability. Such a framework would make it possible to monitor, analyse and understand better the interrelations between the various aspects of well-being, and to understand better the trade-offs and the win–wins between the various domains. For example, what is the relationship between, on the one hand, the output of human health and social work industries and unpaid household activities on care for (non-)household members, and, on the other hand, the health outcomes of people, and how does this affect, for example, employment and government finance. How to improve health outcomes? Should more money be spent on prevention, on development of pharmaceuticals, on improving medical techniques, and how much money should be spent? In efforts to answer these types of questions, a very promising

way forward could be to link business statistics on human health and social work industries, very granular administrative data on treatments, data on relevant time use categories, government finance, national accounts and, last but certainly not least, relevant outcome indicators.

As shown before, this way of thinking and analysing is actually very well developed in the area of environmental sustainability. But there are also other promising initiatives. For example, quite a number of countries have done work on health satellite accounts, while more and more work is being done on making use of administrative data for medical treatments, for example to arrive at better volume measures for health services. Furthermore, in the area of education and training, a conceptual framework for compiling satellite accounts for education, training and human capital has been developed; see United Nations Economic Commission for Europe (2016). The same is true for satellite accounts on unpaid household activities; see United Nations Economic Commission for Europe (2017).

In the latter case, as shown in Section 3 of this paper, various attempts have been made to value the unpaid services, although for many types of analysis, a monetary valuation is not strictly necessary. Having a complete set of data on time use, which are integrated and combined with data on paid employment (and related income), as included in the SNA, major shifts in how people spent their time could be derived as well as evaluating how this affects the paid economy, as currently represented by output, value added and GDP. Actually, having more granular and more timely data on time use would provide a magnificent tool for monitoring and analysing shifts in time spent on various activities, including shifts from paid to unpaid activities and *vice versa*, which are considered highly relevant for the measurement of people's well-being, whether this may concern activities benefiting people's own well-being (for example, work-life balance, leisure), other people's well-being (for example, childcare, care of the elderly, volunteering), or both (for example, socialising). It could be considered, for example, how government policy on long-term care affects people's labour input in paid and unpaid care activities. Furthermore, it would be good to have additional information on, for example, digital activities, such as time spent on social media, search activities, and so on, thus allowing an alternative way of measuring consumer surplus that may arise from the digitalisation of society. However, the requested granularity and timeliness cannot be achieved by applying traditional survey methods. The potential of big data to compile time use data, or at least to supplement current data collection methods, needs to be thought about.

As a point on the horizon, it would be desirable to develop an overarching accounting framework in which statistics on economic, societal and environmental issues are integrated (not necessarily monetised) and in which it is possible to drill easily down into micro datasets. It is clear that this would definitely be a long-term goal, also requiring the development of a suitable conceptual framework. As a more realistic goal for the nearer future, the regular compilation of certain satellite accounts could be envisaged, such as those mentioned above. Having satellite accounts for the environment, health, education and unpaid household activities, or time use more generally, on a regular basis for a substantial number of countries would definitely support the monitoring and analysis of quite a number of well-being aspects included in the OECD Better Life Index and in other dashboards nationally and internationally.

In developing such a broad framework, the importance of communication should be acknowledged. Referring to the traditional set of national accounts as being the 'central framework' or the 'core' set of national accounts and referring to the measurement frameworks for other areas as being satellite accounts, is not particularly helpful. In line with Vanoli (2017), the terminology and the content of what is currently being referred to as the central framework needs to be rethought. Vanoli proposes to refer to the current set of national accounts as the system of national economic accounts (SNEA) and to include a much broader set of accounts in the central framework of national accounts. Perhaps it might be desirable to go a step further when it comes to the term for the current set of national accounts and refer to it as the system of national monetary accounts, to make clear that an economic account is more than a consistent set of monetary transactions and positions. Furthermore, Vanoli also presents a concise conceptual foundation for the broader set of accounts, with reference to four spheres and their related information systems: economy, people, nature and society. A similar plea for a new and comprehensive 'system of global and national accounts', including an in-depth analysis and description of how such a system should look, can be found in Hoekstra (2019). Hoekstra argues for a distinction of four sets of interrelated accounts, three describing the environment (global environmental accounts), the society (global societal accounts) and the economy (global economic accounts), and one describing distributional aspects (global distribution accounts). A separate set of global quality accounts is distinguished for the definition and recording of key indicators that can be derived from the other accounts, to provide a summary as to whether things are moving in the right direction.

Here, a more pragmatic approach is being proposed ([23]), to get things moving forward relatively quickly, as it may still take some time to define the exact conceptual framework, including the templates, discuss these proposals and have them endorsed at an international level, and — last but certainly not least — to get all of this implemented by countries. Instead of embarking on a full-scale update of the 2008 SNA, the United Nations Statistical Commission, in its 49th meeting held on 6-9 March 2018, agreed to develop guidance notes on three areas for which further clarifications and guidance are needed in the context of the system of national accounts: (i) digitalisation, (ii) globalisation, and (iii) sustainability and well-being. A starting point for pushing the above ideas could be the compilation of a guidance note on the latter. However, it should not come as a surprise that the whole process may take another 5-10 years. In moving forward, it is considered of the utmost importance to involve specialists from other areas of expertise (environment, social issues, education, health, time use, and so on) as well. It should be avoided that all of this is looked upon as a form of economic imperialism. The objective is to arrive at a consistent framework which covers much more than the economy alone.

([23]) The approach here is similar to, but also much broader than, the SESAME-approach in which the social accounting matrix was combined with environmental-economic accounts; see for example Kazemier et al. (1999).

5. Summary and conclusions

So it has come to this. The global diversity crisis is so severe that brilliant scientists, political leaders, eco-warriors, and religious gurus can no longer save us from ourselves. The military are powerless, but there may be one last hope for life on earth: accountants. (Jonathan Watts, The Guardian, 28 October 2010).

The above quote may look slightly satirical, but the author is not trying to be. Instead, he wants to emphasise the importance of quantifying, in this case, the stocks and flows of ecosystems. According to him, environmental issues are not truly taken into account in designing policy unless there is a (monetary) quantification of the costs related to degradation. It is related to the argument that economic growth — as measured by GDP — has, during certain periods of time, been the most successful macro indicator, basically defining what is considered to be a successful economy, or even more broadly whether societal developments are going in the right or wrong direction; this is why GDP still largely drives the policy agenda, despite its lack of accounting for well-being and environmental and societal sustainability. Philipsen (2015) looks upon GDP as the devil in disguise, seeing conspiracies all over the place to show the importance, or 'value added', of industries. I do not think that this is a fair assessment, but — as Gleeson-White (2011) argues — methods to summarise developments can have an impact on the goals we pursue. As an example, in addition to the success story of GDP, she mentions the concept of 'profit' that could for the first time be explicitly derived from the double entry bookkeeping system developed in the golden years of Venetian trade in the 14th century. Or, as Stiglitz et al. (2009) puts it: *What we measure affects what we do; and if our measurements are flawed, decisions may be distorted.*

The above does not alleviate the task of statisticians and accountants. On the contrary! It puts a major responsibility on the shoulders of the statistical community, to develop metrics that can guide policy to a better and more sustainable future. Metrics which are well-founded, based on an underlying conceptual and statistical framework, agreed across various areas of expertise, convincing, and easy to communicate.

Since the Second World War, national accounts have become very 'successful', GDP and economic growth often being put on a par with success or failure of economic developments, and even more broadly, societal developments. Nowadays, a large part of the economic research community seems to have turned their back to the intricacies of defining and measuring macroeconomic data. National accounts have increasingly become the object of criticism in the media and academic research, the most notable recent examples being the measurement of financial services, the inclusion of illegal activities, and the way in which the digitalisation of the economy is being represented. Sometimes these critiques are justified and call for further investigation. In other instances, the comments and remarks simply show a certain level of ignorance concerning accounting standards and what they intend to measure, and call for enhanced communication between the research community and national accountants.

A more substantive body of criticism relates to the measurement of (economic) well-being and sustainability. Indeed, GDP does not take into account various aspects of well-being and does not account for environmental externalities. As such, navigating on GDP alone is the shortest route to disaster. There is an increasing demand from users for better metrics that provide a more encompassing measure of developments in (sustainable) well-being. However, it has to be recognised that the latter is a multi-faceted phenomenon, which is not easy to capture in one single headline indicator. Instead of having endless discussions on how such a single metric could be defined and developed, from a statistical perspective it seems preferable to apply a dashboard type of approach, such as the OECD Better Life Index, and to try to define and populate an underlying conceptual and statistical framework. To include all these aspects into one consistent (monetary) accounting framework, similar to the system of national accounts, thus arriving at one single measure, is, in my opinion, 'mission impossible'.

A more feasible approach is to arrive at a consensus on the further enrichment of the central framework of national (monetary) accounts by including and combining a standard range of accounts for the environment, health, education and time use. All of these additions need not necessarily be defined in monetary terms, although monetising (the degradation of) ecosystems could further support the urgency of dealing with environmental sustainability. More generally however, having more and better data in physical units will already provide an enhanced monitoring framework for further analysis and can be considered as a pre-condition for developing more refined summary indicators. In the meantime, the use of alternative indicators within the system of national accounts, the most obvious being household disposable income and household final consumption, should be further emphasised and explicitly communicated. Also the compilation of consistent distributional information on income, consumption, saving and wealth should be pursued with quite some urgency. So, yes, there is a role to play for accounting as well as for statistics more generally, and it is by far not a small task and responsibility.

References

Ahmad, N. and J. Ribarsky (2018), 'Towards a framework for measuring the digital economy', paper presented at the *35th General Conference of the International Association for Research on Income and Wealth (IARIW)*, held 20-25 August, 2018 in Copenhagen, Denmark.

Ahmad, N. and P. Schreyer (2016), 'Measuring GDP in a Digitalised Economy', *OECD Statistics Working Papers*, No. 2016/07, OECD Publishing, Paris, France.

Ahmad, N and P. van de Ven (2018), 'Recording and measuring data in the System of National Accounts', paper prepared for a meeting of the *Informal Advisory Group on measuring GDP in a digitalised economy*, held 9 November, 2018 in Paris, France.

Bese Goksu, E. and P. van de Ven (2015), 'G-20 Data Gaps Initiative (DGI): a second phase', *The Statistics Newsletter for the extended OECD statistical network*, No. 63, September 2015.

Brynjolfsson, E., F. Eggers, and A. Gannamaneni (2018), 'Using massive online choice experiments to measure changes in well-being', *NBER Working Paper Series*, No. 24514, National Bureau of Economic Research, Cambridge, United States.

Gleeson-White, J. (2011), *Double Entry — How the Merchants of Venice Created Modern Finance — and How Their Invention Could Make or Break the Planet*, Allen & Unwin, Sydney, Melbourne, Auckland, London.

Heath, R. and E. Bese Goksu (2016), 'G-20 Data Gaps Initiative II: meeting the policy challenge', IMF Working Paper, WP/16/43, International Monetary Fund, Washington, D.C., United States.

Hoekstra, R. (2019), *Replacing GDP by 2030. Towards a Common Language for the Well-being and Sustainability Community*, Cambridge University Press, Cambridge, United Kingdom.

Kazemier, B., S. Keuning, and P. van de Ven (1999), 'Measuring Well-being with an Integrated System of Economic and Social Accounts: an Application of the SESAME Approach to the Netherlands', *National Accounts Occasional Paper*, NA-090, Statistics Netherlands, Voorburg/Heerlen, Netherlands.

Keuning, S. (1995), *Accounting for economic development and social change, with a case-study for Indonesia*, Ph.D. thesis, Erasmus University, Rotterdam, Netherlands.

Nakamura, L. I., and R. H. Soloveichik (2015), 'Valuing "Free" Media Across Countries in GDP', *Federal Reserve Bank of Philadelphia*, Working Papers No. 15-25, Philadelphia, Pennsylvania, United States.

OECD (2013), *OECD Framework for Statistics on the Distribution of Household Income, Consumption and Wealth*, OECD Publishing, Paris, France.

Philipsen, D. (2015), *The Little Big Number. How GDP came to rule the world and what to do about it*, pp. 156-157, Princeton University Press, Princeton, New Jersey, United States.

Piketty, T. (2014), *Capital in the Twenty-First Century*, The Belknap Press of Harvard University Press, Cambridge, Massachusetts, United States and London, England, United Kingdom.

Pilling, D. (2018), *The Growth Delusion: Wealth, Poverty and the Well-Being of Nations*, Tim Duggan Books, New York, United States.

Pinkovskiy, M. and X. Sala-i-Martin (2015), 'Lights, Camera,…Income! Estimating Poverty Using National Accounts, Survey Means, and Lights', *Federal Reserve Bank of New York*, Staff Report No. 669, New York.

Ravets, C. (2016), 'The Internet economy', paper presented at the 10th Meeting of the Advisory Expert Group on National Accounts, held 13-15 April 2016, Paris, France.

Ribarsky, J., C. Kang, and E. Bolton (2016), 'The drivers of differences between growth in GDP and household adjusted disposable income in OECD countries', *OECD Statistics Working Papers*, No. 2016/06, OECD Publishing, Paris, France.

Stiglitz, J. E., A. Sen and J-P. Fitoussi (2009), *Report by the Commission on the Measurement of Economic Performance and Social Progress*, Paris, France.

Timmerman, J. and P. van de Ven (1994), 'A Social Accounting Matrix for The Netherlands, concepts and results', *National Accounts Occasional Paper*, NA-068, Statistics Netherlands, Voorburg/Heerlen, Netherlands.

United Nations, European Commission, International Monetary Fund, Organisation for Economic Cooperation and Development, World Bank (2009), *System of National Accounts 2008*, New York, United States.

United Nations, European Commission, Food and Agriculture Organization of the United Nations, International Monetary Fund, Organisation for Economic Cooperation and Development, World Bank (2014a), *System of Environmental-Economic Accounting 2012 — Central Framework*, New York, United States.

United Nations, European Commission, Food and Agriculture Organization of the United Nations, International Monetary Fund, Organisation for Economic Cooperation and Development, World Bank (2014b), *System of Environmental-Economic Accounting 2012 — Experimental Ecosystem Accounting*, New York, United States.

United Nations Economic Commission for Europe (2016), *Guide on Measuring Human Capital*, New York, United States and Geneva, Switzerland.

United Nations Economic Commission for Europe (2017), *Guide on Valuing Unpaid Household Service Work*, New York, United States and Geneva, Switzerland.

Van de Ven, P., J. Zwijnenburg, and M. De Queljoe (2018), 'Including unpaid household activities: an estimate of its impact on macro-economic indicators in the G7 economies and the way forward', *OECD Statistics Working Papers*, No. 2018/04, OECD Publishing, Paris, France.

Vanoli, A. (2017), 'The Future of the SNA in a Broad Information System Perspective', *The Review of Income and Wealth*, Volume 63 s2, pp. S238-S265.

Watts, J. (2010), 'Are accountants the last hope for the world's ecosystems?', The Guardian, 28 October 2010.

Zwijnenburg, J., S. Bournot and F. Giovannelli (2017), 'Expert Group on Disparities in a National Accounts Framework: Results from the 2015 Exercise', *OECD Statistics Working Papers*, No. 2016/10, OECD Publishing, Paris, France.

Zwijnenburg, J. (2018), 'Unequal distributions? A study on differences between the compilation of household distributional results according to DINA and EGDNA methodology', paper presented at a workshop on harmonization of household surveys, fiscal data and national accounts: comparing approaches and establishing standards, held on 17-18 May 2018 at the Paris School of Economics, Paris, France.

Annex: Digitalisation and households' (economic) well-being

In the main article, reference was made to the digital transformation of the economy. This transformation has major consequences for the way things are done within the economy and society at large. Internet access by households has led, for example, to a blurring between market production, unpaid household activities, and leisure. For instance: households -booking their own hotels or flights, instead of arranging this via a travel agency; self-service checkouts in supermarkets; on-line banking; and so on. What these changes have in common is a movement from purchasing services delivered by dedicated market producers towards out-of-market solutions. In a similar manner to unpaid household activities in general, none of these new activities are captured within GDP. As such, these changes can be looked upon as yet another layer in the problem of capturing unpaid household activities and related (economic) well-being in the system of national accounts. This development is not new, as the displacement of market activities by unpaid household activities, and *vice versa*, has always taken place, but digitalisation has certainly raised the issue to a higher and more prominent level.

Another, slightly different, issue concerns the 'free' provision to households of apps, search facilities from the likes of Google, social networking through Facebook, Tencent, and so on. In these cases, the financing of these services is often arranged via revenues from advertisements or through the provision of data ([24]) which are subsequently used as a business model for generating revenues (including the advertising mentioned before). The provision of these 'free' services is frequently cited as output that goes unnoticed despite their contribution to consumer well-being, and there is indeed quite some debate going on as to how additional output, value added and household final consumption might be imputed for information services which are financed through advertising ([25]). The rationale usually put forward is that households actually derive substantial economic well-being from consuming free apps or social media, which should be accounted for. However, it may be considered whether the recording of this additional consumption does not lead to a double-counting, as households implicitly pay more for the products of the advertising firms. Whatever the case, it is also clear that — again — this is not a new problem. Broadcast television, radio, newspapers and the like have also been provided for free or at significantly reduced prices because of advertising revenues. Similarly, sports clubs may provide free entry to executive boxes for their sponsors. When looking in more detail at estimates for media services, the impact on economic growth of changing the recording of free services financed through advertising revenues is minimal. Nakamura and Soloveichik (2015), for example, impute a value of production by unincorporated household enterprises equal to the value of advertising receipts and use data on advertising expenditure for different media. Although these imputed services grew considerably faster (at 6.7 % per year) than overall GDP, their impact on economic growth across 80 countries amounted to 0.018 %.

([24]) In this age of digitalisation, it is possible to observe an ever-increasing role of personal data in the economy. It calls into question the current recording, or better to say non-recording, of data exchanges without a monetary counterpart transaction, and of data as an asset category; this issue is discussed in more depth in Ahmad and Van de Ven (2018).

([25]) For more details on the various options to include these services in the system of national accounts, reference is made to Ahmad and Schreyer (2016) and Ravets (2016).

Yet another phenomenon relates to the growing activities of communities of people together creating freely available assets like Wikipedia, R, Linux, and so on. Although it is clear that the relevant assets generate benefits for their users, their use is free of charge and thus not accounted for in the current system of national accounts. Of note is that the users are not restricted to households, as enterprises and governments can also make use of such free software or resources, thereby replacing the use of purchased software or information. Accounting for this phenomenon of free assets is not that straightforward: it actually gives rise to major complexities, both from a measurement perspective and from a conceptual point of view. For example, this phenomenon could be considered as people providing input to the creation of a commonly produced asset, which would lead to an extension of the current production and asset boundaries of the 2008 SNA. People in the community contributing to the asset would be regarded as being producers of services, the value of which could be based on the time spent multiplied by a measure of their hourly compensation. The annual services provided would then be recorded as annual additions to, or investments in, the assets, while the sum of these additions, adequately adjusted for the decline in value as a result of normal obsolescence ([26]), would lead to a monetary estimate of the capital stock.

However, the recording and valuation of free assets like this would still leave open the question as to how to account for the ownership and the use of these assets. The assets are typically worldwide assets that are made available across the internet, so even an allocation of the ownership to countries might prove to be quite challenging. The community of producers could be considered as a kind of virtual non-profit institution serving households (NPISH), and this NPISH could be considered as the creator and the owner of the assets. The services delivered by this NPISH — equal to the sum of costs of operating the relevant asset, including the decline in value of the assets due to normal obsolescence — could then be regarded as final consumption of NPISHs. In the 2008 SNA, the final consumption of NPISHs (and the individual part of government final consumption) is subsequently re-allocated to benefiting households, with a concomitant (social) transfer in kind. A similar recording could be envisaged for the NPISHs providing services from free assets, however with the added complication of having to figure out who actually benefits from these assets, which not only consists of households but also includes enterprises ([27]). Finally, it should also be taken into consideration that, in the process of recording the production of these assets, additional income is being allocated to the community of people contributing to the build-up of the assets. To balance the accounts, the free delivery of these services would need to be counterbalanced by an equivalent current transfer of some kind. All in all, a considerable amount of imputations, not to mention the complexities in valuing the relevant transactions and positions, and allocating them to countries and sectors. An example of all accounting entries is provided in Table A.1.

([26]) Here, the term 'consumption of fixed capital', or depreciation, has been avoided, as in the current system of national accounts the former terms are limited to physical deterioration, normal obsolescence and normal accidental damage of produced assets.

([27]) Not to mention the additional complication of allocating social transfers in kind (whose receipts are currently restricted to households) to enterprises. In the case of enterprises, it is perhaps also necessary to consider a reclassification of final consumption to intermediate consumption.

A completely different approach to measuring economic gains linked to increased well-being from free services is taken by Brynjolfsson et al. (2018). In their research, consumer surplus from digital services is derived from surveys on measures of willingness to pay or willingness to accept. In the main experiment, a single binary discrete choice (SBDC) experiment, consumers are asked … *to make a choice between keeping a digital good or taking a monetary equivalent compensation when foregoing it*. As a benchmark to check the results, an alternative lottery procedure has been implemented on Facebook. The results are striking, to say the least. The median willingness to pay, which is assumed to be equivalent to the consumer surplus attached to digital services, adds up to more than USD 32 000 per year in 2017, with 'all search engines' and 'all e-mail' ranking highest (USD 17 539 and USD 8 414, respectively), and 'all music' and 'all messaging' ranking lowest (USD 168 and USD 155, respectively). Brynjolfsson et al. (2018) also show the results of choices between digital services, non-digital products, and giving up a certain amount of income, through a Google consumer survey. The results confirm the outcomes of other experiments. For example, no access to the internet for one year is ranked just below giving up an income of USD 5 000 for one year. Using massive internet surveys, Brynjolfsson et al. (2018) claim that it would be relatively easy to make estimates for the consumer surplus derived from the complete basket of goods and services consumed by households. Such a measure could then supplement the traditional measures of household final consumption.

The above estimates of consumer surplus related to digital services may be questioned. One problem is that the estimates do not (adequately) reflect budget constraints which households are facing in real life. Although the authors' goal is to arrive at a measure of consumer surplus, it might be considered what consumers would actually be willing to pay, given budget constraints, thus trying to capture some measure of the shadow prices of free digital services. Such a measure would be more consistent with the current valuation methodologies based on market prices or exchange values, as applied within the system of national accounts.

More generally, it would be desirable to have a more holistic approach to free goods and services, which also includes, for example, all other unpaid household activities. Perhaps this could be done through massive internet surveys, like the one done for the extended Google survey on choices between digital services, non-digital products and income. It would be very useful to be able to make a comparison of the results for unpaid household activities with methodologies using a cost-based approach, like the one explained above.

Furthermore, as it stands now, the methodology will only be able to provide some kind of supplementary measure for consumer surplus, thus making it possible, for example, to compare the results with monetary estimates of household final consumption. However, it would be a standalone measure, not embedded in a system of accounts, and would therefore also be unable to provide any possibility to improve the rigour of estimates, by using the consistency rules of output, expenditure and income, or to provide ample opportunities for policy analysis in a broader context.

Last but not least, the methodology applied by Brynjolfsson et al. (2018) may indeed be considered as a viable way forward to estimate total consumer surplus. But, if the intention is to arrive at a broader measure of (economic) well-being, the problem remains of not taking on board certain aspects that also directly affect well-being, such as health, social relationships, environmental conditions, and so on. Returning closer to the topic of free digital services, it may also be considered whether negative externalities from free digital services on for example trust, work-life balance, and so on are adequately reflected in the estimates, and whether consumers take these types of issues into account when entering into the choice experiments. Whatever the case, the point to be made here is that the methodology remains a consumption-oriented approach, although — as said — it could perhaps be extended to include the whole range of unpaid household activities and to include alternative valuations for the whole consumption basket of households which better reflect the economic well-being households derive from them.

Looking at the current system of national accounts, more specifically the supply and use tables which describe the production process and transactions in goods and services, it is clear that the classification systems for industries and products do not appropriately reflect newly developing digital activities/technologies. It is therefore very hard, if not impossible, to track the extent and growth of digital activities and products, as they are usually an implicit part of broader categories such as trade, transport, housing, and so on. To meet this user demand, a satellite account on the digital economy is in the process of being developed and subsequently populated. This satellite account separately distinguishes transactions that are electronically ordered and/or electronically delivered, in addition to covering more traditional activities that are considered enablers of the digital economy (information and communication technology, software development, and so on). The framework also enables an extension of the production boundary, by including estimates of free digital services ([28]). With respect to the latter, estimates made by Brynjolfsson et al. (2018) could indeed provide a valuable addition, although it is preferable to have estimates which try to capture a valuation of free services which is more consistent with the traditional valuation methodologies of national accounts. From the perspective of trying to capture well-being more broadly, having fully-fledged estimates of the consumer surplus derived from the whole basket of household final consumption, including free digital services and, more broadly, all unpaid household activities, could feature as an excellent supplementary measure, adding to our understanding of what drives household (economic) well-being.

([28]) For more details, see Ahmad and Ribarsky (2018).

Table A.1. Example of recording of free asset created by a community of people
(USD)

Contributors				Non-profit institutions serving households				Users			
Production account				**Production account**				**Production account**			
Intermediate consumption	0	Output (1)	400	Intermediate consumption	400	Output (2)	700				
				Depreciation	300						
Value added (net)	400			Value added (net)	0						
Distribution of income account				**Distribution of income account**				**Distribution of income account**			
		Value added (net)	400			Value added (net)	0				
Current transfers	400					Current transfers	400				
Disposable income (net)	0			Disposable income (net)	400						
Use of disposable income account				**Use of disposable income account**				**Use of disposable income account**			
						Disposable income (net)	400				
				Final consumption	300						
				Saving (net)	100						
Redistribution of income in kind account				**Redistribution of income in kind account**				**Redistribution of income in kind account**			
						Disposable income (net)	400			Disposable income (net)	0
				Transfers in kind	300					Transfers in kind	300
				Adjusted disposable income	100			Adjusted disposable income	300		
Use of adjusted disposable income account				**Use of adjusted disposable income account**				**Use of adjusted disposable income account**			
						Adjusted disposable income	100			Adjsuted disposable income	300
				Actual final consumption	0			Actual final consumption	300		
				Saving (net)	100			Saving (net)	0		
Capital account				**Capital account**				**Capital account**			
						Saving (net)	100				
				Investments	400	Depreciation	300				
				Net lending	0						
				Capital stock at the beginning of period *t*			1 600				
				Investments			400				
				Depreciation			-300				
				Capital stock at the end of period *t*			1 700				

(1) Services delivered to NPISH, consisting of an imputed value of 20 hours * USD 20.
(2) Sum of costs, consisting of USD 400 of investment produced on own account (= deliveries of services by contributors) and depreciation of the free asset created (= final consumption of NPISH).

2 Measuring activities of multinational enterprise groups via large cases units

MUSHTAQ HUSSAIN [1], RAMI PELTOLA [2] AND SANJIV MAHAJAN [3]

Abstract: MNE groups stand at the centre of economic globalisation. They play a very important role cutting across most economies in the world. This paper presents the rationale, and the recommendation, as to why national statistical institutes (NSIs) should establish a team of experts (also named large cases unit — LCU) to deal with all statistical aspects of MNE groups in economies where such MNE groups are significant. The main objective of an LCU is to provide all relevant statistical domains with consistent data originating from the biggest MNE groups for compiling their statistics. This can be ensured by collecting timely and accurate data for MNE groups at the very beginning of the production process of economic statistics, enabling a prompt reaction to data changes and the resolution of anomalies before they are processed by any of the statistical domains. The paper argues that in an ever-changing globalised world, investment in an LCU-type entity is essential to ensure that national statistics are of high quality and do not double-count or miss any activity.

Keywords: LCU, economic globalisation, consistency

JEL codes: E01, F62

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1. Introduction

The impact of globalisation through multinational enterprise groups (MNE groups) presents one of the largest 'statistical measurement' challenges facing producers of economic statistics today. This paper presents the rationale, and the recommendation, as to **why national statistical institutes (NSIs) should establish a team of experts to deal with all statistical aspects of MNE groups in economies where such MNE groups are significant**. The establishment of such a team dedicated to data collection, data reconciliation and managing the relationships with MNE groups goes a long way in addressing these challenges. For the purposes of this paper, we will refer to this team as a 'large cases unit' (LCU).

This type of team should adopt an account management approach with the MNE groups as well as data sharing, data exchange and data reconciliation with other NSIs and national central banks (NCBs). This should enable NSIs collectively to address the ever-growing impacts of globalisation (which encompass the creation and use of intellectual property products) on the quality of collected data which feed into main statistical outputs like the national accounts and balance of payments and then in turn into downstream products such as productivity and environmental analyses.

By having an effective, efficient and appropriately resourced LCU, the quality of domestic economic statistics, and key aggregates, will be improved. Furthermore, with such LCUs operating via an 'international network' supported by international organisations, this would further enhance these benefits as well as improve international comparability and the reduction of trade asymmetries.

2. Background

MNE groups stand at the centre of economic globalisation. They play a dominant role in global production, which is then reflected statistically in their contribution to total external trade, foreign direct investments or international transfers of knowledge and technology. A study carried out in 2001 showed that over 80 % of all international trade is related to at least one MNE group, while a third takes place within MNE groups (Kleinert (2001)).

MNE groups play a very important role cutting across most economies in the world. In many European Union (EU) Member States their contribution to production, value added, employment, trade in goods and services, foreign direct investments, and so on is substantial. Indeed, in 2011, in the French economy, MNE groups represented roughly half of total employment (47 %) and total value added (56 %) of all enterprises located on French territory (Boccara and Picard (2015)). According to a recent study carried out by Statistics Netherlands (CBS (2017)), MNE groups were responsible for 21 % of total employment and 30 % of total value added in the Netherlands. Moreover, these MNE groups were responsible for about three quarters of Dutch international trade (excluding re-exports) in goods and services.

The collection of reliable and consistent statistical information from MNE groups is, therefore, of utmost importance for NSIs and/or NCBs. Data received from MNE groups should be

complete in terms of recording on statistical business registers and the statistics recorded should be coherent across different statistical domains. These domains include short-term statistics (STS), structural business statistics (SBS), international trade in goods statistics (ITGS), international trade in services statistics (ITSS), foreign direct investment (FDI) and foreign affiliates statistics (FATS), and ultimately, these will feed into the balance of payments (BoP), national accounts (NA) including financial accounts (FA) by institutional sector, prices and labour market data as well as environmental accounts (EA), thereby providing a full, coherent and correct picture of the economy and the environment.

As data collection in many countries may be decentralised and not sufficiently coordinated across statistical domains, large MNE groups are usually confronted with many different questionnaires where some of the questions ask for the same or similar information. On the other hand, the multifaceted organisational structure of MNE groups, their complex ownership structures and intricate global production arrangements create major challenges for NSIs and/or NCBs in measuring their activities and properly recording their transactions.

For such reasons, the establishment of a specialised team within an NSI to focus on communications and relationships with the largest MNE groups, as well as data collection, processing and quality assurance of data is becoming an essential requirement. The main purpose of such a team is to improve the quality, consistency and coherency of data, although there can also be other beneficial impacts such as better use of resources and reducing the statistical reporting burden on MNE groups.

This is a key first step and addresses the domestic picture for MNE groups. More importantly, any developments within this domain also need to address the global picture of MNE groups. Here, international organisations need to step in to help integrate data and ensure a coherent global picture of MNE groups.

The present role of Eurostat and other international organisations in this respect is a facilitating one but this could, and should, change as time goes by, for example, through the creation of a worldwide register of MNE groups and/or even international data collection and data reconciliation. EU Member States provide statistics to Eurostat based on various agreed domain specific statistical regulations. These regulations describe concepts, definitions and required outputs, as well as timeliness. EU Member States, however, decide themselves how to organise the collection of data and the production of statistics, in line with the subsidiarity principle ([4]).

This paper summarises available information, updates and shares good practices, and concludes by developing a consolidated approach for how to deal with statistics in relation to MNE groups. It incorporates comments made by members of the UNECE Task Force on Exchange and Sharing of Economic Data during a meeting in April 2018.

For the purposes of this paper — given the different roles, links and structures of NSIs and NCBs in different countries — and to avoid repetition, any reference(s) to NSIs should hereafter be read to apply to NCBs too, as appropriate. NCBs may be directly or indirectly involved

([4]) In areas in which the EU does not have exclusive competence, the principle of subsidiarity, laid down in the Treaty on European Union, defines the circumstances in which it is preferable for action to be taken by the European Union, rather than the Member States. The legal basis is formed under Article 5(3) of the Treaty on European Union and Protocol (No 2) on the application of the principles of subsidiarity and proportionality.

depending upon the MNE group case or issue(s) through the provision of various sources such as centralised securities databases, security by security holding statistics and analytical credit registers providing details on external financing of MNE groups.

3. Large cases unit (LCUs)

Every country with a significant number of MNE groups should consider establishing a specialised unit responsible for MNE groups. Such a specialised unit is often called a large cases unit (LCU) as it deals with large and complex cases of MNE groups trading across borders and within national boundaries. At the beginning of 2019, the NSIs of Canada, Denmark, Finland, France, Hungary, Ireland, Italy, Luxembourg, the Netherlands and Sweden have established LCUs, while the United Kingdom (undergoing a pilot exercise to develop an international business unit), Belgium (in the NCB) and Norway are considering creating permanent LCUs. Other countries have dedicated programmes to perform similar activities (for example, profiling) as LCUs. However, LCUs are still quite rare and are mostly concentrated in EU Member States.

Establishing an LCU requires, and brings, a cultural and organisational change to the traditional way of organising statistical production. The common question is: what does the NSI want to achieve by establishing an LCU? Consequently, the way LCUs are then organised, and located, in practice can differ from country to country depending upon the organisational structure of the NSI, available resources, and so on. One of the key roles of an LCU is to facilitate the cultural change needed by bridging any cultural divide within the organisation and/or across organisations. In this paper, different approaches and common characteristics are described. It is also worth noting that, unlike the sequential system described in the Generic Statistical Business Process Model (GSBPM), the LCU brings together various functions from different parts of the GSBPM (UNECE (2013)).

A. Stakeholders of a LCU

Three important stakeholders of LCUs, namely the statistical domains in the NSI, MNE groups and NCBs, were mentioned in the background to this paper. In addition to these stakeholders, LCUs need to liaise, cooperate and communicate with many other stakeholders.

At the NSI, one important stakeholder is the senior management of the NSI. They need to understand the important role and impact of the LCU, provide their full support with readiness to engage in meetings with the senior management of MNE groups (where necessary), and provide adequate resources for the work to be undertaken by the LCU. To establish a separate, autonomous LCU, some organisational restructuring and shifting of resources is likely to be required. Strong senior management and leadership are essential to overcome initial internal resistance for the benefit of the NSI.

Often the first contact with an MNE group requires the involvement of senior management from both organisations and this contact should be maintained thereafter.

The work of the LCU also relies on dynamic and close cooperation with statistical domains and the statistical business register as a source of data and as a tool for consistency improvements.

It is especially important to ensure data consistency with other producers of official statistics such as the NCB (as a producer of BoP statistics in many countries) and customs authorities (as a data collector of ITGS). These organisations should be involved with the LCU with regular communication: good working relations and bilateral data exchange (as appropriate) are essential to ensure consistent and high quality data on MNE groups across the various parts of the national accounting framework. Where the statistical system is decentralised, the LCU may need to be established as a centralised organisation providing a link to all the producers of statistics — here the role of the LCU is even more critical.

LCUs may need to establish direct contacts with key administrative data providers, as full access to their data is important for a proper analysis of consistency. If allowed by the relevant statistical laws, access to the data of private data holders has similar importance. LCUs may also review the availability of private data sources with relevant data on MNE groups ([5]).

The counterpart may be either the national unit of an MNE group or the headquarters of an MNE group situated in the compiling country (typically with MNE groups but possibly also large national enterprises). Residency will need to be considered when defining the strategy for data collection, which may be different via an international network of LCUs for the non-resident parts of the MNE group. Typically, the headquarters have a more complete picture of the operations of the enterprise but may at the same time have more difficulties in reporting country specific data.

Cooperation with LCUs (or other units) in NSIs of other countries will need to be developed. In the first place, this should include sharing of best practices in LCU work. Thereafter, LCUs should be the contact point for more regular information exchange, data exchange and data reconciliation underpinned by a secure framework for the international network of LCUs.

Eurostat has recently launched a grant for establishing LCUs and one of its goals is to set-up a dedicated discussion forum of LCU-related topics for countries in the European statistical system (ESS). It is important to follow-up how this forum develops and to consider possibilities for creating links between the forum and other countries with an interest in developing statistics on MNE groups.

International organisations have developed, and are developing, several other crucial areas in relation to work on LCUs, for example:

- Eurostat has several initiatives such as the EuroGroups Register (EGR), international profiling, an Early Warning System (EWS), and so on (see Section 4 for more details);
- the Organisation for Economic Cooperation and Development (OECD) undertakes a range of work in this area (for example, an Analytical Database on Individual Multinationals and their Affiliates (ADIMA), Base Erosion and Profit Shifting (BEPS), reconciliation of asymmetries, and so on);
- the United Nations Statistics Division (UNSD) is working towards a Global Groups Register (GGR); and

([5]) For example, by means of targeted web searches of companies, web scraping tools, analytical databases like the OECD's ADIMA database, and private databases on mergers and acquisitions.

- UNECE plans to establish an LCU network to facilitate, for example, a framework for data sharing.

The exchange of information, experience and good practice at international forums is crucial.

Users of statistics receive benefits from the work of LCUs and are also important stakeholders. They benefit from the provision of more consistent and coherent statistics, and furthermore, the service provided to users may be improved through better understanding and analyses of MNE groups.

Irrespective of the stakeholder concerned, the language used to communicate with them is extremely important. LCUs need to be ready to take on the role of interpreter between different players in the supply, production and use of official statistics when it comes to data consistency, especially in terms of their dialogue with MNE groups.

B. Benefits of an LCU

The major benefit of an LCU is that a multi-skilled account management team should ensure the collection of timely and accurate data for MNE groups at the very beginning of the production process of economic statistics, enabling a prompt reaction to data changes and the resolution of anomalies before they are processed by any of the statistical domains. Data consistency should be ensured by analysing the data received from different surveys and addressing potential issues at the first receipt of data.

Depending upon the role and responsibilities of the LCU, the response burden on the MNE group could be significantly reduced — this forms a unique selling point to gain the cooperation of MNE groups. The LCU could collect the data, maybe using data readily available from the MNE group and/or bespoke questionnaires designed to suit the MNE group. The LCU could ensure the data are only collected once rather than collecting some of the data multiple times through different questionnaires.

A multi-disciplinary team should have the skills and capability of understanding these complex MNE groups, their accounts, and underlying global issues such as:

- factoryless goods production;
- goods sent abroad for processing;
- merchanting of goods and services;
- contract manufacturing;
- toll processing;
- transfer pricing;
- stocks and flows of intellectual property products (IPPs);
- activity of special purpose entities (SPEs);
- internet-related activity; and
- FDI and related income flows.

The measurement and consistency challenges posed by the above issues are not new but have grown significantly in the past two decades and constitute the main problem areas that need to be addressed. By setting-up an LCU, NSIs would be well placed to ensure that these issues are addressed in relation to the functioning of MNE groups.

C. Main objective of an LCU

The main objective of an LCU is to provide all relevant statistical domains with consistent data originating from the biggest MNE groups for compiling their statistics. In practice, inconsistent data are often discovered at different stages of the statistical value chain. Ultimately, many statistical differences and (mis-)measurement issues can be identified when balancing supply and use tables (where for example, the supply and use of goods and services in an economy do not equal), although this may be considered too late in the production chain. Similarly, differences or imbalances can be identified when compiling the institutional sector accounts. Analysing such discrepancies, the differences may be traced back to inconsistent data covering MNE groups in source data, for instance between foreign trade statistics and structural business statistics. An LCU should identify and resolve these inconsistencies at an early stage before dissemination by the individual primary statistical domains. In general, this may lead to the following activities ([6]):

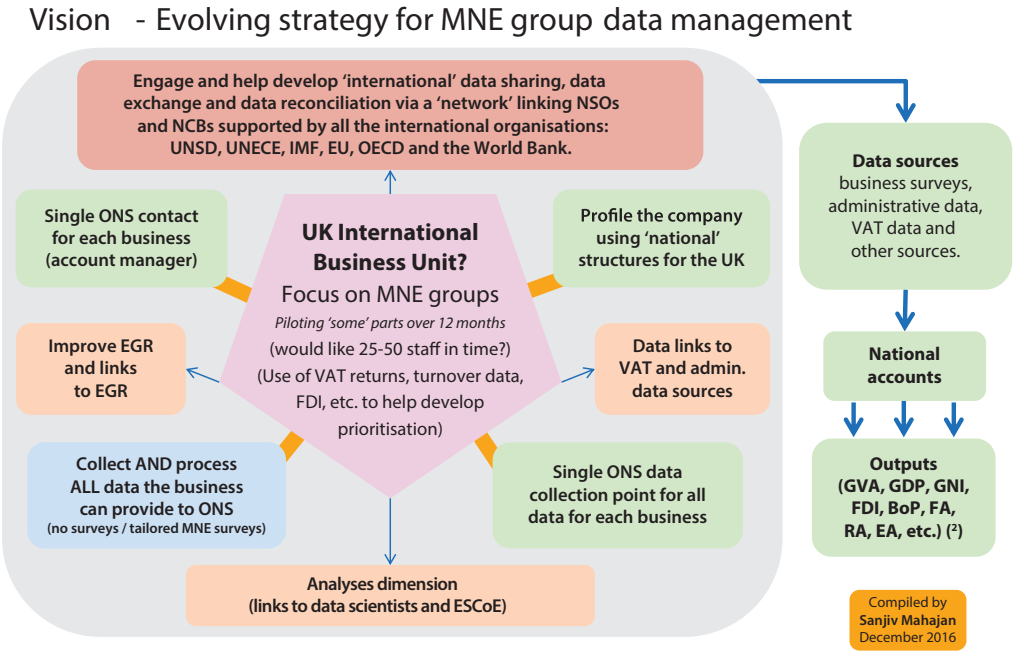
- Define the population of MNE groups that should be managed by the LCU.
- Develop and maintain regular communication and good working relationships with the selected MNE groups and develop a contract manager type role, for example, acting as a single contact point for the MNE group and other staff within the NSI.
- Coordinate data collection for various statistical domains (for example, STS, SBS, FDI, outward FATS) by designing common or bespoke questionnaires (monthly, quarterly and annual) and carrying out centralised data collection from the selected MNE groups. This eliminates the duplication of questions and cuts the statistical reporting burden on MNE groups by substantially reducing the number of questionnaires sent to them.
- Other data collection strategies can be developed such as collecting all the data that the MNE group can provide in the form convenient for them, for example, through management accounts. However, in this scenario, the burden switches to the NSI to process the data (as required) and to implement more effective and efficient strategies such as collecting data electronically. On the other hand, spending time with the MNE group mapping their datasets to those required by the NSI and generating bespoke forms to be submitted electronically would benefit both parties.
- Analyse all aspects of the data submitted to the NSI by the selected MNE groups operating in the country. This includes the delineation and classification of statistical units of the enterprises concerned.
- Exchange and reconciliation of mirror data with partner LCUs, for example trade asymmetries or property income flows.
- Carry out consistency checks of the various statistical and administrative returns, within and between the statistical domains (in other words, check if data from separate statistical domains are consistent with each other).
- Eventually, provide all relevant statistical domains (business statistics as well as national accounts and balance of payments) with consistent data for compiling their statistics.

Depending on the specific tasks of the LCU concerned, the LCU could thereby take over the responsibility for consistency and provide a complete and coherent picture of the MNE group and its contribution to each statistical domain. In some cases, the unit is not called a 'large cases unit' as the functions covered are more like a 'consistency unit' which better reflects

([6]) It should be noted that not all existing LCUs are involved in all of the above-mentioned actions.

its objectives and goes far beyond traditional profiling-related functions. For example, in the United Kingdom, a pilot exercise is underway to work with MNE groups; if successful, over the longer-term the aim would be to develop into the 'International Business Unit' as shown in Figure 1.

Figure 1: Pilot exercise — developing an International Business Unit in the United Kingdom (1)



(1) The Economic Statistics Centre of Excellence (ESCoE) based in the United Kingdom provides the Office for National Statistics with research that addresses the challenges of measuring the modern economy, as recommended by Professor Sir Charles Bean in his *Independent Review of UK Economic Statistics*.

(2) Gross value added, gross domestic product, gross national income, foreign direct investment, balance of payments, financial accounts, regional accounts, environmental accounts.

D. Positioning of an LCU within the organisational structure of an NSI

Those NSIs which already have an established LCU usually differ in terms of the positioning of the LCU within their organisational structure. For example:

- In Finland, the LCU is situated in the Data Collection Department, as part of the Business Register Unit. As all the data are collected centrally by the Data Collection Department, the LCU is not involved in data collection from MNE groups.
- In the Netherlands, the LCU is situated in the Business Statistics Department, between data collection and data analysis. Here again, as all data are collected centrally, the LCU receives the relevant data from the data collection unit and carries out consistency tasks, before providing the data to other statistical domains.
- In Ireland, on the contrary, the LCU is part of the National Accounts Department. However, in this case the LCU itself collects data, carries out consistency checks and provides all relevant domains with the final data.

In the three cases mentioned above, three different approaches have been taken. However, the common feature in all these cases is the fact that the LCU is organisationally close to where the data are collected or is even responsible for data collection itself. It is also important to note that in these three NSIs, data collection, business statistics, national accounts and balance of payments are also organised differently and may have different roles, responsibilities and coverage.

Following the principles and approaches described in *Guidelines on Integrated Economic Statistics* (United Nations, 2013) and the GSBPM, it is recommended that the LCU should sit close to, and separate from, the statistical business register and data collection areas, thus near the start of the statistical value chain.

The LCU would need to be an autonomous unit at arms-length from its stakeholders to ensure impartiality and independence, for example, the LCU would apply guidelines consistently, correctly and fairly, irrespective of the preferences of statisticians working in areas such as short-term statistics or structural business statistics. The LCU would then naturally feed timely, reconciled, coherent and consistent data through to the statistical survey domains, and beyond, avoiding unnecessary process and feedback loops. Responsiveness and timeliness dimensions are key for short-term surveys and associated statistics. The LCU will still need to involve key downstream actors such as national accounts and balance of payments statisticians, as well as having links to other areas such as analyses of productivity and linking microdata.

E. Size of an LCU and required skills

The size of the LCU should logically depend on various factors, such as, the:

- number of selected MNE groups;
- size and complexity of MNE groups;
- number of survey questionnaires sent per year to MNE groups;
- amount of time spent on collecting and checking information for each MNE group; and
- staff resources — the number of 'ring-fenced' staff working either full-time or part-time in the LCU, as they may also work in other domains. It is recommended that LCU staff are 'ring-fenced' and work only for the LCU and not partly for other statistical survey domains. This will help to remove any conflict of interest and ensure an efficient process feeding into the survey areas and beyond. This will be dependent upon the resources and budget available to the NSI.

The following skills and experiences are desirable in an LCU:

- good communication skills to develop and maintain a good working relationship with MNE groups. Communication inside the NSI (and the NCB, as appropriate) is also important — the LCU should listen to users and discuss (conceptual) issues as well as be able to convince the statistical domains that the data provided are correct, consistent and coherent and need no further adjustments;
- experience and knowledge about business models, business practices and the functioning of MNE groups to understand the content and validity of the statistical returns;
- experience in the different types of profiling techniques, preferably manual 'intensive' profiling;
- expertise in accountancy, to be able to understand business accounts and translate the information to statistical concepts in line with the system of national accounts (SNA) and the IMF's balance of payments manual (BPM) — bridging the gap is key, as well as being able to communicate in a language that businesses understand;
- experience and knowledge of the statistical system and the relations between different statistical domains;
- proficiency in statistical techniques and data engineering dealing with a large amount of information;
- identification, investigative and data problem resolution skills such as reconciling data from different domains, company accounts and other sources;
- administrative skills;
- providing support for information technology solutions;
- a mix of internal competencies from different areas (registers, business surveys, national accounts, balance of payments, etc.) is considered a strong asset to be integrated with external knowledge (finance, international accounting standards, business strategy) provided by training and/or consultancy.

In most of the cases above, it is rare that all of the skills mentioned are available in one person. Thus, the focus should be on building a team whereby all of the skills and competencies required are brought together and complement each other. The number of staff, part-time and/or full-time, solely deployed in the LCU will vary in each NSI depending upon the skills and experience mentioned above.

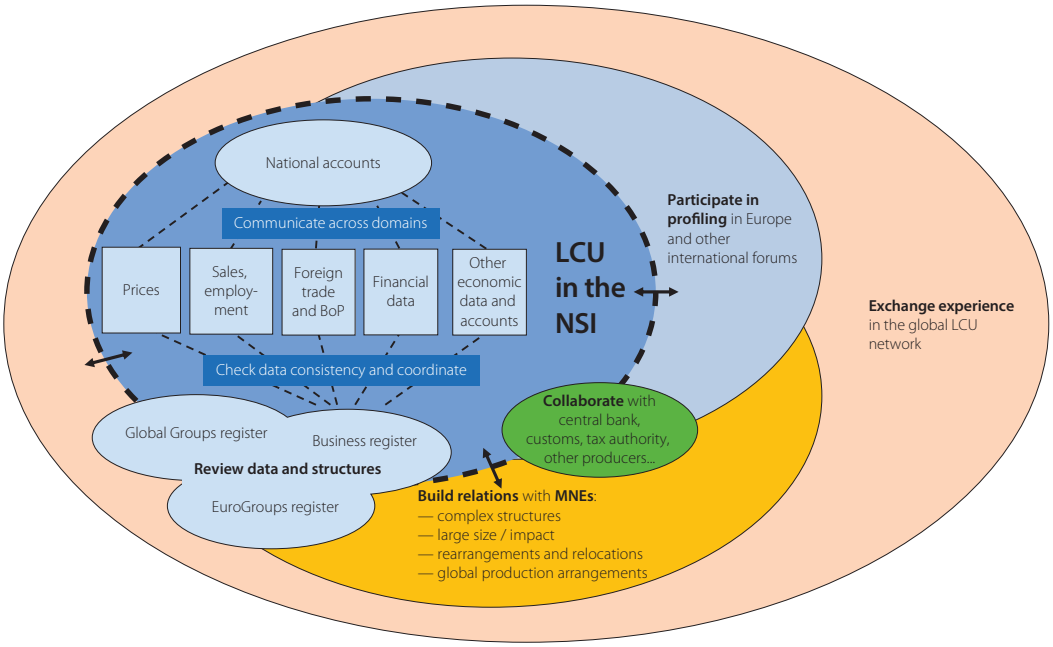
F. Working procedures for an LCU

The working procedure of currently existing LCUs usually includes:

- regular contacts with the MNE groups and official formal meetings, complemented by ad-hoc and informal contacts;
- good preparation for MNE group meetings by reviewing the company structure, company data and notes and actions of previous meetings;
- service-minded attitude to all statistical domains to whom the LCU will provide consistent and coherent data for compiling their statistics;
- intra-institutional and international cooperation, including contacts with LCUs in other countries — this should be part of the LCU strategy from the beginning.

Figure 2 illustrates the role that an LCU may play in the statistical production process. As already mentioned, the role of an LCU may be crucial to the statistical production process insofar as it provides coherent data to national accounts, balance of payments and other upstream domains by building relations with MNE groups and ensuring close cooperation with other relevant authorities inside and outside the country.

Figure 2: Role of LCUs in the statistical production process



It should be noted that to work as effectively as possible, it is important to have the right selection of MNE groups to be managed by the LCU. The size of the MNE group is an important but not the sole criterion. Other important selection criteria are complex ownership structures, opaque organisational structures, the number of countries across which the MNE group operates, transmission of inconsistent data, re-arrangements and relocations of MNE groups, involvement in global production arrangements, ownership of intellectual property products, etc. The LCU may also need to monitor resident subsidiaries of MNE groups whose controlling institution resides outside their territory.

It might be useful to have a suite of criteria, and priorities, to help define (and possibly to review regularly) the units treated by the LCU.

Furthermore, it is very important that the selected MNE group is willing to cooperate which should underpin the functioning of the LCU — this may not always be the case. Indeed, one of the prime functions of the LCU and senior management will be to pursue initiatives to foster collaboration with the MNE group.

4. International aspects

Sections 2 and 3 are essential steps in setting up a foundation so that the LCU can ensure the domestic data for the MNE group are consistent and coherent. However, the real problem is that the LCU will not have the complete picture: indeed, a global perspective is needed to ensure there are no parts missing or being double-counted. Here, international organisations need to play a role in developing processes and frameworks for facilitating access to information and helping to reconcile data consistency across borders.

To understand MNE groups fully and to compile data on their global business activities better, it is important to understand their structure and their international ownership chain(s). MNE groups organise their production chains across national boundaries with affiliates in numerous countries as well as potentially having various links with different companies in a broad range of countries. Therefore, a proper treatment of MNE groups would require cooperation between all concerned NSIs in the form of the exchange of relevant information, sharing statistical data related to the activities of those MNE groups and the reconciliation of data to ensure the whole picture was correct. Without a full picture of the activities of the MNE group, it is a challenge to produce meaningful and correct measurements of global production and trade, and to understand the influence of MNE groups on macroeconomic and business statistics.

Therefore, data sharing, data exchange and data reconciliation between national LCUs is essential if they are to accomplish their tasks in an efficient and effective way. An international network of LCUs seems to be the right answer to facilitate the necessary exchange of relevant information. LCUs may have a special role in facilitating international work towards better understanding MNE groups. LCUs could provide a point of contact between NSIs for MNE group profiling and data exchange. The active involvement of LCUs in international work and the follow-up of results achieved in recent international initiatives would support national work on MNE groups.

However, the exchange of confidential data will face a number of different obstacles of a legal, administrative, statistical, technical and cultural nature. Several on-going international initiatives are attempting to make progress in addressing such issues across countries:

- the G-20 Data Gaps Initiative;
- a number of European Commission initiatives (for instance, the EuroGroups Register (EGR), EU profiling, the FDI network, the gross national income (GNI) MNE groups pilot exercise, and the Early Warning System (EWS);
- the Nordic LCU network; and
- the UNECE Task Force on Exchange and Sharing of Economic Data.

In March 2017, a **G-20 Data Gaps Initiative** (DGI) workshop on data sharing concluded that national authorities should review non-legal restrictions to data exchange, build trust by striking a balance between making more data available while maintaining confidentiality, and start with the sharing of data at the national level to contribute to further data sharing internationally. The G-20 DGI workshop highlighted the need for further standardisation and use of common frameworks in statistical production and data exchange (for example, Statistical Data and Metadata Exchange (SDMX)) and noted the necessity to consider ways to adopt common identifiers. Also noted was the need to establish an international network to advance work, and it was suggested that members of the DGI contact group ([7]) serve as a first point of contact for questions on data sharing and accessibility. It would be useful for LCUs to liaise with the national contacts in G-20 countries in order to highlight issues and progress from a statistical viewpoint.

The European statistical system has set-up the **EuroGroups Register** (EGR), a unique international business register of MNE groups that have more than one enterprise in the territory of the EU. The EGR contains information that identifies each enterprise in terms of ownership, activity, persons employed, as well as structure and turnover. Together with national business registers, the EGR helps to provide a more informed view of the impact of MNE groups on the economy. This can immensely facilitate the work of LCUs, as the EGR should lead to better survey frame populations and improve the quality of information on MNE groups. Although the EGR can be improved regarding quality and timeliness, it is a key tool to facilitate further developments.

Another important tool in obtaining consistency in the observation and description of large and complex MNE groups is **EU profiling**. This approach should precede the work of LCUs in reconciling data for MNE groups. Profiling is a method to analyse the legal, operational and accounting structure of an enterprise group at national and EU level, to establish the statistical units within that group, their links, and the most efficient structures for the collection of statistical data. The initial step of profiling is the delineation of statistical units in large and complex MNE groups. It is therefore directly linked to the EGR, which offers a starting point in terms of acquiring a first view of the legal units concerned and an understanding of how MNE groups are structured and controlled. However, a more up-to-date, live and dynamic EGR is necessary. For MNE groups, 'intensive' profiling including company visits will also be necessary, especially for more complex cases.

([7]) Members of the DGI contact group are senior-level officials identified by the G-20 national authorities to serve as main points of contacts for the inter-agency group (IAG) of the DGI. These officials are the first point of contact for annual monitoring reports, attend global conferences, and coordinate with the policy departments of their respective institutions.

The **FDI network** project (a joint Eurostat and European Central Bank (ECB) initiative) was launched in June 2009 to reduce asymmetries and increase the internal consistency of EU and euro area balance of payments statistics. The FDI network is a secure tool for FDI compilers to exchange information (microdata) on FDI transactions and (since 2012) FDI positions, while preserving the confidentiality of the data. Although it does not allow for the reconciliation of all transactions and positions, bilateral exchange of microdata between statisticians is considered as a good practice to reduce asymmetries and to identify the reasons behind them.

Participation in the FDI network is based on the following principles:

- It is a voluntary exercise.
- FDI compilers participating in the network undertake to follow the rules and provisions laid down in the FDI network manual.
- The activities of the FDI network will be carried out in line with European Commission legislation related to statistical activities within the European statistical system and the European system of central banks.

The objective of the **GNI MNE groups pilot exercise** is to achieve by the end of the current GNI verification cycle in December 2019 a reasonable understanding of the reliability of the recording of globalisation issues through GNI data. This will help to identify the globalisation measures necessary after the end of the 2019 cycle. In addition, the two recommendations made by the European Court of Auditors in relation to globalisation need to be satisfied ([8]). As part of this initiative, the European Statistical System Committee (Director-Generals of the EU NSIs) agreed to share microdata for this pilot exercise on a trust-based approach established around Regulation (EC) No 223/2009 on European statistics; a longer-term solution should be developed for the future. Microdata will only be shared between EU Member States working on the same MNE group in relation to the statistical validation process and therefore will not be available to the public or other international organisations.

Eurostat has established the **Early Warning System** (EWS) which aims to identify important MNE Groups and possible restructuring cases, and to agree a common recording, preferably before the changes materialise or need to be incorporated in business statistics, balance of payments or national accounts. The purpose is to ensure consistency of applied methods, statistical treatment and communication of statistics involving MNE groups across EU Member States. The EWS provides a light procedure for voluntary cooperation between national statistical authorities and Eurostat, and between business statisticians and national accountants.

In September 2017, the Nordic countries decided to establish a **Nordic LCU network**. In the first phase, the network aims to share practical information on tasks and processes of these units in the Nordic countries. Later, the network intends to discuss the need and possibilities to share data on MNE groups for statistical purposes among the statistical authorities of the countries concerned.

The **UNECE Task Force on Exchange and Sharing of Economic Data** is also vital in relation to making progress on identifying the enablers of and the obstacles to international data sharing and data exchange, as well as developing possible solutions.

([8]) The two recommendations were: (i) to analyse all potential implications of multinational activities on the estimation of GNI; and (ii) correctly capture R & D assets in terms of valuation and residency.

5. Conclusions

Even though the activities of LCUs vary across countries and MNE groups are rapidly changing cross-country production chains, LCUs can provide an essential mechanism to support statisticians in dealing with the data for MNE groups across statistical domains. LCUs can also improve efficiency by promoting the use of common tools, drafting instructions for data collection and enhancing the consistent treatment of data for large and complex enterprises operating nationally and/or internationally. Moreover, when LCUs review data for MNE groups, they do so for various statistical domains, whereas without LCUs, this work would be done multiple times for various statistical domains leading to higher costs and lower levels of consistency across datasets.

Good communication with MNE groups can result in receiving timely and accurate information on the restructuring or relocation of MNE groups before these changes impact on the statistics disseminated by NSIs. The EWS, which has been launched by Eurostat with the participation of all EU Member States, relies on the potential of a well-functioning LCU and would benefit from the development of an international LCU network.

Examples from countries with existing LCUs show that while the setting-up of the LCU requires initial investment and training, in the medium and longer-term efficiency gains and even resource reductions can be achieved, while the response burden for MNE groups may also be diminished. All countries with an established LCU benefit from a better level of knowledge and understanding of major MNE groups and higher quality data covering their activities.

In summary, in an ever-changing globalised world, investment in an LCU-type entity is essential to ensure that national statistics are of high quality and do not double-count or miss any activity. It is also important to make the step to share data, exchange data and reconcile data for MNE groups beyond just the national concept. Global data sharing will enable NSIs (and NCBs) to develop a consistent and complete view of MNE groups, thereby improving international comparability of economic statistics and reducing trade asymmetries (Mahajan (2017)).

Acknowledgements

The authors would like to thank Ales Capek, Isabelle Rémond-Tiedrez, Henk Nijmeijer, Paul Konijn (all Eurostat) and Ruth O'Shaughnessy (Central Statistics Office (CSO), Ireland) for their valuable comments.

References

Boccara, F. and T. Picard (2015), 'Multinational enterprises and international trade: different country profiles', *INSEE Premiére*, No 1558, Paris.

CBS (2017), 'Waardeketens', *Internationaliseringsmonitor*, 2017/IV, Statistics Netherlands, Den Haag.

Kleinert, J. (2001), 'The Role of Multinational Enterprises in Globalization: An Empirical Overview', Kiel Institute of World Economics, Working Papers No. 1069, Kiel.

Mahajan, S. (2017), 'Measurement challenges related to MNEs — Why profiling is necessary?', presented at a Eurostat seminar, *Economic globalisation: addressing measurement challenges related to MNEs*, Luxembourg.

UNECE (2013), Generic Statistical Business Process Model (GSBPM) version 5.0, available at: http://www1.unece.org/stat/platform/display/metis/The+Generic+Statistical+Business+Process+Model.

3 The employment content of EU exports: an application of FIGARO tables

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Abstract: The Eurostat-JRC project 'Full International and Global Accounts for Research in Input-Output Analysis' (FIGARO) has produced experimental EU inter-country supply, use and input-output tables for the year 2010 in line with ESA 2010 methodology [3]. This paper uses FIGARO tables to analyse the employment content of EU Member States exports. This application relies on standard Leontief modelling and combines EU inter-country input-output data and EU employment data.

The results show that 11.3 % of EU employment in 2010 was supported by EU exports to the rest of the world, which corresponded to 25.6 million jobs. This share varies from 25 % in Luxembourg to around 7 % in Greece, Portugal and Spain.

Keywords: input-output analysis; employment; national accounts; exports

JEL codes: C67, E24, F19

[1] Eurostat, Unit C.5: Integrated global accounts and balance of payments.
[2] Joint Research Centre, European Commission.
[3] See: https://ec.europa.eu/eurostat/web/experimental-statistics/figaro.

1. Introduction

Employment and trade policies are major pillars of the Europe 2020 strategy ([4]). In an era of globalisation and digital transformation, providing evidence on the relationship between employment and trade at a European level is vital for supporting the Europe 2020 strategy.

One approach for providing these new insights is through the new European Union (EU) inter-country supply, use and input-output tables, combined with data on number of persons employed. These supply, use and input-output tables are produced by a project run jointly by Eurostat and the European Commission's Joint Research Centre (JRC) called 'full international and global accounts for research in input-output analysis' (FIGARO).

The results show that the exports of the EU to the rest of the world supported nearly 25.6 million jobs in 2010, representing 11.3 % of the EU's total employment. Of these jobs, 21.3 million (9.4 % of EU-28 employment) were in EU enterprises engaged in direct exports to the rest of world but 4.3 million (1.9 % of EU employment) were in upstream enterprises supporting EU exporters.

These and other results are provided in this article with the aim to provide the reader with an example of the type of detailed product/industry analysis that can be done with FIGARO tables, not only for understanding the link of one specific industry in a specific EU Member State with respect to its trade with other EU Member States and with the rest of the world but also for helping EU policymakers to monitor the economic and social gains of international trade and global value chains.

In this paper, the approach for measuring the employment content of EU Member States exports draws on well-established literature concerning input-output analysis with multiple regions. Models for calculating indicators related to EU exports to the rest of the world have been widely used to explore the impact of trade on different economies (Miller and Blair (2009); Johnson and Noguera (2012, 2017); Koopman, Wang and Wei (2014); Timmer et al. (2014); Arto et al. (2015); Los, Timmer and de Vries (2015) and Los and Timmer (2018)). This article applies a modified version of the above literature based on Arto et al. (2015) for EU Member States, leading to a multi-country specification whereby EU exports include exports for final uses to EU Member States only and exports (both for intermediate and for final uses) to non-member countries. This avoids problems of endogeneity since only EU exports of intermediate goods and services to EU Member States are included in the Leontief inverse matrix.

Section 2 describes the data sources used in this analysis, while Section 3 outlines the basic methodology. Section 4 presents the results and Section 5 provides conclusions.

([4]) See: https://ec.europa.eu/info/business-economy-euro/economic-and-fiscal-policy-coordination/eu-economic-governance-monitoring-prevention-correction/european-semester/framework/europe-2020-strategy_en.

2. Sources for employment, input-output accounting and trade data

To compute and analyse the employment content of EU trade, we require two data inputs: employment data and an inter-country input-output table (IC-IOT). Both relate to the year 2010.

A. Employment data

In this paper, the data on employment ([5]) for each EU Member State at the level of 64 industries (based on NACE Rev. 2) are expressed in numbers of persons employed ([6]). These data are collected via the European system of accounts (ESA 2010) transmission programme and are available on Eurostat's website ([7]).

Table 1: Employment and exports (balanced view) to non-member countries, 2010

	Employment (thousand of persons)	Exports to non-member countries (million EUR)
EU-28	225 676.6	1 917 658.6
Belgium	4 474.0	79 958.2
Bulgaria	3 603.9	7 854.8
Czechia	5 057.2	17 951.9
Denmark	2 786.0	53 442.6
Germany	41 020.0	477 747.4
Estonia	552.5	3 622.4
Ireland	1 882.7	20 384.4
Greece	4 705.5	88 142.8
Spain	19 639.5	38 022.0
France	26 886.0	283 418.3
Croatia	1 697.8	21 313.6
Italy	24 765.7	72 058.8
Cyprus	405.6	3 068.5
Latvia	843.5	21 898.6
Lithuania	1 246.8	169 456.8
Luxembourg	359.6	6 579.3
Hungary	3 969.3	3 571.7
Malta	163.8	3 321.2
Netherlands	8 778.0	3 232.1
Austria	4 098.3	40 779.5
Poland	15 369.1	121 219.1
Portugal	4 871.3	34 304.1
Romania	9 156.1	13 319.7
Slovenia	962.1	79 597.4
Slovakia	2 169.8	5 959.5
Finland	2 483.8	223 970.7
Sweden	4 502.0	14 238.3
United Kingdom	29 226.9	9 224.8

Source: Eurostat (online data code: nama_10_a64_e) and own calculations

([5]) As one referee notes, the employment data used do not distinguish between exporting enterprises (more productive) and non-exporting enterprises (less productive), thus leading to an implicit upward bias in the estimation of the employment effects of EU exports to the rest of the world.

([6]) The dataset on employment content in exports disseminated alongside FIGARO tables was based on the product-by-product EU inter-country input-output table. For this paper, we decided, however, to compile the employment content in exports using the industry-by-industry EU inter-country input-output table. The dataset for this paper is not published but is available upon request from the authors.

([7]) See: table nama_10_a64_e on Eurostat's website.

In some cases where data are missing or under confidentiality restrictions, imputations use non-publicly available data (from other tables of the ESA 2010) such as value added ratios. Table 1 presents the level of total employment estimated for each EU Member State for 2010. In the EU-28, 225.7 million persons were employed in 2010. The balanced view of trade (see Section C below) shows trade flows from the EU-28 to non-member countries of EUR 1 918 billion in 2010.

B. Input-output data

The underlying input-output tables used in this analysis draw on national supply and use tables for the 28 EU Member States and for the United States, for the reference year 2010. FIGARO tables do not represent the rest of the world as fully-fledged supply and use matrices but just as export and import vectors. The EU inter-country supply, use and input-output tables depict the production and consumption of products (for intermediate and final use) by industries and economic agents in a number of countries and across trading partners (Rémond-Tiedrez and Rueda-Cantuche (2019)) with information for 29 economies and 64 industries (see Annex B for details).

C. Trade data

Cross-country interactions in FIGARO tables are based on a balanced view of trade in goods — made at the 6-digit level of the harmonised system (HS) ([8]) — and a balanced view of trade in services — following the extended balance of payments services classification (EBOPS). Both balanced views of trade are converted to the classification of products by activity (CPA), as used in European national accounts; Eurostat's RAMON website ([9]) publishes correspondence tables. However, for the compilation of FIGARO tables, some EU Member States provided additional data that were used to improve the general correspondence table, mostly on multiple correspondence cases.

3. Methodology

FIGARO inter-country input-output tables (IC-IOTs) depict, in monetary units, the transactions between industries and final users across a set of 29 countries: the EU Member States and the United States, as well as the rest of the world (as an import vector). Next, the model is described using the case of three countries and *n* industries. Table 2 below depicts a simple three country illustration ([10]).

([8]) See: https://unstats.un.org/unsd/tradekb/Knowledgebase/50018/Harmonized-Commodity-Description-and-Coding-Systems-HS.

([9]) See: https://ec.europa.eu/eurostat/ramon/relations/index.cfm?TargetUrl=LST_REL&StrLanguageCode=EN&IntCurrentPage=8.

([10]) Bold-faced lower-case letters are used to indicate vectors, bold-faced capital letters indicate matrices, and italic lower-case letters indicate scalars (including elements of a vector or matrix). Subscripts indicate industries and superscripts indicate countries. Vectors are columns by definition, row vectors are obtained by transposition, denoted by a prime (for example, $\mathbf{x}'$). Diagonal matrices are denoted by ^ (for example, $\hat{\mathbf{x}}$).

Table 2: Three country inter-country input-output table

Countries	Intermediate use			Final demand			Gross output
	1	2	3	1	2	3	
1	$\mathbf{Z}^{11}$	$\mathbf{Z}^{12}$	$\mathbf{Z}^{13}$	$\mathbf{f}^{11}$	$\mathbf{f}^{12}$	$\mathbf{f}^{13}$	$\mathbf{x}^{1}$
2	$\mathbf{Z}^{21}$	$\mathbf{Z}^{22}$	$\mathbf{Z}^{23}$	$\mathbf{f}^{21}$	$\mathbf{f}^{22}$	$\mathbf{f}^{23}$	$\mathbf{x}^{2}$
3	$\mathbf{Z}^{31}$	$\mathbf{Z}^{32}$	$\mathbf{Z}^{33}$	$\mathbf{f}^{31}$	$\mathbf{f}^{32}$	$\mathbf{f}^{33}$	$\mathbf{x}^{3}$
Primary inputs	$\left(\mathbf{w}^{1}\right)'$	$\left(\mathbf{w}^{2}\right)'$	$\left(\mathbf{w}^{3}\right)'$				
Total inputs	$\left(\mathbf{x}^{1}\right)'$	$\left(\mathbf{x}^{2}\right)'$	$\left(\mathbf{x}^{3}\right)'$				

Where:

$\mathbf{Z}^{rs}$ is an $(n\times n)$ matrix of intermediate inputs going from country *r* to country *s*; and $\mathbf{z}_{ij}^{rs}$ represents the sales of industry *i* in country *r* to industry *j* in country *s*.

$\mathbf{f}^{rs}$ is a column vector $(n\times 1)$ of final demand (in other words, the sum of private consumption, government consumption and investments) of country *s* for goods and services produced in country *r*; and $\mathbf{f}_{i}^{rs}$ indicates the final demand in country *s* of commodities produced by industry *i* of country *r*; and $\mathbf{f}^{r}=\sum_{s}\mathbf{f}^{rs}$ is the column vector of final demand for commodities produced in country *r* from all countries.

$\mathbf{x}^{r}$ is a column vector $(n\times 1)$ containing country *r*'s output of industries; and $\mathbf{x}_{i}^{r}$ denotes industry *i*'s output in country *r*.

$\mathbf{w}^{r}$ is a column vector $(n\times 1)$ containing country *r*'s primary inputs (value added, labour and capital use, other taxes on production, etc.) by industry; and $\mathbf{w}_{i}^{r}$ denotes industry *i*'s primary inputs in country *r*.

The relation between $\mathbf{x}$, $\mathbf{Z}$ and $\mathbf{f}$ can be shown as $\mathbf{x}=\mathbf{Zi}+\mathbf{f}$, where $\mathbf{i}$ is a column summation vector.

Along with these elements, in order to undertake the analysis, data on employment by country and industry are also required.

We can define the column vector $\mathbf{Em}^{r}$, to denote employment (for example, in thousands of persons) in country *r*, whose element $\mathbf{Em}_{i}^{r}$ represents industry *i*'s employment in country *r*.

From Table 2, we can define a technical coefficients matrix as $\mathbf{A}^{rs}=\mathbf{Z}^{rs}\left(\hat{\mathbf{x}}^{s}\right)^{-1}$, where $\left(\hat{\mathbf{x}}^{s}\right)^{-1}$ designates the inverse of the diagonal matrix of total outputs in country *s*.

With these elements, the standard input–output model is defined as $\mathbf{x}=\mathbf{Ax}+\mathbf{f}$ whose solution is $\mathbf{x}=\mathbf{Lf}$, where $\mathbf{L}=\left(\mathbf{I}-\mathbf{A}\right)$ represents the Leontief matrix and $\mathbf{L}=\left(\mathbf{I}-\mathbf{A}\right)^{-1}$ the Leontief inverse matrix.

Similarly, employment coefficients are calculated as $\mathbf{d}^{r}=\left(\hat{\mathbf{x}}^{r}\right)^{-1}\mathbf{Em}^{r}$. Employment coefficients represent employment intensity per unit of output. Total employment can therefore be obtained as $\mathbf{d}'\mathbf{x}=\mathbf{d}'\mathbf{Lf}$.

Embodied effects

While $\mathbf{Em}^r$ reflects the direct employment involved in the production of a particular product it only tells part of the story with regards to the links between employment and production, and, in turn, employment and trade. To fully understand the impact on overall employment requires an estimate of the upstream jobs engaged in providing intermediate goods and services for the production of a particular product, not just those involved in the industry associated with the product itself. And of course, in order to differentiate between EU (intra-EU) and non-EU (extra-EU) trade we need to distinguish between these two regions.

In a three country case, assuming that countries 1 and 2 are members of the EU, and country 3 is the rest of the world ([11]), we can redefine the components of the IC-IOT framework for the EU as:

$$\mathbf{Z}^{EU} = \begin{bmatrix} \mathbf{Z}^{11} & \mathbf{Z}^{12} \\ \mathbf{Z}^{21} & \mathbf{Z}^{22} \end{bmatrix} \qquad \mathbf{f}^{EU} = \begin{bmatrix} \mathbf{f}^{11} + \mathbf{f}^{12} + \mathbf{e}^{13} \\ \mathbf{f}^{21} + \mathbf{f}^{22} + \mathbf{e}^{23} \end{bmatrix} = \begin{bmatrix} \mathbf{f}^{1} \\ \mathbf{f}^{2} \end{bmatrix}$$

$$\mathbf{x}^{EU} = \begin{bmatrix} \mathbf{x}^{1} \\ \mathbf{x}^{2} \end{bmatrix} \qquad \mathbf{Em}^{EU} = \begin{bmatrix} \mathbf{Em}^{1} \\ \mathbf{Em}^{2} \end{bmatrix} \qquad \mathbf{d}^{EU} = \begin{bmatrix} \mathbf{d}^{1} \\ \mathbf{d}^{2} \end{bmatrix}$$

where $\mathbf{e}^{rs} = \mathbf{f}^{rs} + \mathbf{Z}^{rs}\mathbf{i}$ are exports from EU Member State *r* to the non-member country s. With these elements, we can obtain the employment generated in the EU due to the exports to non-member countries by applying the following formula:

$$\mathbf{Em}^{EU}_{ex_{EU}} = \left(\mathbf{d}^{EU}\right)' \mathbf{L}^{EU}\mathbf{e}^{EU} = \left(\mathbf{d}^{1}\right)' \mathbf{L}^{11}\mathbf{e}^{13} + \left(\mathbf{d}^{1}\right)' \mathbf{L}^{12}\mathbf{e}^{23} + \left(\mathbf{d}^{2}\right)' \mathbf{L}^{21}\mathbf{e}^{13} + \left(\mathbf{d}^{2}\right)' \mathbf{L}^{22}\mathbf{e}^{23}$$

where $\left(\mathbf{d}^{r}\right)' \mathbf{L}^{rs}\mathbf{e}^{st}$ is the employment supported in EU Member State *r* due to the exports of another EU Member State *s* to a non-member country *t*.

The employment supported by EU exports to non-member countries comprises two different types of effect: domestic effects and spillovers. Domestic effects refer to the employment in a given EU Member State supported by its own exports to the rest of the world. Spillovers refer to the employment in a given Member State that is supported by the exports of another Member State to the rest of the world. Besides, domestic effects can be split up into direct effects on the exporting industry itself and indirect effects ([12]) on other domestic industries that supply intermediate inputs to the exporting industry (in other words, employment in domestic upstream industries).

The interpretation of results will focus on the 28 EU Member States for the year 2010; therefore no results are presented for the United States economy.

([11]) Without loss of generality, in FIGARO tables this is a single vector instead of a matrix.
([12]) To some extent, spillovers could also be thought as indirect effects occurring in other countries.

4. Results

The results presented here cover 28 economies and 64 industries and therefore contains a huge amount of detailed information; more than 3.2 million cells only in the part detailing intermediate consumption. At this level of granularity we have estimated, for example, that:

- around 7 600 persons employed in the motor vehicles industry (C29) of Czechia were supported by exports made from the German motor vehicles industry to non-member countries, representing 45 % of the employment in the Czech motor vehicles industry that was supported by exports of EU Member States (not only Germany) to the rest of the world.
- around 13 000 persons employed within the EU were supported by Dutch exports of water transportation services (H50) to the rest of the world, of which 10 700 persons were employed in the Netherlands — domestic employment ([13]).

For presentation purposes, results are aggregated to country and industry levels, separately.

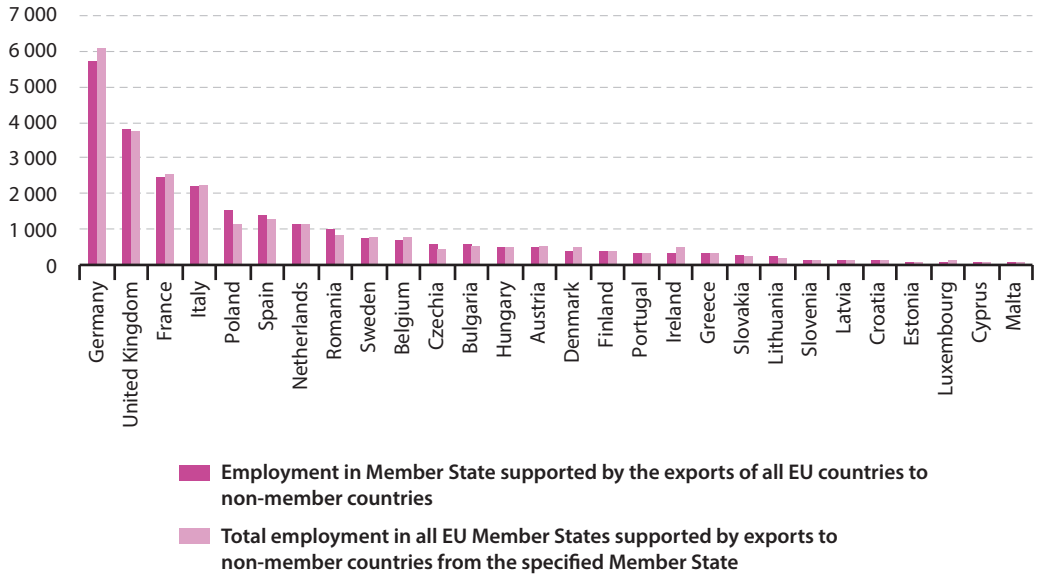
A. Country level

In 2010, EU exports to the rest of the world supported 25.6 million jobs in the EU-28 that represented 11.3 % of EU-28 employment.

More than half of the jobs in the EU-28 supported by EU exports to the rest of the world were concentrated in the following four Member States: Germany, the United Kingdom, France and Italy, which together had a total of more than 14.1 million jobs (see Figure 1), respectively 5.7 million jobs, 3.8 million, 2.5 million and 2.2 million. Similarly, more than half (14.6 million jobs) of the EU workforce whose jobs were supported by exports to the rest of the world was based on exports from one of these four Member States.

([13]) Absolute values result from many estimation steps coming from the compilation process used for FIGARO tables, for which a quality assessment was carried out and described in detail in Rémond-Tiedrez and Rueda-Cantuche (2019).

Figure 1: Employment supported by EU exports to non-member countries, 2010
(thousand persons)



However, relative to total employment in each of the individual EU Member States, a different picture appears (see Figure 2). EU exports to the rest of the world supported 25 % of total employment in Luxembourg. This value consists of two factors: i) exports from Luxembourg to the rest of the world supported 19.4 % of employment (domestic part) and ii) exports from the other EU Member States to the rest of the world supported 5.7 % of employment (identified as spillover received in Figure 2).

Figure 2 delineates between northern and western EU Member States on the one hand and southern and eastern Member States on the other (with some exceptions). Northern and western Member States (as well as Bulgaria, Malta and Slovenia) had employment shares supported by domestic exports that were above the EU-28 average of 9.4 %. On the contrary, in southern and eastern Member States (as well as in France and Austria) domestic exports systematically supported less than 8.5 % of total employment.

In terms of spillover effects, the top five Member States with the highest shares of their employment supported by the exports of other EU Member States were (in decreasing order): Luxembourg (5.7 %), Slovakia (4.8 %), Czechia (4.7 %), Estonia (4.1 %) and Malta (3.5 %).

Domestic effects can be additionally broken down into direct and indirect effects (see Section 3). The lime marker in Figure 2 indicates the share of each EU Member State's supported employment due to direct effects. The ratio of direct effects over total domestic effects was quite similar across Member States with an average of just under 60 % and values that ranged between 47 % in Cyprus and 75 % in Malta. Therefore, the remaining 40 % of domestic effects corresponded to indirect employment supported by exports of intermediate goods and services to other domestic exporting industries.

Figure 2: Employment supported by exports to non-member countries, 2010
(% of total employment)

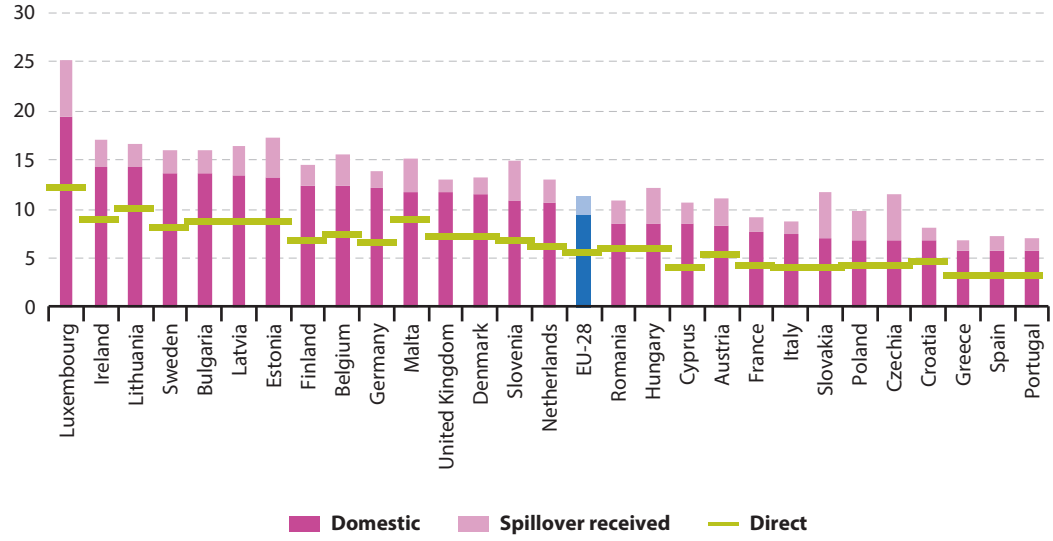


Table 3 shows (first column) how many jobs each EU Member State were supported through their exports to non-member countries (see also the light pink bars in Figure 1). The second and third columns of Table 3 split the values in the first column between domestic and spillover effects. As an example, Romanian exports to non-member countries supported 817 300 jobs across the EU, of which 780 300 were located in Romania (95.5 %) and 37 100 were located elsewhere in the EU (4.5 %). Table 3 also presents this information in terms of the domestic and spillover shares (in the fourth and fifth columns).

EU Member States with high domestic shares (and low spillover shares) were not, by definition, typically integrated into international or European supply chains, such as the cases of Romania, Bulgaria and Croatia. On the other hand, Ireland and Luxembourg had the largest shares for spillover effects indicating that a high share of the employment effects of Irish and Luxembourgish exports was typically located in other EU Member States. In particular, Irish exports to non-member countries supported 485 000 jobs across the EU, of which almost half were jobs outside the country itself.

Table 3: Employment supported by exports to non-member countries, ranked by spillover share, 2010

	Total employment in all EU Member States supported by exports to non-member countries from the specified Member State (thousand persons)	Employment supported in each Member State by its own exports — domestic supported (thousand persons)	Employment in other EU Member States supported by its own exports — spillover supported (thousand persons)	Domestic share (%)	Spillover share (%)
Romania	817.3	780.3	37.1	95.5	4.5
Bulgaria	512.8	488.6	24.2	95.3	4.7
Croatia	123.5	116.5	6.9	94.4	5.6
Latvia	122.7	113.9	8.8	92.9	7.1
Lithuania	192.7	178.3	14.4	92.5	7.5
Poland	1 155.1	1 063.4	91.7	92.1	7.9
United Kingdom	3 779.4	3 404.8	374.6	90.1	9.9
Greece	305.4	274.3	31.1	89.8	10.2
Spain	1 300.4	1 124.4	176.0	86.5	13.5
Portugal	323.7	277.4	46.2	85.7	14.3
Germany	6 055.9	5 003.4	1 052.5	82.6	17.4
Netherlands	1 146.1	945.8	200.3	82.5	17.5
Estonia	88.8	73.3	15.5	82.5	17.5
Slovania	127.9	105.1	22.8	82.2	17.8
France	2 541.5	2 078.4	463.0	81.8	18.2
Italy	2 264.3	1 837.4	426.9	81.1	18.9
Czechia	432.4	349.0	83.3	80.7	19.3
Cyprus	43.1	34.5	8.6	79.9	20.1
Finland	399.3	309.8	89.5	77.6	22.4
Sweden	792.9	613.9	179.0	77.4	22.6
Hungary	453.1	338.1	115.0	74.6	25.4
Slovakia	205.1	150.5	54.6	73.4	26.6
Belgium	781.2	554.3	226.9	71.0	29.0
Denmark	461.0	324.0	137.0	70.3	29.7
Malta	28.3	19.2	9.1	67.7	32.3
Austria	510.7	344.7	165.9	67.5	32.5
Ireland	485.8	270.1	215.7	55.6	44.4
Luxembourg	131.3	69.9	61.4	53.3	46.7

Large EU Member States provide the biggest domestic and spillover effects in absolute terms. German exports to non-member countries supported over 1 million jobs outside of Germany, while French and Italian exports to non-member countries each supported more than 400 000 jobs elsewhere in the EU. Moreover, German exports to non-member countries supported 5 million jobs in Germany, while French exports to non-member countries supported 2 million jobs in France and Italian exports to non-member countries supported 1.8 million jobs in Italy.

A full table of the employment in each EU Member State supported by exports to non-member countries is provided in Annex C. For example, in the column for Spain (ES), Spanish exports to non-member countries supported a total of 1.3 million jobs across the whole of the EU-28: 1.12 million jobs in Spain itself; 32 800 jobs in Germany; 30 100 jobs in France; 21 700 jobs in Italy; 19 500 jobs in the United Kingdom; 13 200 jobs in Portugal and 10 800 jobs in Poland, and so on.

Reading the table in Annex C by rows, there were 1.4 million persons employed in Spain whose jobs were supported by exports from EU Member States to non-member countries, of which 1.12 million jobs were supported by Spain's own exports, 65 700 jobs by Germany's exports, 59 300 jobs by France's exports, and so on.

B. Industry level

At their most detailed level, the results cover 64 industries, from agricultural products to services through manufactured products; they are available on the FIGARO webpage. For readability, the results presented in Table 4 are aggregated to show information for 10 main industries.

Table 4: Employment supported by exports of each industry to non-member countries, EU-28, 2010
(thousand persons)

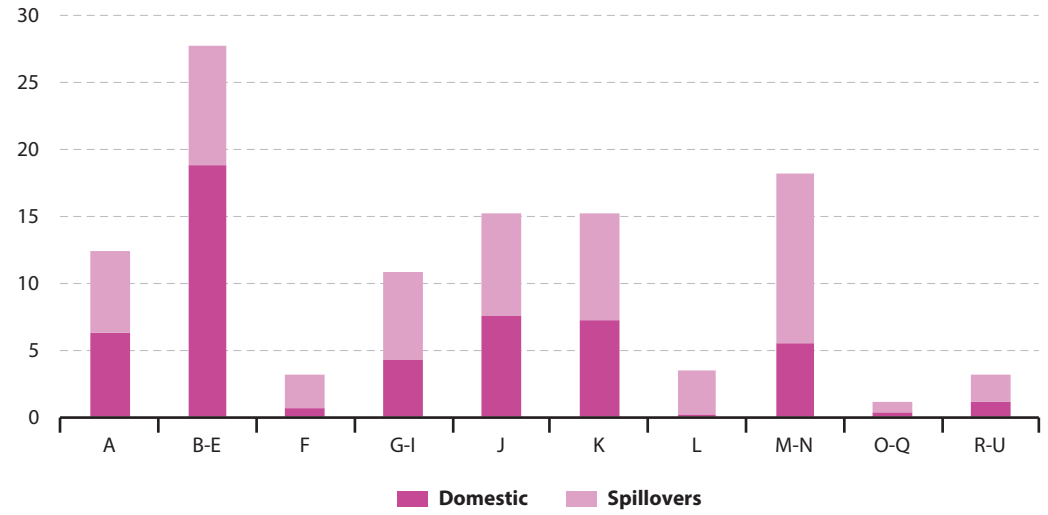
		Exports by product										
		A	B-E	F	G-I	J	K	L	M-N	O-Q	R-U	All products
Employment in industries	A	776.9	660.4	1.8	51.3	4.8	2.2	0.2	8.8	0.9	1.0	1 508.3
	B-E	44.8	9 387.7	26.9	242.4	62.8	29.8	2.2	78.4	7.0	7.0	9 888.9
	F	5.6	271.7	106.4	71.7	12.2	16.1	2.5	23.2	3.0	2.0	514.4
	G-I	47.6	2 691.2	21.1	2 923.3	85.1	74.9	1.4	134.9	9.7	8.6	5 997.7
	J	3.2	264.2	1.8	73.0	483.0	42.5	0.3	50.8	2.5	4.2	925.4
	K	7.0	290.6	2.6	78.9	16.6	500.0	1.3	31.2	1.7	1.9	931.8
	L	0.8	47.1	0.5	17.1	3.2	3.4	5.2	6.8	0.4	0.3	84.8
	M-N	32.9	2 123.0	16.3	488.3	153.8	176.3	2.5	1 647.9	16.4	20.1	4 677.6
	O-Q	4.2	271.1	2.0	62.0	21.2	19.8	0.4	45.1	205.9	2.2	633.9
	R-U	2.4	161.1	1.1	39.8	22.5	13.8	0.2	28.3	2.0	162.7	433.9
	All industries	925.4	16 168.0	180.5	4 047.6	865.3	878.7	16.2	2 055.5	249.5	210.0	25 596.7

In 2010, EU-28 exports to non-member countries supported nearly 10 million jobs in industry (Sections B-E), which represented 28 % of the total number of persons employed in industry (see Figure 3). Out of these 9.9 million jobs, 9.4 million were supported by the exports of industry, while 242 000 jobs were supported by the exports of trade, transport, accommodation and food services (Sections G-I), as shown when reading Table 4 by rows.

Trade, transport, accommodation and food services had the second highest number of jobs supported by EU-28 exports to non-member countries (nearly 6 million), followed by professional, scientific and technical activities; administrative and support service activities (Sections M and N), where 4.7 million jobs were supported by exports to non-member countries.

Table 4 also shows (reading by columns) that EU-28 exports of industrial products to non-member countries supported more than 16 million jobs across the EU, with 9.4 million of these in industry, with considerable spillover effects for trade, transport, accommodation and food services (2.7 million jobs) and professional, scientific and technical activities; administrative and support service activities (2.1 million jobs).

Figure 3: Employment supported by exports of each product to non-member countries, EU-28, 2010
(% of total employment)



5. Conclusions

This article describes how the FIGARO dataset may be used for economic analysis, providing a picture of the economic relationships between EU Member States and the rest of the world. In particular, this article provides an example of specific analysis of the relationship between trade and jobs in the EU. It provides interesting results at a detailed level of products/industries that not only enables an understanding of the links that exist between specific industries and/or specific EU Member States with respect to their trade with non-member countries and its impact on jobs, but also helps policymakers monitor the economic (including labour market) gains of international trade and global value chains. The authors envisage a range of alternative applications using the FIGARO dataset, including an analysis of environmental footprints, factor contents of trade, input-output modelling, and other issues.

The FIGARO dataset will also constitute the main reference dataset for the European Commission's economic model, FIDELIO (Rocchi et al. (2018)).

Further comparisons of the results using other international databases such as the world input-output database (WIOD) or the recently published OECD inter-country input-output tables (December 2018) would help to understand the different methodological assumptions used and therefore would also help users to make the best choice about which database to use (depending on their own research objectives).

The main limitation of the current FIGARO dataset concerns data availability, insofar as information is given for reference year 2010 only. This situation will soon change, as the continuation of the FIGARO project foresees the dissemination of time series results by the end of 2020, both in current and previous year's prices.

Acknowledgements

The authors would like to acknowledge helpful comments and input from colleagues in Eurostat and the JRC that contributed towards this paper. The authors would also like to thank the reviewers for their feedback and suggestions.

References

Arto, I., J.M. Rueda-Cantuche, A.F. Amores, E. Dietzenbacher, N. Sousa, L. Montinari and A. Markandya (2015), *EU exports to the World: Effects on Employment and Income*, Publications Office of the European Union, Luxembourg.

Eurostat (2008), *Eurostat Manual of Supply, Use and Input-Output Tables*, Publications Office of the European Union, Luxembourg.

Johnson, R.C. and N. Guillermo (2012), 'Accounting for intermediates: Production sharing and trade in value added', *Journal of International Economics*, Volume 86, Issue 2, pp. 224-236.

Johnson, R.C. and N. Guillermo (2017), 'A Portrait of Trade in Value Added over Four Decades', *The Review of Economics and Statistics*, Volume 99, Issue 5, pp. 896-911.

Koopman, R., Z. Wang and S. Wei (2014), 'Tracing Value-Added and Double Counting in Gross Exports', *American Economic Review*, Volume 104, No 2, pp. 459-494.

Los, B. and M.P. Timmer (2018), 'Measuring Bilateral Exports of Value Added: A Unified Framework', NBER working paper, No 24896.

Los, B., M.P. Timmer and G.J. de Vries (2015), 'How Global are Global Value Chains? A New Approach to Measure International Fragmentation', *Journal of Regional Science*, Volume 55, Issue 1, pp. 66-92.

Miller, R.E. and P.E. Blair (2009), 'Input-Output Analysis: Foundations and Extensions', 2nd edition, Cambridge University Press, New York.

Rémond-Tiedrez, I. and J.M. Rueda-Cantuche (eds.) (2019), *EU inter-country supply, use and input-output tables — Full international and global accounts for research in input-output analysis (FIGARO)*, Eurostat — Statistical working papers, Publications Office of the European Union, Luxembourg.

Rocchi, P., S. Salotti, F. Reynès, J. Hu, T. Bulavskaya, J.M. Rueda Cantuche, J.M. Valderas Jaramillo, A. Velázquez Afonso, A.F. Amores and T. Corsatea (2019), *FIDELIO 3 manual: Equations and data sources*, JRC technical reports, Publications Office of the European Union, Luxembourg.

Timmer, M.P., E. Dietzenbacher, B. Los, R. Stehrer and G.J. de Vries (2015), 'An Illustrated User Guide to the World Input–Output Database: the Case of Global Automotive Production', *Review of International Economics*, Volume 23, Issue 3, pp. 575-605.

Timmer, M.P., A.A. Erumban, B. Los, R. Stehrer and G.J. de Vries (2014), 'Slicing Up Global Value Chains', *Journal of Economic Perspectives*, Volume 28, No 2, pp. 99-118.

Annex A: Comparison of FIGARO results with WIOD 2016 release

With the release of EU inter-country input-output tables compiled for the year 2010, users have a new dataset alongside other international inter-country input-output tables, such as the world input-output database (WIOD) ([14]) or the OECD's inter-country input-output tables ([15]).

A brief comparison between the FIGARO dataset and the WIOD dataset is described below.

EU-28 employment supported by EU exports to non-member countries amounted to 25.5 million jobs in 2010 according to the FIGARO database, while it concerned 27.4 million jobs in 2010 using the WIOD database (2016 release). As such, the estimation of embodied employment was lower when using the FIGARO database than using the WIOD database.

There are three main factors that may explain such differences:

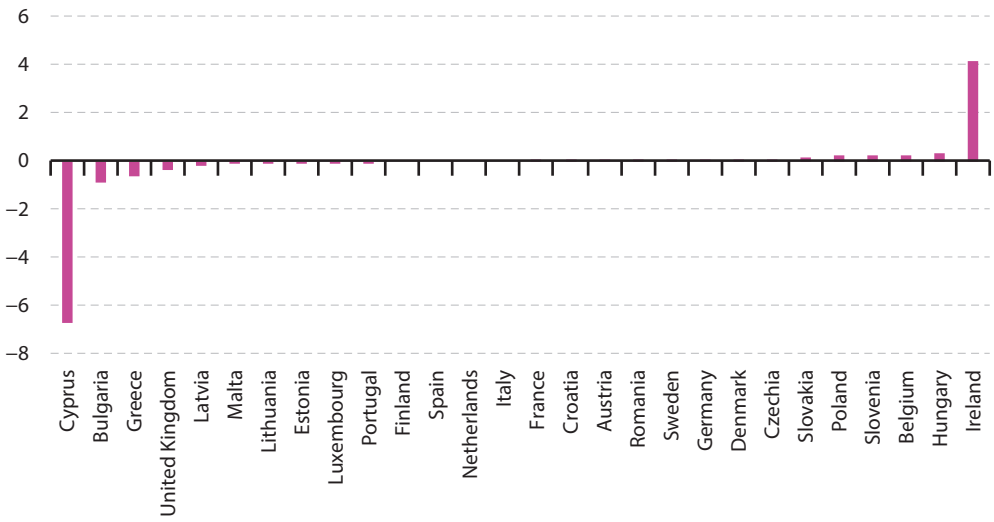
1. Employment coefficients, **d**;
2. EU exports to the rest of the world, **e**; and
3. the Leontief inverse, **L**.

1. *Employment coefficients* are defined as the number of persons employed per unit of output. The numerator, number of persons employed, is the same in both databases. However, the denominator, the output may be different between the two databases due to vintage issues or source data. In the FIGARO dataset the output measure comes from supply and use tables (SUTs) provided to Eurostat. This measure may not be fully consistent with the output provided in the latest national releases, as many countries do not revise the SUTs for each release of their national gross domestic product (GDP) figures. The WIOD database used for this comparison was released in November 2016. National data included in FIGARO may be more recent. To compare WIOD data with FIGARO data an exchange rate of 1.3257 USD = 1 EUR was used (the same rate as that applied in the FIGARO database). The percentage differences between output values in the two databases were close to zero for most of the EU Member States. The only significant differences were registered for Cyprus and Ireland (see Figure 4).

Employment coefficients are calculated at a detailed level (64 industries for FIGARO and for 56 industries for WIOD ([16])). WIOD employment coefficients tend to be smaller than FIGARO employment coefficients. Although the total employment and total output per EU Member State are similar, at the detailed level of industries differences are present.

([14]) See: http://www.wiod.org/home.
([15]) See: http://www.oecd.org/sti/ind/inter-country-input-output-tables.htm.
([16]) In the WIOD database there are only 56 industries, as Sections N, Q and R-S are aggregated.

Figure 4: Gross output, difference between FIGARO and WIOD values, 2010
(%



2. *EU exports to the rest of the world* were different across the two databases with a higher value in the WIOD database compared with the FIGARO database: total EU-28 exports were valued at EUR 2 014 billion in the WIOD database and at EUR 1 917 billion in the FIGARO database (as such, they were 5.1 % higher in the WIOD database).

The differences varied between EU Member States: the inter-quartile interval was [-0.2 %; 12.7 %] with a median of 5.7 %. The biggest differences were recorded for Croatia, Portugal, Ireland, Cyprus and Malta.

The compilation of the export vector is a core part of the methodology in both databases. A more thorough investigation of this aspect would be worthwhile, examining more closely the compilation of the export vector and the balanced view of trade underlying the two different inter-country input-output tables. However, this task falls beyond the scope of this paper.

3. *The Leontief inverse*: any differences between the two matrices result from different methodologies. The main divergence relates to adjustments for goods sent abroad for processing, merchanting transactions, re-exports, and so on that are included in the FIGARO dataset ([17]).

([17]) For further details on the adjustments included in the FIGARO dataset, refer to Rémond-Tiedrez and Rueda-Cantuche (2019).

Annex B: List of industries in FIGARO

List of industries in FIGARO

Section	Division(s)	Label
A	01	Products of agriculture, hunting and related services
A	02	Products of forestry, logging and related services
A	03	Fish and other fishing products; aquaculture products; support services to fishing
B	05 to 09	Mining and quarrying
C	10 to 12	Food, beverages and tobacco products
C	13 to 15	Textiles, wearing apparel, leather and related products
C	16	Wood and of products of wood and cork, except furniture; articles of straw and plaiting materials
C	17	Paper and paper products
C	18	Printing and recording services
C	19	Coke and refined petroleum products
C	20	Chemicals and chemical products
C	21	Basic pharmaceutical products and pharmaceutical preparations
C	22	Rubber and plastic products
C	23	Other non-metallic mineral products
C	24	Basic metals
C	25	Fabricated metal products, except machinery and equipment
C	26	Computer, electronic and optical products
C	27	Electrical equipment
C	28	Machinery and equipment n.e.c.
C	29	Motor vehicles, trailers and semi-trailers
C	30	Other transport equipment
C	31 and 32	Furniture and other manufactured goods
C	33	Repair and installation services of machinery and equipment
D	35	Electricity, gas, steam and air conditioning
E	36	Natural water; water treatment and supply services
E	37 to 39	Sewerage services; sewage sludge; waste collection, treatment and disposal services; materials recovery services; remediation services and other waste management services
F	41 to 43	Constructions and construction works
G	45	Wholesale and retail trade and repair services of motor vehicles and motorcycles
G	46	Wholesale trade services, except of motor vehicles and motorcycles
G	47	Retail trade services, except of motor vehicles and motorcycles
H	49	Land transport services and transport services via pipelines
H	50	Water transport services
H	51	Air transport services
H	52	Warehousing and support services for transportation
H	53	Postal and courier services
I	55 and 56	Accommodation and food services

List of industries in FIGARO (continued)

Section	Division(s)	Label
J	58	Publishing services
J	59 and 60	Motion picture, video and television programme production services, sound recording and music publishing; programming and broadcasting services
J	61	Telecommunications services
J	62 and 63	Computer programming, consultancy and related services; Information services
K	64	Financial services, except insurance and pension funding
K	65	Insurance, reinsurance and pension funding services, except compulsory social security
K	66	Services auxiliary to financial services and insurance services
L	68	Real estate services
M	69 and 70	Legal and accounting services; services of head offices; management consultancy services
M	71	Architectural and engineering services; technical testing and analysis services
M	72	Scientific research and development services
M	73	Advertising and market research services
M	74 and 75	Other professional, scientific and technical services and veterinary services
N	77	Rental and leasing services
N	78	Employment services
N	79	Travel agency, tour operator and other reservation services and related services
N	80 to 82	Security and investigation services; services to buildings and landscape; office administrative, office support and other business support services
O	84	Public administration and defence services; compulsory social security services
P	85	Education services
Q	86	Human health services
Q	87 and 88	Residential care services; social work services without accommodation
R	90 to 92	Creative, arts, entertainment, library, archive, museum, other cultural services; gambling and betting services
R	93	Sporting services and amusement and recreation services
S	94	Services furnished by membership organisations
S	95	Repair services of computers and personal and household goods
S	96	Other personal services
T	97 and 98	Services of households as employers; undifferentiated goods and services produced by households for own use
U	99	Services provided by extraterritorial organisations and bodies

Annex C: Employment supported by exports to non-member countries

Employment supported by exports to non-member countries, 2010
(thousand persons)

Employment in	Exports by: BE	BG	CZ	DK	DE	EE	IE	EL	ES	FR	HR	IT	CY	LV	LT	LU	HU	MT	NL	AT	PL	PT	RO	SI	SK	FI	SE	UK	Sum for all Member States
BE	554.3	0.2	1.2	4.2	37.0	0.2	7.0	0.6	4.5	27.3	0.1	10.0	0.2	0.1	0.3	5.5	1.4	0.6	14.1	2.2	2.1	0.7	0.5	0.3	0.5	1.8	4.9	15.5	697.4
BG	5.7	504.8	1.3	1.5	20.4	0.2	1.2	4.1	3.4	7.0	0.1	17.0	0.4	0.1	0.2	0.2	1.8	0.3	2.3	4.1	1.8	0.6	5.2	0.5	1.2	0.9	1.4	4.9	592.3
CZ	6.8	0.7	349.0	3.7	104.8	0.5	3.2	0.6	5.4	14.6	0.3	17.3	0.5	0.2	0.6	0.8	8.7	0.1	7.1	13.9	10.0	0.6	1.3	1.6	14.5	2.5	6.2	11.8	587.5
DK	1.6	0.1	0.4	324.0	9.6	0.2	2.2	0.3	1.2	2.8	0.0	2.3	0.0	0.1	0.2	0.3	0.7	0.2	1.8	0.5	1.0	0.1	0.1	0.1	0.2	2.4	12.0	5.6	370.4
DE	48.5	2.5	19.0	30.7	5 003.4	1.7	25.3	4.2	32.8	94.3	1.1	85.3	0.8	0.7	1.6	17.0	26.5	1.4	48.4	56.0	26.2	4.5	5.0	3.8	9.2	17.6	39.8	91.2	5 698.6
EE	0.5	0.0	0.1	2.1	3.1	73.3	0.5	0.1	0.2	0.7	0.0	0.5	0.1	1.0	0.6	0.1	0.1	0.0	0.7	0.3	0.3	0.0	0.0	0.0	0.0	6.9	4.0	0.8	96.1
IE	2.6	0.1	0.5	0.9	8.8	0.1	270.1	0.1	2.1	4.9	0.0	5.0	0.0	0.0	0.0	1.8	0.6	0.1	2.5	0.6	0.5	0.2	0.1	0.1	0.1	0.9	1.8	16.3	321.0
EL	1.6	2.1	0.4	1.4	12.8	0.1	0.7	274.4	1.5	3.5	0.1	6.5	1.6	0.1	0.2	0.3	0.5	0.2	1.5	0.8	0.6	0.2	1.2	0.2	0.2	1.1	1.1	5.6	320.4
ES	11.8	0.6	2.7	8.1	65.7	0.3	8.2	1.7	1 127.1	59.3	0.2	38.7	0.2	0.2	0.6	2.0	2.8	0.4	10.5	4.1	4.1	15.5	1.1	0.6	1.2	2.8	6.3	32.4	1 409.1
FR	37.3	0.8	4.1	6.4	114.8	0.4	13.5	1.9	30.1	2 078.4	0.3	50.3	0.2	0.2	0.4	7.4	5.7	0.9	18.8	6.7	6.0	3.4	2.3	1.2	2.8	4.3	12.6	48.8	2 459.9
HR	0.9	0.1	0.4	0.5	5.1	0.0	0.4	0.1	0.3	1.5	116.5	4.4	0.1	0.0	0.0	0.1	0.7	0.1	0.6	2.0	0.3	0.1	0.1	1.6	0.2	0.2	0.4	1.2	138.1
IT	13.4	2.0	5.4	7.1	98.7	0.6	10.8	4.8	21.7	66.4	1.2	1 837.4	0.4	0.3	0.8	2.7	6.3	1.5	9.3	14.0	8.0	2.7	4.2	3.8	3.1	4.9	8.3	30.2	2 170.1
CY	0.1	0.1	0.0	0.2	2.7	0.4	0.4	0.6	0.1	0.2	0.0	0.2	34.5	0.0	0.0	0.1	0.1	0.1	0.2	0.1	0.1	0.0	0.1	0.0	0.1	0.1	0.3	0.9	41.9
LV	0.5	0.0	0.2	2.4	3.9	2.6	0.5	0.1	0.5	0.9	0.0	1.0	0.3	115.4	1.6	0.1	0.2	0.1	0.7	0.4	0.8	0.0	0.1	0.0	0.1	2.5	3.3	2.0	140.3
LT	1.1	0.1	0.2	2.8	6.6	1.1	0.4	0.1	0.6	2.3	0.0	1.9	0.1	2.5	178.3	0.1	0.3	0.0	1.1	0.7	1.4	0.1	0.1	0.1	0.1	1.1	2.2	1.5	206.8
LU	2.2	0.1	0.1	0.3	4.8	0.0	3.8	0.1	0.5	2.5	0.0	1.8	0.0	0.0	0.0	69.9	0.1	0.1	0.6	0.3	0.2	0.1	0.1	0.0	0.0	0.1	0.4	2.2	90.4
HU	3.4	0.8	4.0	2.3	53.5	0.2	2.3	0.6	3.7	9.6	0.5	13.9	0.2	0.1	0.3	0.5	338.1	0.1	4.9	12.8	3.7	0.4	4.8	1.5	4.7	1.6	3.4	8.5	480.4
MT	0.3	0.0	0.0	0.1	1.4	0.0	1.3	0.1	0.1	0.5	0.0	0.3	0.0	0.0	0.0	0.1	0.1	19.2	0.1	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.9	24.9
NL	27.7	0.3	1.3	6.7	46.3	0.3	27.4	1.0	6.5	18.6	0.1	13.3	0.2	0.2	0.4	1.6	2.8	0.2	945.8	3.4	3.1	0.9	0.6	0.4	0.6	3.9	7.4	22.7	1 143.7
AT	2.5	0.6	2.8	1.4	55.6	0.1	1.3	0.5	2.2	6.9	0.4	14.4	0.1	0.1	0.1	0.6	5.2	0.3	2.7	344.7	2.3	0.3	1.4	1.9	1.3	1.3	2.4	5.3	458.6
PL	13.1	1.8	20.8	16.1	174.1	2.7	8.1	1.4	10.8	35.9	0.5	34.7	0.8	1.6	4.8	1.4	19.1	0.3	16.2	13.2	1 063.4	1.1	4.7	1.9	9.6	8.6	20.1	31.5	1 518.4
PT	2.9	0.1	0.5	1.6	12.6	0.1	2.0	0.2	13.2	11.6	0.0	5.9	0.1	0.0	0.1	0.5	0.5	0.1	2.3	0.9	0.6	284.9	0.2	0.1	0.2	1.0	1.3	7.7	351.1
RO	5.6	9.2	2.8	1.7	49.5	0.2	2.6	3.3	6.6	21.6	0.5	46.8	0.7	0.1	0.2	0.3	14.0	0.2	7.6	8.3	4.0	1.2	780.3	1.1	2.3	1.6	3.0	5.9	981.4
SI	0.7	0.2	0.8	0.6	12.0	0.1	0.3	0.2	0.7	2.6	0.8	8.4	0.0	0.0	0.1	0.1	1.8	0.0	0.9	4.3	0.8	0.1	0.3	105.1	0.6	0.3	0.7	1.5	144.2
SK	2.1	0.4	10.1	1.3	33.2	0.1	0.6	0.3	2.2	7.9	0.2	9.4	0.0	0.1	0.3	0.2	9.0	0.0	2.8	7.6	5.2	0.2	1.2	1.0	150.5	0.9	3.1	4.4	254.7
FI	2.1	0.1	0.4	2.9	11.1	2.0	1.1	0.3	1.2	3.1	0.0	2.9	0.1	0.3	0.3	0.5	0.5	0.1	2.9	1.0	1.1	0.1	0.2	0.1	0.1	309.8	10.8	4.2	359.4
SE	4.9	0.2	1.2	17.2	23.2	1.1	2.3	0.4	2.4	8.2	0.1	5.9	0.1	0.2	0.4	1.1	1.1	0.1	4.5	2.0	2.1	0.3	0.3	0.2	0.4	11.3	613.9	11.3	716.6
UK	26.9	0.6	2.5	12.9	81.1	0.5	88.2	3.4	19.5	48.3	0.2	28.8	1.2	0.2	0.3	15.9	4.4	1.6	34.9	5.5	5.0	2.3	1.4	0.6	1.1	8.9	22.0	3 404.8	3 822.9
EU-28	781.2	528.8	432.4	461.0	6 055.9	88.8	485.8	305.4	1 301.2	2 541.5	123.5	2 264.3	43.1	124.1	192.7	131.3	453.1	28.3	1 146.1	510.7	1 155.1	320.5	817.3	127.9	205.1	399.3	792.9	3 779.4	25 596.7

4 Measuring the consistency of national accounts and balance of payments statistics

ROBERT OBRZUT ([1])

Abstract: Since the adoption of new methodological standards for European national accounts and balance of payments (BoP) statistics in 2014, both statistical domains should be directly comparable and fully consistent. The latter implies that data elements that describe the same economic phenomena related to a specific point-in-time should be identical, and refrain from sending contradictory messages to the user. Hence, in applying both methodologies respectively, the *European system of accounts 2010 (ESA 2010)* and the *Balance of Payments and International Investment Position Manual — Sixth Edition (BPM6)*, a high degree of comparability and consistency between the account for the rest of the world (RoW) and the balance of payments is not only envisaged but should be manifested in quantitative measures of consistency.

Since the introduction ESA 2010 and BPM6 it has been essential for Eurostat to monitor whether data are indeed consistent, and where inconsistencies occur, ascertain which accounts were most concerned, which EU Member States were most concerned, and what actually caused the measured discrepancies. Over time, quantitative analyses and investigations have resulted in the identification of the underlying causes for inconsistencies between sector accounts and the balance of payments (Obrzut (2017)).

From 2019, both statistical domains will be undergoing fundamental revisions by national compilers (benchmark revisions): their endeavours for better quality and more comparable statistics shall be guided by the full implementation of the above mentioned consistency requirements. Therefore, conclusive quantitative measures should assist decision-makers, quality audits and external users in obtaining a good indication as to how effective these oncoming revision processes for the statistics of EU Member States will be in terms of leading to the full adoption of the requirements of the methodological standards.

In this article, concepts and approaches to measure consistency between national accounts and the balance of payments are presented, and consequently a scoreboard of indicators based on mean absolute percentage deviation measures is proposed to produce a rough, but conclusive view on the state of consistency among the statistics of EU Member States.

Keywords: balance of payments, sector accounts, international trade, data consistency

JEL codes: E01, F40

([1]) Eurostat, Unit C.5: Integrated global accounts and balance of payments.

1. Introduction

According to the *European system of accounts (ESA 2010)* and the *Balance of Payments and International Investment Position Manual — Sixth Edition (BPM6)* direct comparability and high consistency shall guide the compilation of national accounts and balance of payments (BoP) statistics ([2]). However, in earlier studies it has been shown that the methodological imperative of consistency is not entirely reflected by data evidence when analysing the statistics of EU Member States (for a more profound analysis, see Eurostat (2019b). It has been argued that different compilation practices and interpretations of the methodological standards, the use of different data sources and concepts inherent to particular sub-items in the accounts, as well as the application of different production and revision calendars do not allow a consequent comparison of vintages without observing differences. These arguments were met by the European Union's institutions' request for addressing organisational issues in the statistics of particular Member States more effectively when rigid interpretations of institutional autonomies by the involved counterparts prevail, and for cooperative strategies when compiling both statistics through task and/or data sharing ([3]).

In addition, it is emphasised that the guidelines of the harmonised European revision policy (HERP) for macroeconomic statistics in the EU suggest a high degree of coordination in revision practices. The oncoming benchmark revisions for both sets of statistics provide therefore a unique opportunity to rectify the situation in the EU Member States characterised by such discrepancies with the ultimate goal of directly comparable statistics. With these guiding principles in mind, the success of the oncoming benchmark revisions will depend greatly on whether increased consistency in both statistical domains is reflected by data evidence.

This article proposes a scoreboard of indicators in order to quantify developments over time in a comparable and communicable manner to external users. They complement available information from annual quality reports for monitoring purposes.

2. Developing consistency measures

2.1 Concepts and approaches to consistency

National accounts and BoP statistics are based on closed accounting frameworks, determined by vertical hierarchies of accounts that add up to aggregates. Elements are summarised from sub-totals to main aggregates, respecting implied rules of integrity and internal consistency (see Table 1).

([2]) BPM6 Appendix 7 and ESA 2010 Chapter 18.
([3]) The Committee on Monetary, Financial and Balance of Payments Statistics (CMFB) — a joint coordination body between the European statistical system and the European system of central banks — investigated the nature of inconsistencies and made proposals for addressing them, see CMFB (2017a) and CMFB (2018). It mandated Eurostat to focus on non-financial accounts, and the European central bank (ECB) to focus on financial accounts.

Table 1: Levels of aggregation in national accounts and the balance of payments

	Level of aggregation	Balance of payments (BoP) item	National accounts: rest of the world (RoW) sector item
1	Non-financial	Current and capital account	Net lending/net borrowing (non-financial) B9
	Financial	Financial account	Net lending/net borrowing (financial) B9F
2	Non-financial	Current account	Goods+Services+Primary income+Secondary income
		Capital account	Capital transfers D9+Net acquisitions of non-financial, non-produced assets NP
3	Current account	Goods	Exports of goods P61, Imports of goods P71
		Services	Exports of services P62, Imports of services P72
		Primary income	D1+D2+D3+D4
		Secondary income	D5+D6+D7+D8
4	Primary income	Compensation of employees D1	Compensation of employees D1
		Taxes on production and imports D2	Taxes on production and imports D2
		Subsidies D3	Subsidies D3
		Investment income D4	Property income D4
	Secondary income	Current taxes on income and wealth D5	Current taxes on income and wealth D5
		Social contributions and benefits D6	Social contributions and benefits D6
		Other current transfers D7	Other current transfers D7
		Adjustment for the change in pension entitlements D8	Adjustments for the change in pension entitlements D8
	Capital account	Capital transfers D9	Capital transfers D9
		Acquisitions less disposals of non-financial, non-produced assets NP	Net acquisitions of non-financial, non-produced assets NP
5	Secondary income	Net non-life insurance premiums D71	Net non-life insurance premiums D71
		Non-life insurance claims D72	Non-life insurance claims D72
		Current international cooperation D74	Current international cooperation D74
		Miscellaneous transfers D75	Miscellaneous transfers D75
		VAT- and GNI-based EU own resources D76	VAT- and GNI-based EU own resources D76

Note: BoP and RoW items according to BPM6 and ESA 2010

Due to its hierarchical nature, different levels of data aggregation can be identified, thus measures of consistency being attributed to each level of aggregation. As a general rule the higher the level of aggregation, the rougher and less specific the conclusion that can be obtained from such measures. The lower the level of aggregation, the more specific but also problematic these measures can become, due to different concepts applying to some specific components of the accounts (for example, ESA 2010 property income and BPM6 investment income; or the classification of financial instruments in ESA 2010 and the functional categories of the financial account in the BoP ([4])).

([4]) A different presentation of the same economic phenomena prevents a direct comparison of the financial account components; a more detailed discussion is presented in Obrzut (2016).

Depending on which level of aggregation the corresponding measures focus on, different concepts of consistency apply. While at the most aggregated level measures remain unspecific about the situation in the underlying components, they still might appear sufficient in order to gain a rough top-down view. However, consistency measured at the most aggregated level can be blurred by offsetting effects among the components ([5]) and therefore cannot be considered conclusive. On the other hand, conceptual differences in the statistics become apparent at lower aggregation levels, where comparison is problematic. In order to determine the ideal set of aggregation both aspects of concepts and approaches to consistency appear relevant. Measures that compare at the highest levels of aggregation (top-down approach) cannot disclose the dynamics in the underlying components, while measures that compare at the lowest possible levels of aggregation (bottom-up approach) trigger alerts due to different concepts applying to some sub-items, as well as overloading the analysis with statistical indicators. Consequently, we have decided not to pursue detailed measures for the financial account components in this article.

2.2 How best to measure consistency?

The statistical measures that have been applied by Eurostat to its consistency analyses so far tried to incorporate aspects of communicability, complexity and comparability, with a view to their interpretation by the user. In other words, the measures used are supposed to be easily understood, although comprehensive enough to cover the full picture, and comparable with each other.

In this article, we present a set of indicators (a scoreboard) that should measure consistency at different levels of aggregation, as is done in Eurostat's annual quality reports for ESA and BoP statistics. High comparability is secured from statistical measures that are built on the same principles over the entire accounting framework. For example, discrepancies should be equally valued at all levels of aggregation. This supports assessment according to the same criteria (thresholds). Ideally, the extent of deviation is not weighted with other factors (such as GDP or total/average transaction volumes/assets and liabilities, and so on) because such weights would bring additional aspects into the analysis that do not directly refer to the extent of discrepancies. For example, measures that set the extent of discrepancies in reference to GDP or total volumes of transactions, tell us only about the relative prominence of these discrepancies from a Member State's point of view. However, for an overall assessment (across Member States), the absolute extent of these discrepancies appears more relevant. Indicators related to GDP or total transaction volumes ([6]) would consequently downplay inconsistencies occurring for economies with higher GDP/transactions volumes and overstate them for economies with lower GDP/transaction volumes, without regard to the absolute extent of deviations for these national statistics.

For a meaningful comparison we have to define the base and reference value. For the purposes of this analysis, we have chosen the value from BoP statistics as a base value and the comparable (mirror) value from the rest of the world (RoW) sector account as a reference value (without perceiving it as a benchmark to the BoP value). In other words, we measure how the BoP value deviates from the RoW value without drawing any conclusions on the qualitative status of either statistic.

([5]) Positive and negative differences compensate each other when being summed up to a total.
([6]) Total transaction volumes are calculated as the sum of credit/exports and debit/imports transactions.

The (nominal) difference between the BoP and RoW values can have a positive or negative sign, and indicates whether the base value appears over- or underestimated in regard to the reference value. However, it is problematic to add up these differences to totals, as offsetting effects hamper further interpretation ([7]).

(2.2.1) $Diff_{nom} = BoP - RoW$

In order to avoid such problems, absolute measures appear more appropriate for analytical purposes. Absolute measures can be summed up across Member States, for example, when wishing to make an analysis of total discrepancies for a particular geographical profile; this allows us to identify major contributors and structural issues.

(2.2.2) $Diff_{abs} = \left|BoP - RoW\right|$

The profile is blurred by the prominence of (particular) economic activities in some Member States. For example, large open economies with high transaction volumes in cross-border trade would appear more exposed to inconsistencies than smaller economies (even though the extent of discrepancies for the former could be relatively small compared with the total size of its economy). Consequently, as a possible way forward, relative measures related to external weights (for example, GDP or total transaction volumes) could help assess the prominence of a Member State's exposure with regard to its overall economic activities. However, as mentioned earlier they would not serve our purposes for a scoreboard presentation, as additional aspects are implicitly imported into the analysis that have no causal relationship with the incurred discrepancies (such as the size of the economy or the prominence of particular economic activities).

(2.2.3) $Diff_{rel} = \frac{\left|BoP - RoW\right|}{GDP}100 \text{ or } \frac{\left|BoP - RoW\right|}{total\ transactions}100$

When comparing discrepancies over longer time spans, percentage error (or percentage deviation) measures based on multiannual averages could be applied (for an overview, see Hyndman, R.J. and G. Athanasopoulos (2018)). The mean absolute percentage deviation or error (MAPD or MAPE) is commonly used to predict the accuracy of forecasting methods; the only difference between the two is the choice of scale.

(2.2.4) $Diff_{MAPD} = \frac{1}{n}\sum\frac{\left|BoP - RoW\right|}{\left|RoW\right|}$, $Diff_{MAPE} = \frac{1}{n}\sum\frac{\left|BoP - RoW\right|}{\left|RoW\right|}100$

The results are also useful insofar as this analysis of multiannual comparisons of discrepancies is easy to explain and does not depend on other weights. On the other hand, the interpretation of the chosen base and reference values is different. While in forecasting the reference value is an explicit benchmark for the base value to be approximated, in the context of consistency analysis there is no clear benchmark, as reconciliation should be initiated from either one or the other side or even both sides, depending on the specific situation in each Member State. The calculation of the MAPD/MAPE involves only base and reference values (and their differences). Thus, the absolute difference is related to the base value and produces a normalised measure that can easily be applied across different Member States, accounts categories and time spans (n = number of years). In the context below, for presentational

([7]) The formulae below have been simplified in order to make the measures more intuitive.

purposes we apply the MAPD to balances and the MAPE to gross transactions. Due to their nature, balances appear more volatile over time, can change signs more often and could oscillate around or close to zero. Particularly the latter poses a mathematical problem, with particularly high values for reference values close to zero. The MAPD/MAPE therefore appears suitable to explain the situation at higher levels of aggregation roughly, although it bears the risk of a mathematical bias.

The advantage of using percentage error measures — as regards the criteria of a scoreboard presentation — is that they exclude in their original form any other weights that have no causal relationship to the measured discrepancy, and they can be applied to data over a longer time span. Full (or almost full) consistency is indicated when at (or close to) zero, while very high discrepancies apply when above 1.0 (100 %). Due to their nature, these measures appear most appropriate for analysing discrepancies in gross transactions. For the analysis of net figures or balances, the values could however trigger outliers (as mentioned above) that require further investigation/explanation.

For the sake of completeness, it should be added that the variety of possible statistical measures is not limited to the measures presented above ([8]), but in our view increasing the complexity of the chosen measures would interfere with the message being communicated to users.

3. Indicating inconsistencies in the non-financial and financial accounts

The data considered in this article refer to the situation as of January 2019 ([9]). For that production cycle, quarterly data up to the third quarter of 2018 had been transmitted to Eurostat by EU Member States and data sets effectively incorporated the results of the annual revision cycles in 2018. The analyses below cover data for the time span from 2015 to 2017. The choice of a three-year period resembles, in our view, the practices of many BoP compilers who review data for the previous two or three years during their annual routines for revisions. Longer time spans would consequently contain revision effects, shorter time spans (for example, just the current production year) would include some open coordination issues during the ongoing quarterly production cycles, but exclude more consistent data in earlier time periods, where coordination and revision efforts have resulted in improvements to consistency. Quarterly data were annualised and multiannual means were calculated for presentation purposes. Finally, the selected data can be expected to reflect a high degree of consistency, as they have been revised at earlier instances.

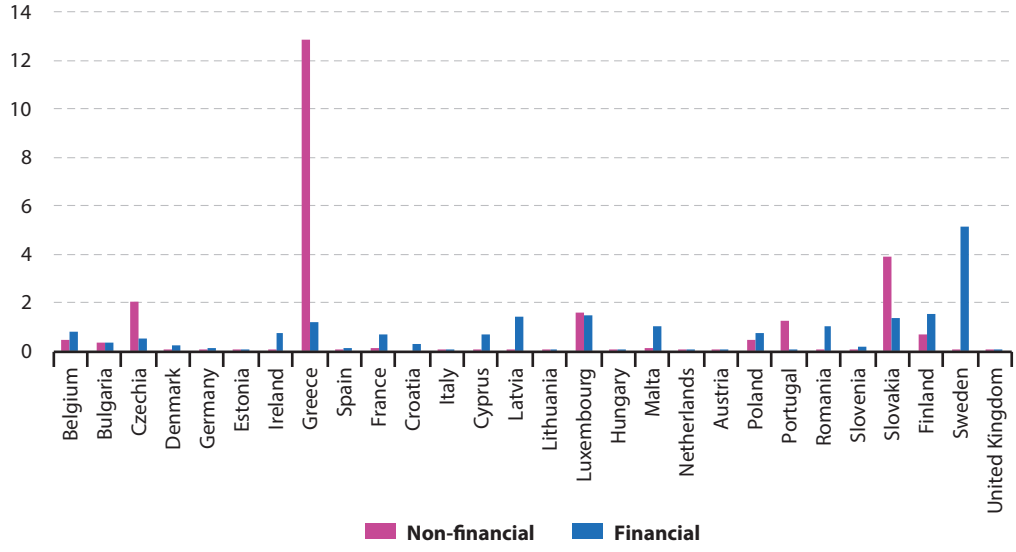
([8]) Alternatives include variance-based measures (root mean square error) or directional indicators; see Damia V. and C. Picon Aguilar (2006) and Eurostat Quality Report (2018).

([9]) Data for the April 2019 production cycle published for the first time annual figures for 2018. As the April 2019 data contained gaps, coordination issues in some country statistics and a vintage bias in the financial accounts, the January vintage appears more conclusive for the purpose of illustration in this article.

3.1 Level 1 — a top-down view of the accounts

At the most aggregated level (level 1 in Table 1) the balance of the BoP current and capital account is compared with the balancing item (B9) of the RoW sector account. Conceptually, both should represent the balance of the respective non-financial account and their values should be equal. For the purpose of the analyses presented, we define high consistency as prevailing where the chosen measures reach MAPD values between 0.0 and 0.1, moderate inconsistencies occur with values between 0.2 and 1.0, and high inconsistencies for values above 1.0; this categorisation is subject to interpretation and cannot be generalised. In the debate about what is considered an 'acceptable' discrepancy, views differ substantially, depending on the context.

Figure 1: Mean absolute percentage deviation for consistency indicators level 1, 2015-2017



Note: the mean absolute percentage deviation (MAPD) is calculated as the multiannual mean deviation of the BoP value (balance of current and capital account) from the RoW value (balance of net lending/net borrowing (B9). Croatia: non-financial net lending/net borrowing not available.

Source: Eurostat

While there were often larger percentage deviations for the non-financial account, deviations were more common for the financial account in all of the EU Member States. In other words, discrepancies in the non-financial accounts appear in a Member States-specific context, while discrepancies in the financial accounts occur more broadly across Member States. As these measures concern multiannual data (2015-2017), the deviations could either come from earlier and/or recent periods. The high percentage deviation for Greece in its non-financial accounts for example, results from 2017 data. For Slovakia, the high values come on the other hand from earlier periods. To determine where these deviations come from a further analysis of lower aggregation levels is necessary.

On the positive side, 18 EU Member States showed high consistency between values for non-financial accounts and 11 for their financial accounts. There was a sizeable number of Member States with moderate inconsistencies for their financial accounts, while the situation for non-financial accounts was more polarised (either large differences or very small differences).

The criticism of these results is implicit in the construction of the measures. The deviation measures are applied on balances data. It is in the nature of balances that they can be volatile without raising doubts on plausibility. Level 1 measures therefore cannot stand alone as a conclusive analysis.

3.2 Level 2 — a bird's-eye view of the non-financial account

As a full statistical comparison of the financial account components is difficult in practice due to the different concepts applying to both sets of statistics, level 2 indicators can only feasibly be analysed for non-financial accounts. For financial account components such as debt securities, deposits and loans, it is not feasible to make a direct mapping between the BoP and national accounts, thus invalidating the usefulness of MAPD/MAPE indicators in this context, or rendering these measures inconclusive; for a more detailed discussion, see Obrzut (2016).

Due to presentation differences between the current and the capital accounts, percentage deviations are calculated from gross transactions of the current account (MAPE) and balances of the capital account (MAPD). A mixed presentation appears justified as both measures are constructed on the same principles.

Percentage deviations (MAPE) for gross transactions in the current account appeared to be relatively minor due to the (still) high degree of aggregation. Debit transactions (imports/payments) of Greece and Luxembourg and credit transactions (exports/receipts) of France, Bulgaria and Slovakia were slightly more affected. Although the capital account proved not to be the main contributor to such discrepancies (Obrzut (2017)), relatively high percentage deviations were observed in Slovakia, Germany and France. Recent reports (Eurostat (2019b)) have also confirmed that these three EU Member States show particularly contradictory balances in their capital accounts.

3.3 Level 3 — component analysis of the current account

At this level of aggregation (level 3), the components of the current account can be more rigorously identified providing an opportunity to analyse possible effects on the overall picture of inconsistencies. An analysis of the component accounts proves useful, as it allows remaining structural or coordination issues in component-specific compilation processes to be identified. In general, percentage deviations in primary and secondary income were more prominent than deviations for goods and services, although in absolute terms services had the largest differences (Eurostat (2019b)). For goods, primary income and secondary income larger deviations were observed for credits (exports/receipts), whereas the largest deviations for services were for debits (imports/payments).

The discrepancies at higher levels of aggregation can be traced down to particular components of the current account. The analysis that follows also shows that while overall current account exposure to discrepancies at level 2 was minor (due to offsetting effects), differences for the individual components were more apparent. As an example, we look again at level 1 discrepancies for Greece and Slovakia in the non-financial accounts. At levels 2 and 3, the deviations observed may be closely linked to services imports and primary income payments for Greece, and secondary income and the capital account for Slovakia.

Figure 2a: Mean absolute percentage error for consistency indicators level 2, current account, 2015-2017

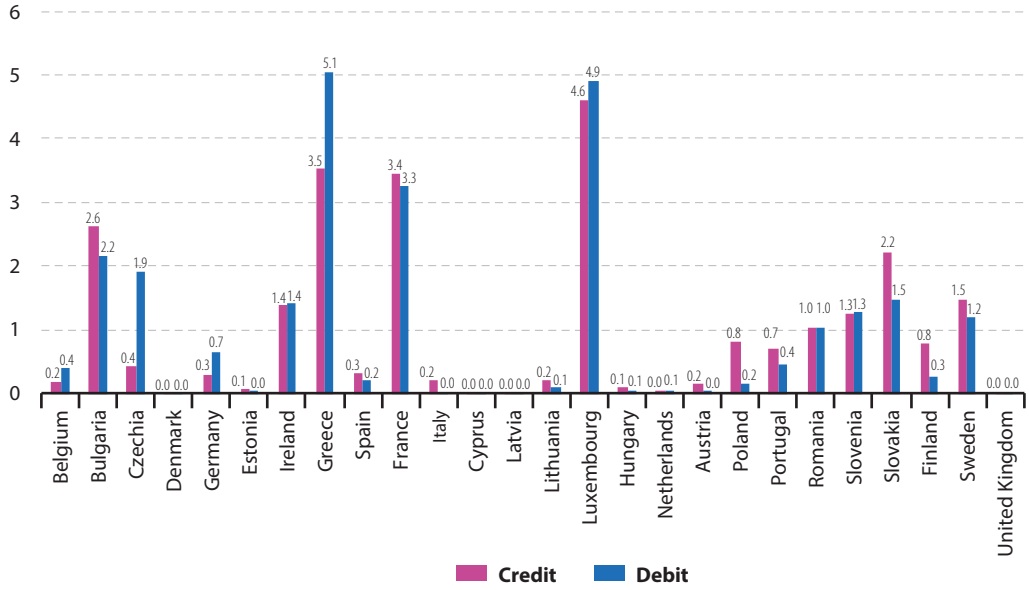
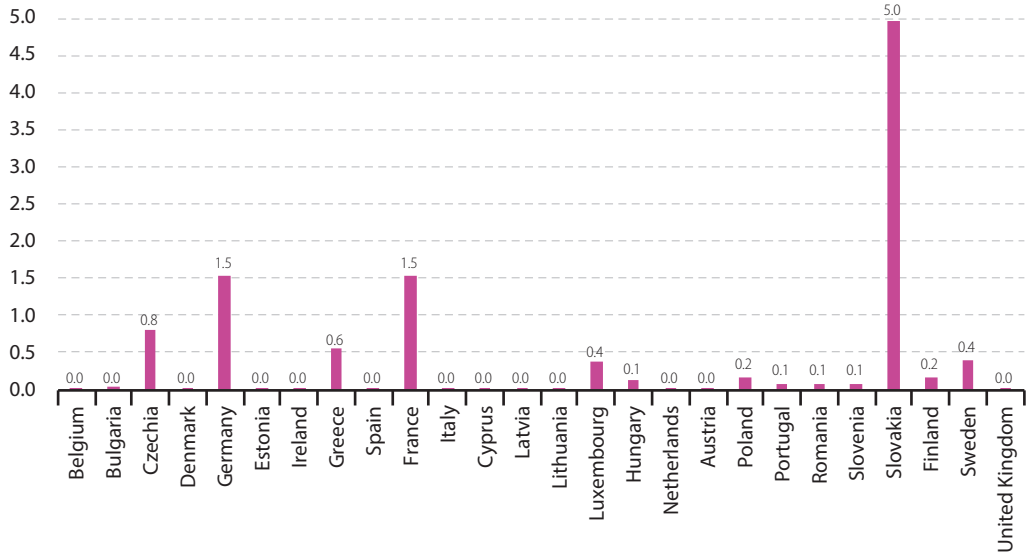


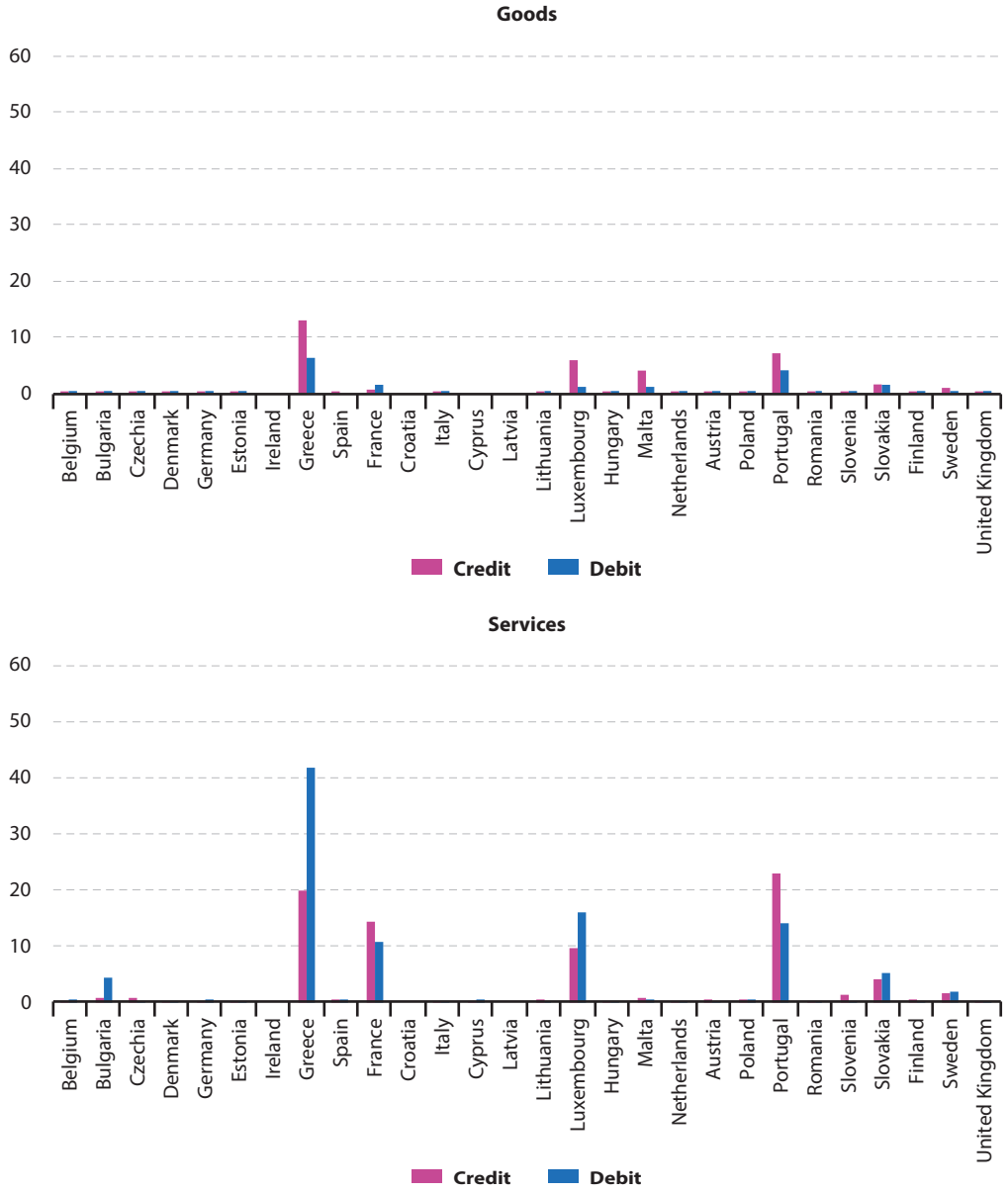
Figure 2b: Mean absolute percentage deviation for consistency indicators level 2, capital account, 2015-2017



Note: the mean absolute percentage deviation (MAPD) is calculated as the multiannual mean deviation of the BoP value (balance of current account; credits and debits) from the RoW value (balance; RoW payable and RoW receivable). The mean absolute percentage error (MAPE) is calculated as the multiannual mean percentage deviation of the BoP value (balance of the capital account) from the RoW value (balance of capital transfers (D9) and RoW acquisitions less disposals of non-financial non-produced assets (NP)). Croatia: not available. Malta: not publishable.

Source: Eurostat

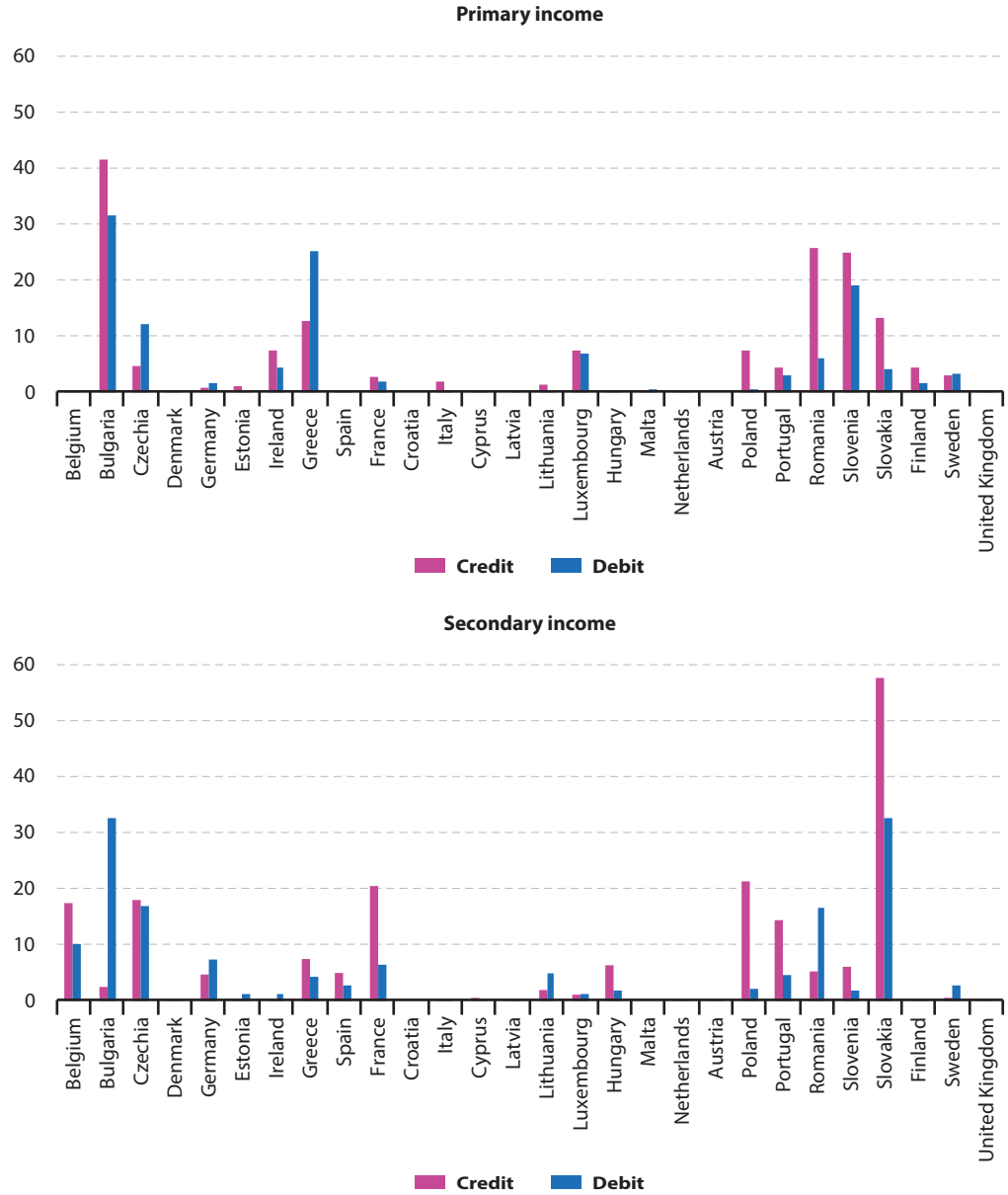
Figure 3: Mean absolute percentage error for consistency indicators level 3, main components of the current account, 2015-2017



Note: mean absolute percentage error (MAPE) is calculated as the multiannual mean percentage deviation of the BoP value from the RoW value for credits (exports/receipts) and for debits (imports/payments). Croatia: not available.

Source: Eurostat

Figure 3 (continued): Mean absolute percentage error for consistency indicators level 3, main components of the current account, 2015-2017



Note: mean absolute percentage error (MAPE) is calculated as the multiannual mean percentage deviation of the BoP value from the RoW value for credits (exports/receipts) and for debits (imports/payments). Croatia: not available. Malta: secondary income, not publishable.

Source: Eurostat

The indicators presented and their levels of aggregation are shown in the context of Member State-specific analyses on consistency. They cannot completely replace direct measures of (absolute) differences, but complement them for a broader picture. This analysis makes it possible to identify the most affected elements of the accounts, in order to eliminate possible sources for inconsistencies and locate areas where higher coordination efforts would appear to be desirable.

3.4 Levels 4 and 5 — sub-item analysis of the primary and secondary income accounts

At the lowest levels of aggregation, sub-items can be conclusively compared, while they also face restrictions in their presentations. More detailed data are generally challenged by confidentiality issues, although in some EU Member States more than in others. As such, conclusions are hampered not by the level of aggregation, but by the unavailability of comparable data for one or other of the statistical sources. Furthermore, the primary income sub-item of investment income/property income (D4) faces presentational differences, which do not support conclusive comparisons (see Annex). Sub-items for level 5 reflect the elements of secondary income; however, for the purposes of this article we refrain from a detailed presentation.

3.5 Scoreboard presentation

Summarising all of the above mentioned measures into one intuitive presentation could promote the identification of statistics for those EU Member States with considerable discrepancies in their data sets, highlighting areas that were most affected within the component accounts. This would enable analysts to draw a causal path from the (inconclusive) top-down perspective to the lower levels of aggregation. The values in Table 2 summarise — for each Member State —measures calculated with regard to each level of aggregation. The Member States with complete rows marked in a pink shade have a noticeable exposure to inconsistencies at all levels and thus illustrate the path of inconsistencies through the (vertical) data hierarchies; Member States without shaded areas are characterised by relatively consistent data across all levels of presentation. The ensuing analysis of possible causes to inconsistencies in a Member State-specific context (Obrzut (2017)), as well as international recommendations for improving convergence between the two statistical sources, should guide the revision process (CMFB (2017b) and CMFB (2018)).

Eight EU Member States had no (or low) inconsistencies in their statistics — Estonia, Spain, Italy, Lithuania, Hungary, the Netherlands, Austria and United Kingdom (some for only one of the specific levels of aggregation); for these, the presentation of BoP data did not significantly deviate from the presentation of data for RoW sector accounts. An additional four Member States had inconsistencies that were principally recorded for their financial accounts, with no lack of consistency for their non-financial accounts — Denmark, Cyprus, Latvia and Ireland ([10]). Greece had the greatest deviations across many of the components, including relatively high percentage deviations for goods, services, primary income, the capital and financial account.

([10]) Ireland had consistent non-financial accounts, but was subject to a coordination issue, especially for primary income; see its slightly elevated MAPE measure for this component.

Table 2: Scoreboard of consistency indicators, 2015-2017

	Level 1		Level 2		
	Non-financial	Financial	Current account credit	Current account debit	Capital account
	MAPD	MAPD	MAPE	MAPE	MAPD
Belgium	0.5	0.8	0.2	0.4	0.0
Bulgaria	0.4	0.4	2.6	2.2	0.0
Czechia	2.1	0.5	0.4	1.9	0.8
Denmark	0.0	0.2	0.0	0.0	0.0
Germany	0.0	0.2	0.3	0.7	1.5
Estonia	0.0	0.0	0.1	0.0	0.0
Ireland	0.0	0.7	1.4	1.4	0.0
Greece	12.9	1.2	3.5	5.1	0.6
Spain	0.0	0.1	0.3	0.2	0.0
France	0.1	0.7	3.4	3.3	1.5
Croatia	:	0.3	:	:	:
Italy	0.0	0.1	0.2	0.0	0.0
Cyprus	0.0	0.7	0.0	0.0	0.0
Latvia	0.0	1.4	0.0	0.0	0.0
Lithuania	0.1	0.0	0.2	0.1	0.0
Luxembourg	1.6	1.5	4.6	4.9	0.4
Hungary	0.0	0.0	0.1	0.1	0.1
Malta	0.1	1.1	:	:	:
Netherlands	0.0	0.0	0.0	0.1	0.0
Austria	0.1	0.0	0.2	0.0	0.0
Poland	0.5	0.8	0.8	0.2	0.2
Portugal	1.3	0.1	0.7	0.4	0.1
Romania	0.1	1.0	1.0	1.0	0.1
Slovenia	0.0	0.2	1.3	1.3	0.1
Slovakia	3.9	1.4	2.2	1.5	5.0
Finland	0.7	1.5	0.8	0.3	0.2
Sweden	0.1	5.2	1.5	1.2	0.4
United Kingdom	0.0	0.0	0.0	0.0	0.0

Note: values marked with a pink shade indicate a moderate to high level of inconsistencies with MAPD >0.1 or MAPE >10 %.

Source: Eurostat

Table 2 (continued): Scoreboard of consistency indicators, 2015-2017

	Level 3							
	Goods credit	Goods debit	Services credit	Services debit	Primary income credit	Primary income debit	Secondary income credit	Secondary income debit
	MAPE	MAPE	MAPE	MAPE	MAPE	MAPE	MAPE	MAPE
Belgium	0.2	0.0	0.3	0.5	0.0	0.0	17.5	9.0
Bulgaria	0.0	0.0	0.9	4.4	41.6	31.5	2.5	29.4
Czechia	0.2	0.1	0.9	0.0	4.8	12.3	17.9	15.3
Denmark	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Germany	0.0	0.1	0.1	0.6	0.8	1.8	4.8	6.7
Estonia	0.0	0.0	0.0	0.0	1.2	0.1	0.1	1.1
Ireland	0.0	0.0	0.0	0.0	7.6	4.4	0.0	1.2
Greece	13.1	5.2	19.9	41.7	12.8	25.1	7.4	3.8
Spain	0.0	0.0	0.6	0.5	0.0	0.1	4.9	2.5
France	0.6	1.2	14.4	10.7	2.6	1.9	20.5	5.9
Croatia	:	:	:	:	:	:	:	:
Italy	0.0	0.0	0.2	0.0	1.8	0.2	0.3	0.1
Cyprus	0.0	0.0	0.0	0.7	0.0	0.2	0.6	0.2
Latvia	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.1
Lithuania	0.0	0.0	0.5	0.0	1.3	0.0	1.9	4.5
Luxembourg	5.8	1.0	9.7	16.1	7.6	7.0	1.1	1.0
Hungary	0.0	0.0	0.2	0.0	0.3	0.0	6.4	1.8
Malta	4.2	1.0	0.9	0.4	0.0	0.6	:	:
Netherlands	0.0	0.0	0.2	0.3	0.0	0.0	0.0	0.0
Austria	0.0	0.0	0.6	0.1	0.0	0.0	0.0	0.0
Poland	0.1	0.0	0.5	0.4	7.4	0.6	21.2	2.0
Portugal	7.0	3.6	23.1	14.0	4.6	3.0	14.4	4.2
Romania	0.0	0.0	0.0	0.0	25.8	6.0	5.2	15.0
Slovenia	0.0	0.0	1.4	0.1	25.0	19.2	6.2	1.8
Slovakia	1.7	1.2	4.3	5.2	13.2	4.1	57.5	29.4
Finland	0.1	0.1	0.4	0.0	4.4	1.5	0.4	0.2
Sweden	1.0	0.5	1.6	2.0	3.0	3.3	0.6	2.4
United Kingdom	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Note: values marked with a pink shade indicate a moderate to high level of inconsistencies with MAPD >0.1 or MAPE >10 %.

Source: Eurostat

Table 2 (continued): Scoreboard of consistency indicators, 2015-2017

	Level 4									
	Compensation of employees credit	Compensation of employees debit	Taxes on production and imports debit	Subsidies credit	Current taxes on income and wealth credit	Current taxes on income and wealth debit	Social contributions and benefits credit	Social contributions and benefits debit	Capital transfers credit	Capital transfers debit
	MAPE	MAPE	MAPE	MAPE	MAPE	MAPE	MAPE	MAPE	MAPE	MAPE
Belgium	0.0	0.0	0.0	0.2	0.0	0.1	0.0	0.0	1.0	0.2
Bulgaria	0.1	0.4	:	:	0.0	20.8	0.0	85.0	2.1	8.0
Czechia	0.6	4.2	19.4	5.0	1.8	0.7	4.3	0.1	32.4	96.8
Denmark	0.1	0.0	0.1	0.0	0.0	0.7	0.1	0.1	:	:
Germany	6.0	16.2	9.1	3.7	1.8	13.4	12.2	6.0	11.9	46.8
Estonia	0.1	0.7	5.4	8.8	2.9	0.7	0.5	0.2	0.2	7.2
Ireland	0.3	0.0	22.4	0.0	0.0	0.0	0.7	0.0	0.0	:
Greece	55.3	265.8	76.8	15.4	:	:	:	:	51.6	18.6
Spain	0.0	0.0	:	:	:	100.0	:	100.0	:	:
France	0.7	1.8	10.4	5.0	4.0	:	2.5	2.0	10.9	39.8
Croatia	:	:	:	:	:	:	:	:	:	:
Italy	0.0	0.0	1.3	0.4	0.0	0.0	0.0	1.1	0.1	0.0
Cyprus	0.0	0.0	2.5	3.9	:	0.0	16.7	75.0	0.9	:
Latvia	0.0	0.0	1.9	0.0	0.0	:	0.7	0.0	0.0	0.0
Lithuania	0.7	0.4	0.5	0.1	4.3	1.9	1.1	2.0	0.1	9.6
Luxembourg	:	:	:	:	:	:	:	:	:	:
Hungary	0.0	0.1	1.4	2.5	1.4	0.0	0.1	0.0	9.7	32.9
Malta	3.7	0.7	229.2	11.5	:	:	:	:	:	:
Netherlands	0.0	0.0	0.0	0.0	0.0	0.1	0.0	1.3	0.0	0.0
Austria	0.0	0.0	0.1	0.1	0.0	0.2	0.0	0.1	0.1	0.1
Poland	0.0	0.0	22.9	19.0	0.1	0.1	0.2	0.0	20.9	100.0
Portugal	0.0	0.0	:	:	100.0	100.0	:	100.0	4.8	40.6
Romania	53.0	45.2	31.0	0.5	:	5.1	91.3	98.4	7.9	:
Slovenia	0.2	0.4	577.9	9.5	91.9	2.3	2.7	1.9	0.8	3.5
Slovakia	5.3	6.9	4.8	72.2	100.0	100.0	100.0	100.0	148.4	63.2
Finland	0.2	0.1	5.1	0.0	:	:	1.0	0.3	0.7	316.7
Sweden	1.4	24.9	0.1	3.8	2.6	0.3	47.0	0.3	16.1	94.1
United Kingdom	0.0	0.0	:	:	0.1	0.0	2.7	0.0	0.1	0.0

Note: values marked with a pink shade indicate a moderate to high level of inconsistencies with MAPD >0.1 or MAPE >10 %.

Source: Eurostat

Table 2 (continued): Scoreboard of consistency indicators, 2015-2017

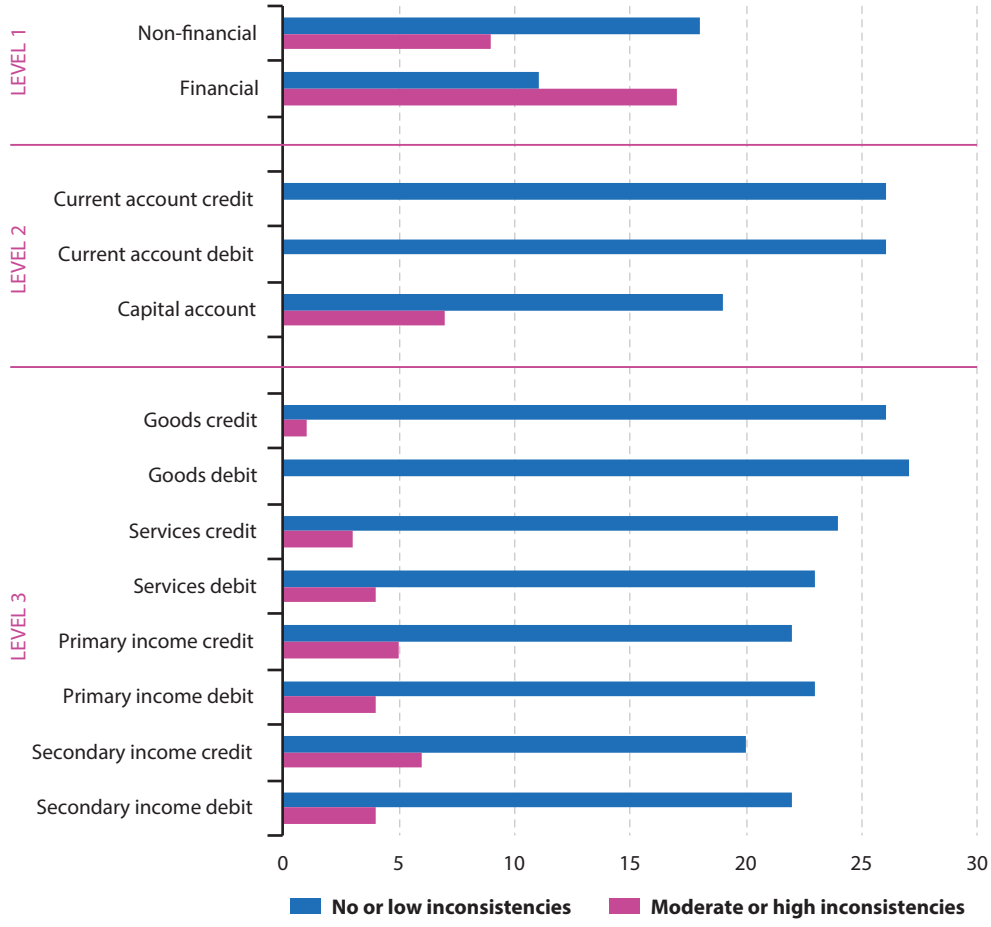
	Level 5							
	Net non-life insurance premium credit	Net non-life insurance premium debit	Non-life insurance claims credit	Non-life insurance claims debit	Current international cooperation credit	Current international cooperation debit	Miscellaneous current transfers credit	Miscellaneous current transfers credit
	MAPE	MAPE	MAPE	MAPE	MAPE	MAPE	MAPE	MAPE
Belgium	:	:	:	:	:	:	:	:
Bulgaria	:	:	:	:	489.9	100.0	:	183.2
Czechia	5.8	100.0	100.0	3.5	188.9	25.3	21.6	7.8
Denmark	0.2	0.1	0.1	0.1	14.2	2.4	6.6	5.1
Germany	8.5	10.0	11.8	8.4	:	:	:	:
Estonia	28.9	1.2	2.9	4.2	0.2	0.9	0.3	0.7
Ireland	0.0	:	:	0.0	100.0	100.0	37.0	27.6
Greece	:	:	:	:	100.0	100.0	118.2	268.0
Spain	:	:	:	:	:	:	:	:
France	76.6	38.2	197.3	89.2	6.2	3.9	8.5	4.7
Croatia	:	:	:	:	:	:	:	:
Italy	0.0	0.0	1.1	0.0	0.0	0.1	0.4	0.0
Cyprus	:	:	:	:	0.0	0.0	:	:
Latvia	0.0	0.0	0.0	0.0	20.4	0.0	3.1	0.5
Lithuania	80.8	88.8	88.7	91.5	0.3	14.6	0.1	0.1
Luxembourg	:	:	:	:	:	:	:	:
Hungary	7.1	2.0	6.4	0.5	100.0	100.0	44.7	96.1
Malta	:	:	:	:	100.0	100.0	:	:
Netherlands	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.9
Austria	:	:	:	:	0.0	0.3	:	:
Poland	1.2	0.1	0.1	1.2	:	:	:	:
Portugal	:	:	:	:	:	:	:	:
Romania	:	:	0.2	0.5	468.3	27.8	:	:
Slovenia	6.6	196.4	97.0	60.9	0.7	100.0	7.9	4.9
Slovakia	100.0	:	:	100.0	:	:	:	:
Finland	2.0	0.5	0.5	2.0	0.3	0.0	0.3	2.5
Sweden	0.0	0.1	0.1	0.0	32.5	102.0	8.0	9.8
United Kingdom	0.0	233.4	0.0	:	:	:	3.6	340.4

Note: values marked with a pink shade indicate a moderate to high level of inconsistencies with MAPD >0.1 or MAPE >10 %.

Source: Eurostat

To conclude, a majority of the EU Member States met the (expected) standards in relation to their non-financial accounts (18 Member States had no or low inconsistencies), while 11 Member States recorded a satisfactory situation with respect to their financial accounts. The vast majority (19 Member States) also reported consistent data for the capital account, while high percentage deviations were nevertheless still encountered for some Member States. While percentage deviations appeared relatively small for the current account at level 2, the component analysis (for level 3) revealed that for some Member States this was due to offsetting effects for the aggregate measures as there were large deviations at the lower level. While large deviations for goods were only apparent for one Member State (Greece), the other level 3 components witnessed between three and six Member States with large deviations (see Figure 4).

Figure 4: Scoreboard — extent of consistency between BoP and RoW sources, 2015-2017
(count of EU Member States)



Note: Croatia, data for RoW, not available.
Source: Eurostat

3.6 Benchmarks in the assessment of consistency

The above presentation has applied implicit thresholds in order to classify whether data consistency has been achieved or not, and, if not, at what level of aggregation alerts have been signalled. This is useful information to complement compilers' ambitions for reconciliation. At the same time, the choice of threshold determines the number of 'performers' and sends signals to compilers. If thresholds were set too restrictively, then there might be an unrealistic number of signals — either too many or too few. For this analysis a threshold was set such that MAPD/(MAPE) values in the range of 0.0-0.1 (0-10 %) were associated with no or low levels of inconsistencies. If the thresholds had instead been set with a strict interpretation of MAPD = 0.0/MAPE = 0 % then only the United Kingdom would be classified as a 'performer', in a position to provide consistent data. Alternatively, if the threshold had been set at 0.5 (50 %) then the number of 'performers' for the current account would have included all of the EU Member States except Slovakia for secondary income credits, while it would also have included all but five Member States for the capital account. At the threshold of 1.0 (100 %), the number of 'performers' would have increased further still.

In practice there are no clear recommendations for thresholds, and if they are made, they are usually contingent to the purpose of the assessment and the underlying data to be analysed. In the context of BoP and RoW sector statistics, data compilers face several factors that influence the extent of deviations in their statistical products (Obrzut (2016) and Obrzut (2017)), such as the organisational and institutional framework under which compilation processes are operating, the extent of data sharing/shared use of data sources among different compiling institutions, the level of systematic coordination of the data production processes, the national production and revision calendars, and/or the aforementioned presentational differences in statistical frameworks.

In the light of evidence provided by the EU Member States, setting a threshold at zero discrepancies would appear to be an unrealistic objective ([11]). The margin of 0.1/10 % in the above context is assumed to accommodate 'reasonable' deviations based on vintage effects or occasional coordination issues. It remains also at the discretion of the analyst to envisage assessment from the first three levels of aggregations, where underlying data availability appears more satisfying, or include all five presented levels (although with some caveats on confidentiality and possible conceptual differences in some sub-items). Under any circumstances the scoreboard can alert for inconsistent presentations in the accounts of Member State's statistics, and gauge the effectiveness of the processes used for major revisions.

([11]) Only fully integrated compilation systems could envisage such an ambitions objective.

4. Benchmark revisions of BoP and national accounts statistics for the EU Member States

4.1 Why benchmark revisions?

Benchmark revisions are instrumental for high-quality statistics as they incorporate views and information that has become available to the compiler after the regular publication cycles. Under these circumstances, new data sources and methods are incorporated effectively into the statistics. Due to their nature, benchmark revisions complement regular routine revisions and are therefore less frequent. As a general rule they occur every 5-10 years in practice (Eurostat (2019a)) and include revisions of back data over a longer time span. However, it remains at the discretion of individual EU Member States to determine their revision frequencies and the most appropriate reference year based on the data sources available to them. In the context of EU statistics, such reoccurring revision events should be conducted in a coordinated manner in order to produce comparable time series across all Member States.

4.2 Harmonised benchmark revisions for the EU-28 and their expected outcomes

The last major revision of data for the EU Member States occurred in 2014 with the introduction of the new methodological standards for national accounts (ESA 2010) and the balance of payments (BPM6). Such major (recurring) events in European macroeconomic statistics are scheduled for 2019 and 2024 (CMFB (2017b)); they should take place in accordance with agreed harmonised revision guidelines — the harmonised European revision policy (HERP). According to the indicative planning available at the time of writing, a majority of the EU Member States will have conducted such revisions by 2019 or 2020 for their national accounts. Due to the imposed requirement for consistency, this also implies a reconciliation between national accounts and BoP statistics. To arrive at simultaneously published national accounts and BoP data, the compilers of both domains are expected to coordinate their work processes and exchange estimates in good time, in order to support the publication of comparable statistics (Eurostat (2019a)). With increased coordination of the statistical production and revision processes, improvements may be expected in relation to the degree of consistency between national accounts and BoP statistics. In practice, this implies that the earlier causes for discrepancies identified by Eurostat should be addressed under the following assumptions:

- it should not make a difference whether national accounts and BoP statistics are produced in the same institution, or not;
- data sources and estimation practices should be reconciled in order to produce the same results for comparable statistical products;
- statistical production and data revisions should occur in a coordinated manner without permitting revision and vintage effects for any ensuing data comparisons;
- conceptual differences for specific sub-items should be agreed among compiling institutions for the sake of comparable statistics.

Conclusions

In 2019 and 2020, the compilation of national accounts and BoP statistics within the EU will undergo widespread benchmark revisions. These revisions are expected to trigger a higher degree of convergence between the two sources of statistics in line with international recommendations, as laid out in BPM6 and ESA 2010. Since the implementation of these standards in 2014, evidence from the data for individual EU Member States has shown that the consistency requirement does not necessarily apply to all Member States. While a few Member States produce fully comparable statistics, measured inconsistencies continue to be recorded for a few others. The overall extent of such inconsistencies has been constantly decreasing (Eurostat (2019b)), reducing the discrepancies recorded for the remaining Member States to predominantly 'structural' causes. Oncoming benchmark revisions provide an opportunity to rectify the situation, particularly in the affected Member States in order to emphasise the integrated concept of macroeconomic statistics ([12]). Without quantitative evidence, the course of improvements can however not be observed. Consequently, we presented a scoreboard of indicators to survey developments over time in a comparable and communicable manner to external users. The scoreboard complements available information from annual quality reports (Eurostat (2018)) for monitoring purposes.

These indicators focus only on the extent of differences between the two statistical sources and refrain from incorporating other aspects into the presented measures (that are not causally related to the measured discrepancies). Three levels of data aggregations were identified where comparisons appear meaningful. At the most aggregated level (level 1) a rough picture can be obtained whether the two statistical sources correspond to each other and whether discrepancies are of a financial or non-financial nature. At level 2, the situation can be assessed for the current and capital account, although no detailed conclusions appear possible due to the underlying risk of offsetting effects for discrepancies across the component data. The component analysis (level 3) can produce conclusive results which help to identify specific issues in the (non-financial) accounts.

But why not go further than level 3? At the lower aggregation levels different concepts (for example, primary income, financial account components) become more relevant, although there are also flagging policies maintained by data compilers that impede drawing comprehensive conclusions. The scoreboard of indicators has therefore been designed to alert users when relatively high percentage deviations occur between data from the BoP and those from the RoW sector. Equally, there is no causal relationship imposed in this assumption whether BoP or RoW data should serve as a benchmark. Most reasonably, an exchange of practices — as suggested by international guidelines — will lead to the adoption of new standards and policies for both statistics.

([12]) According to a recent Eurostat questionnaire (May 2019), at least 22 EU Member States regard full consistency between BoP and the RoW sector accounts as being achievable during 2019/2020.

References

Eurostat (2013), *European system of accounts (ESA 2010)*, Eurostat, Luxembourg.

International Monetary Fund (2009), *Balance of Payments and International Investment Position Manual — Sixth Edition (BPM6)*, Washington D.C., United States.

CMFB (2017a), 'Final report on phase 1 of the CMFB task force on the consistency between national accounts and balance of payments statistics', Committee on Monetary, Financial and Balance of Payments Statistics (CMFB), February 2017, Frankfurt am Main, Germany.

CMFB (2017b), 'A harmonised European revision policy for macroeconomic statistics', Committee on Monetary, Financial and Balance of Payments Statistics (CMFB), October 2017, Frankfurt am Main, Germany.

CMFB (2018), 'Final report on phase 2 of the CMFB task force on the consistency between national accounts and BoP/IIP statistics', Committee on Monetary, Financial and Balance of Payments Statistics (CMFB), February 2017, Frankfurt.

Damia V., C. Picón Aguilar (2006), 'Quantitative quality indicators for statistics', European Central Bank, *Occasional Paper Series 54/2006*, Frankfurt am Main, Germany.

Eurostat (2018), *Quality report on balance of payments (BoP), international trade in services (ITS) and foreign direct investment (FDI) statistics — 2017 edition*, Eurostat Statistical Reports, Luxembourg.

Eurostat (2019a), *Practical guidelines for revising ESA 2010 data — 2019 edition*, Eurostat Manuals and Guidelines, Luxembourg.

Eurostat (2019b), 'Consistency between national accounts and balance of payments statistics', Eurostat Statistics Explained, Luxembourg.

Hyndman, R.J., G. Athanasopoulos (2018), *Forecasting: principles and practice*, 2nd edition, Melbourne, Australia.

Obrzut R. (2016), 'Consistency between national accounts and balance of payments statistics', *Eurostat Review on National Accounts and Macroeconomic Indicators (EURONA)*, 1/2016, Luxembourg.

Obrzut R. (2017), *Consistency between national accounts and balance of payments statistics — an updated view on the non-financial accounts — 2017 edition*, Eurostat Statistical Reports, Luxembourg.

Annex 1: Presentational differences for primary income

The standard presentation of primary income items is very heterogeneous in the national accounts and BoP due to different statistical concepts being applied. While national accounts apply standard categories D.1 to D.4 for the purpose of calculating gross national income (B.5g), BoP statistics for primary income are mainly built upon the concept of classical economic production factors (cross-border income from labour, capital and land). The only component that appears directly comparable for both statistical sources is that for the compensation of employees.

More fundamentally, the BoP concept of investment income differs considerably from the national accounts concept of property income. Investment income is compiled with regard to the functional categories of the BoP (direct, portfolio and other investment, reserve assets), while property income is structured by primary income components with regard to instrument categories (interest, distributed income of corporations, reinvested earnings on FDI, other investment income, rent). A mapping for primary income sub-items is proposed below.

The BOP concept of investment income explicitly excludes rents (item D.45), which is a standard component of property income, and records it in other primary income. However, the sector accounts do not record rent flows for the RoW sector, since according to ESA 2010 rent payments should only take place between resident units. On the other hand, the BoP summarises some national accounts standard components under the heading of 'other primary income' (taxes on production and wealth, subsidies, rent). Similarly, the national accounts standard component 'other investment income' (D.44) is not identical to the BoP heading of other primary income (see Table A1).

Table A1: Reconciling primary income concepts of balance of payments and national accounts

Balance of payments (BoP) component	BoP item	National accounts component							
		Compensation of employees	Taxes on production and imports	Subsidies	Interest	Distributed income of corporations	Reinvested earnings on FDI	Other investment income	Rent
		D.1	D.2	D.3	D.41	D.42	D.43	D.44	D.45
Compensation of employees	D.1	**x**							
Investment income					**x**	**x**	**x**	**x**	
Direct investment income	*D.4D*				*x*	*x*	*x*		
Income on equity and investment fund shares						x	x		
Dividends and withdrawals from income of quasi-corporations	D.42D					x			
Reinvested earnings	D.43D						x		
Interest	D.41D				x				
Portfolio investment income	*D.4P*				*x*	*x*		*x*	
Investment income on equity and investment fund shares						x		x	
Dividends on equity excl. investment fund shares	D.42P					x			
Investment income attributable to investment fund shareholders	D.443P							x	
Dividends	D.4431P							x	
Reinvested earnings	D.4432P							x	
Interest	D.41P				x				
Other investment income	*D.4O*				*x*	*x*		*x*	
Withdrawals from income of quasi-corporations	D.42O					x			
Interest	D.41O				x				
Investment income attributable to policy holders in insurance,pension schemes and standardised guarantee schemes	D.44O							x	
Reserve assets	*D.4R*				*x*	*x*			
Income on equity and investment fund shares	D.42R					x			
Interest	D.41R				x				
Other primary income			**x**	**x**					**x**
Taxes on production and on imports	D.2		x						
Subsidies	D.3			x					
Rent	D.45								x

Note: simplified for illustration purposes

Source: BPM6 (Appendix 9 — standard components and selected other items); ESA 2010 (Chapter 24 — allocation of primary income account)

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