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**EUROSTAT REVIEW
ON NATIONAL ACCOUNTS
AND MACROECONOMIC
INDICATORS
2020**

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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.

The articles published in EURONA do not necessarily reflect the views or policies of the European Commission.

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Editorial

COVID-19 had a major impact on all our lives in 2020. Worrying about the quality of our statistics may seem unimportant to some in the light of the enormous personal tragedies caused by the virus. In fact, to guide policymakers through these dark times, the need for high quality and timely statistics during the crisis was higher than ever. At the same time, many producers of official statistics were faced with a sudden lack of observations due to various restrictions.

EURONA has not been able to escape the impact of the global crisis either. We cancelled the usual June issue of our journal, making the current issue the only edition of EURONA in 2020. Naturally, the content of this issue is also influenced by COVID-19. The first two articles discuss and analyse the impact of the crisis on the compilation of national accounts and consumer price indices in Europe. Both articles refer to methodological issues that needed to be discussed and agreed with the national statistical offices to ensure a harmonised approach to a number of practices, for example, making estimates for missing data. Practical problems of data collection are also addressed, as well as the challenge of communicating to users the impact on the quality of the data.

The charts included in the first article on national accounts also show the significant impact of the crisis on the economy in the first three quarters of 2020. In the second article on the EU's harmonised index of consumer prices, the tables and charts show, in particular, those consumer markets where the impact of the crisis was the most severe.

Both articles have been written by Eurostat staff. By eliminating the peer review process — in this very special case — it has been possible to include the latest data available at the time of publication.

The two articles in the second half of this issue did follow the usual rigorous peer review process applied for EURONA. In the first, James Tebrake discusses the rapid development of satellite accounts based on the results of a global survey among national statistical offices. The survey shows the wide range of subjects currently addressed in satellite accounts. The author concludes that there is a need for general guidance on the development of satellite accounts and that certain satellite accounts could be formally endorsed by the international statistical community.

In the last article, Filippo Gregorini presents a relatively new national accounts table on pensions. Statistics on pensions become more and more important in the ageing society. The table describes, in detail, existing pension entitlements. Some of these data depend crucially on assumptions related to demography, wages and discount rates. For the latter, a sensitivity analysis is included. The author provides a warning too: the data cannot be used to determine the sustainability of pension schemes.

I hope that you enjoy reading this issue and please keep safe in these turbulent times.

Paul Konijn

Editor of EURONA

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Impact of the COVID-19 crisis on the national accounts

VERONIQUE DENEUVILLE ⁽¹⁾, CHRISTINE GERSTBERGER ⁽¹⁾, ÁNGEL PANIZO ESPUELAS ⁽¹⁾, JENNY RUNESSON ⁽¹⁾, STEINAR TODSEN ⁽²⁾, IVETA TOLEIKYTE ⁽¹⁾ AND ORESTIS TSIGKAS ⁽¹⁾

Abstract: As the COVID-19 pandemic hit EU countries, the economic impact rapidly became a second area of concern both for politicians and for citizens. The release of quarterly national accounts aggregates, which give an integrated picture of the economic situation, was eagerly anticipated by users of official statistics. At the same time, it was clear that the pandemic and its related containment measures implied severe measurement challenges and methodological issues for quarterly national accounts. This article describes the specific methodological guidance notes that Eurostat published on its website to support the work of national compilers and the comparability of estimates. It also presents Eurostat's experience with the production of quarterly national accounts data under COVID-19 conditions. On the positive side, compilation processes continued to function both at country and Eurostat level, allowing timely releases with limited revisions so far. On the other hand, an analysis of detailed aggregates showed some divergence for specific estimates, notably for government consumption. Besides genuine differences in the impact of the COVID-19 crisis, these variations could also partly reflect differences in the sources and methods used to obtain volume estimates of specific non-market services, notably for health and education services. Eurostat and NSIs will therefore continue to analyse estimates carefully in terms of reliability and comparability, aiming to draw lessons and further improve and harmonise estimates, where needed, in line with the guidance provided.

JEL codes: E01, E20

Keywords: national accounts, sector accounts, gross domestic product (GDP), employment, COVID-19

⁽¹⁾ Eurostat, Unit C2 — National accounts production.

⁽²⁾ Eurostat, Unit C1 — National accounts methodology; standards and indicators.

1. Introduction

Since the beginning of 2020, the COVID-19 pandemic has severely affected the health and economic conditions of millions of citizens in the EU and worldwide. It has also affected the compilation of statistics in many ways. While the European Statistical System (ESS) has maintained the dissemination of timely and reliable national accounts statistics, national statistical institutes (NSIs) faced multiple organisational, technical and methodological compilation challenges. For instance, national accounts compilers had to deal with: disruptions in the collection of their usual source data; breaks in economic/econometric relationships; searching for and using additional sources to improve estimates (where possible).

Indeed, as the COVID-19 pandemic evolved rapidly from the detection of first infections in the EU in late January 2020, to rising hospitalisation and death numbers in February 2020 and progressive shutdowns of non-essential activities in many EU Member States during March 2020, the economic impact rapidly became a second area of concern both for politicians and for citizens. Following the release of important short-term economic indicators on specific areas such as industrial production or trade, which are available monthly, but give only a partial picture of the state of the economy, the release of quarterly national accounts aggregates, which give an integrated picture of the economic situation, was eagerly anticipated by users of official statistics.

At the same time, it was clear that the COVID-19 crisis (the pandemic and its related containment measures) implied severe measurement challenges and methodological issues for quarterly national accounts as standard statistical compilation practices were impacted and could not be expected to be fully adequate following the onset of the crisis. There were notably risks to the quality and timeliness of usual data sources, a need to use alternative information to fill in gaps and to examine imputation methods and models to introduce adjustments where appropriate. Moreover, new policy measures introduced to provide employment, fiscal or business support, could potentially be recorded in different ways within the national accounts.

Against this background, this article describes the specific methodological guidance notes that Eurostat published on its website to support the work of national compilers and the comparability of estimates (see Section 2). It then presents Eurostat's experience with respect to the production of quarterly national accounts data during the COVID-19 crisis for the main GDP aggregates (including employment) (see Section 3) and for the quarterly sector accounts (see Section 4). The aim of the article is not only to present methodological guidance and some analysis of the economic impact of the COVID-19 crisis based on quarterly national accounts indicators, but also to determine whether the methodological guidance that was provided seems to have been effective in supporting the data compilation processes of NSIs and ensuring a high comparability of data. Section 5 offers tentative conclusions on these aspects.

2. Methodological guidance

As the COVID-19 crisis affected the ability of statistical compilers to collect and process data in the traditional manner, Eurostat and NSIs forming the ESS worked together to elaborate guidelines and notes on how to address methodological issues triggered by the changes in statistical production. The guidance notes published by Eurostat are available on a webpage, see: [COVID-19: support for statisticians](#). Similar guidelines were also published by the [Intersecretariat Working Group on National Accounts](#).

Several of these guidelines related to various aspects of national accounts. The main issues covered by Eurostat's guidance notes are summarised below. A more practical guidance note aimed at facilitating the compilation of quarterly national accounts (QNA) was followed by methodological guidance on how to record specific government support measures, estimate non-market output, and record deferred and waived interest payments of households. These were complemented by guidance on quarterly sector accounts (QSA) under COVID-19, as well as guidance relating to data transmission and metadata.

2.1. Guidance on quarterly national accounts (including flash estimates)

In order to support national compilers to address the particular circumstances created by the COVID-19 crisis, Eurostat aimed to improve the availability of guidance for QNA at an early stage. A guidance note on QNA published in April 2020 (Eurostat (2020c)) was based on exchanges with national compilers to anticipate the main problems in the compilation of QNA (including flash estimates). This consultation had identified mainly issues related to incomplete or lower quality source data, the use of alternative sources, and estimates for specific areas such as non-market services and government support measures. Based on the most acute needs, the note focussed mainly on issues affecting the compilation of GDP and employment estimates, including modelling techniques.

CHALLENGES FOR GDP ESTIMATES

Under normal circumstances, quarterly GDP estimates are based on established sources and estimation techniques, which have been tested, evaluated and documented carefully. In most EU Member States and EFTA countries, GDP is estimated independently from the output approach and expenditure approach, complemented by estimates of income-related data. These estimates are based on a multitude of sources such as short-term business statistics, trade and balance of payment statistics, as well as administrative data.

NSIs expected that the impact of COVID-19 containment measures on these data sources would be felt heavily from the second half of March 2020, but that the exact timing and scope could vary between EU Member States depending on the stage of infections and the measures taken. Specific measures taken by governments to support the economy, such as wage subsidies or a delay to VAT payments, were also identified as issues for administrative data sources.

In terms of mitigating efforts, national accounts departments were advised to work in close cooperation with other statistical departments to determine the impact on sources and obtain information on delays in data availability, response rates and quality issues. They were also advised to seek access to additional data sources (for example, payments statistics, road traffic data) that could be used for possible adjustments.

CHALLENGES FOR EMPLOYMENT ESTIMATES

Employment estimates are normally based on a number of established sources and techniques, notably data collected via labour force surveys, business surveys, short-term statistics and administrative data. During the COVID-19 crisis, many countries faced difficulties in collecting data from sources normally used for calculating flash estimates of employment. NSIs were especially concerned about the non-availability of source data, both from the labour force survey and from business surveys, since the results of these sources could arrive late or be incomplete, and it was not always possible to contact or follow-up with respondents. Many NSIs planned to adjust to this situation by converting to online data collection and telephone interviews and/or exploring the use of additional administrative data sources, for example data from social security registers.

More specifically, large swathes of employees across Europe were not working during certain (lockdown) periods and their salaries were often partly or fully paid by governments through subsidies. Guidance on the treatment of these schemes for the compilation of government finance statistics was provided in a separate note (see Section 2.2 below). Since according to national accounts concepts employment covers persons temporarily not at work due to various reasons — including temporary absences with or without leave — national compilers were advised to carefully assess the nature of employment-related support schemes to decide on their treatment for employment estimates.

CHALLENGES FOR MODELLING, INCLUDING SEASONAL ADJUSTMENT AND BENCHMARKING

The compilation of QNA also typically includes modelling techniques. These are notably needed for flash estimates, where information for the last month is typically missing, and also for the regular compilation of QNA, which may, to a different extent depending on the country concerned, rely on the use of econometric models to estimate some aggregates. Since these models rely on established sources and stable economic assumptions and relationships, the COVID-19 crisis posed specific challenges in this area.

Against this background, one recommended solution was to use the usual techniques (for example, ARIMA regressions), but subsequently applying a correction factor based on assumptions at a detailed level for industries using additional information from newsfeeds, business surveys, and contacts with enterprises and trade associations (if available). Whatever the method chosen, compilers were advised to insert the impact of the COVID-19 crisis either at the level of input data (explanatory variables) or at the level of the forecast result (manual ad-hoc correction). While all new methods should, in principle, be tested for several quarters, it was clear that the situation in the early stages of the crisis did not allow for a long testing period. This meant that any model adaptations could result in lower quality results and subsequent higher revisions (as additional source data become available).

Considerations relating to the application of seasonal adjustment were the subject of a guidance note published by Eurostat in March 2020 (Eurostat (2020a)). The recommendation for national accounts was for NSIs to consider that an indirect approach to seasonal adjustment would seem preferable during the COVID-19 crisis. Detailed series should be seasonally adjusted separately and then aggregated to obtain total levels, followed by running a residual seasonality test on the total aggregates to avoid that COVID-19 effects were cancelled out (for example, between industries or institutional sectors) and to minimise discrepancies between the total and the components (which can be an issue when using direct seasonal adjustment on all series).

Moreover, the fact that the components of national accounts figures could change sharply, and by extremely different rates during a crisis such as COVID-19, also had to be considered when applying temporal disaggregation and benchmarking techniques since the indicators used for extrapolation could lose their reliability. However, the question how to estimate missing information for the last month (or quarter) taking into consideration that auxiliary information or assumptions normally used to estimate the missing month/quarter might not be useful during the crisis should, in principle, be separated from techniques to derive QNA from a set of indicators. For countries that do not use modelling or econometric techniques but mathematical techniques (Denton), the issue was whether the indicator was still meaningful to calculate QNA.

2.2. Policy measures to mitigate the impact of the COVID-19 crisis

A note on statistical implications of some policy measures in the context of the COVID-19 crisis (Eurostat (2020b)) provided an overview of major policy measures enacted by EU governments in order to mitigate the economic and social impact of lockdowns enforced across the EU Member States as a result of the COVID-19 pandemic. It also provided guidance on the treatment of these measures in the national accounts.

EMPLOYMENT-RELATED MEASURES

New measures by governments to support businesses retaining their employees either on reduced hours or zero hours in the context of COVID-19 lockdowns should be recorded either as:

- subsidies on production (D.39) to employers; compensation of employees (D.1) should continue to be recorded in the accounts of the employers; or as
- current transfers, either as social assistance (D.623) or other current transfers (D.75).

The recording to be chosen may depend on the actual detail of the scheme in question (for example, the degree of discretion held by corporations) and on the choice followed in employment statistics.

FISCAL POLICY RELATED MEASURES

Fiscal policy measures related to the COVID-19 crisis included the deferral of tax deadlines, postponing the submission deadlines for tax declarations, suspension of late payment interest on unsettled tax obligations and the suspension of tax debt enforcement. The accrual principle of recording implies that taxes and social contributions should be recorded in the period when the economic activity generating the tax liability took place. For taxes where the accrual principle is implemented using time-adjusted cash, the time-lag used for time-adjusted cash should be reviewed so as to still reflect accurately the time when the economic activity generating the tax liability took place. Whenever taxes are fully waived for certain time periods, no accrual of revenue can be considered for the period the tax is waived.

OTHER MEASURES

Other government measures to combat the impact of the COVID-19 crisis on the economy included loans, guarantees and equity/capital injections into corporations. For schemes such as these, Eurostat expected the statistical rules that were already available in Eurostat's *Manual on Government Deficit and Debt* (Eurostat (2019)) to be applicable.

2.3. Non-market output

The measures taken to reduce the spread of COVID-19 have affected the activities and output of non-market producers, in other words general government and non-profit institutions serving households (NPISH). Some employees in these sectors worked more than usual, while others worked shorter hours or not at all. Many worked remotely, rather than in their normal workplace. For example, many teachers, pupils and students stayed at home (principally during lockdown periods) with remote teaching for school or university. Health authorities operated COVID-19 test and treatment facilities, while some non-COVID-19 related health services were reduced (in particular during the early months of the crisis).

Eurostat issued a guidance note on non-market output in the context of the COVID-19 crisis (Eurostat (2020f)). This was followed by a questionnaire in July 2020 (answered by 20 EU Member States and 2 EFTA countries), designed to assess how countries dealt with the issues surrounding the measurement of non-market output. The main issues are summarised below.

NOMINAL VALUES

Since, by definition, no market prices exist for non-market output, the value of output in current prices is measured by the sum of costs (intermediate consumption, compensation of employees, other taxes less subsidies on production and consumption of fixed capital). The guidance provided by Eurostat was to continue to measure the nominal value of output of non-market services by the sum of costs approach, with no further adjustment. All 22 respondents to the questionnaire replied that they followed this approach.

As a result of the COVID-19 crisis, there were situations where governments and NPISH continued to pay normal levels of compensation to employees, even though they were actually working shorter hours or not at all. In these cases, measured output in current prices

would be largely unchanged (maybe a little lower due to reduced intermediate consumption or a lower level of other taxes less other subsidies on production) even though activity was clearly reduced. By contrast, where employees were requested to work uncompensated overtime, this change did not increase non-market output in current prices.

VOLUME MEASURES

Without having prices for their output, there are only two options for measuring the volume of non-market services: deflating inputs and direct volume measurement.

When deflating inputs as the preferred approach, Eurostat advised NSIs to estimate the volume of each input separately, taking quality changes of the inputs into account, in particular for the compensation of employees. No additional productivity or quality adjustments to the sum of the volume of quality-adjusted inputs should be applied.

When hours worked were used as an indicator for labour input, then changes in working time resulting from the COVID-19 crisis should have been reflected in volume changes for the output of non-market services. However, if indicators such as hours paid or the number of full-time equivalent employees were used, then short-term changes in activity might not have been captured. In this case, Eurostat advised NSIs to make suitable adjustments to the indicators in order to better reflect the hours actually worked during the period concerned. These adjustments should be transparent and well documented.

When output measures were used, Eurostat advised NSIs that it was important to ensure that the indicators used covered any new services that were introduced as a result of the COVID-19 crisis, as well as existing services that were significantly expanded or reduced.

VOLUME MEASURES FOR COLLECTIVE NON-MARKET SERVICES

According to the European System of National and Regional Accounts (ESA 2010), both input and output methods are acceptable for measuring collective non-market services. All 22 respondents to the questionnaire replied that they used input-based volume measures for collective non-market services. Ideally, a volume measure for the compensation of employees should reflect hours actually worked, but only eight respondents replied that they were able to do that.

VOLUME MEASURES FOR HEALTH SERVICES

For non-market health services, ESA 2010 (paragraph 10.28) states that output in volume terms should be calculated on the basis of direct output measures. However, the input method may be applied 'when the variety of the services is such that it is practically impossible to determine homogeneous products'. The answers to the questionnaire showed that many of the responding countries used input methods. Note that the questionnaire focused on QNA, whereas more countries use output indicators for their annual national accounts.

Few countries replied that they had access to sufficiently detailed and timely data sources to identify new services created by the COVID crisis and their cost. This was also the case regarding sufficiently detailed and timely data sources to monitor the possible reduction in other health services.

VOLUME MEASURES FOR EDUCATION

For education, around half of the responding countries stated that they made use of input methods, rather than the recommended output indicators (the number of students or the number of student hours). As for health, these replies concerned QNA, and more countries say they use output indicators for annual national accounts.

Particularly during the lockdown, many schools, universities and other educational establishments moved from providing physical to remote teaching. The guidance provided by Eurostat was that services delivered remotely should count as output in the same way as those delivered physically. Only a few of the respondents had access to sufficiently detailed and timely data sources to identify students who were receiving no education services (physical or remote) at all.

2.4. Deferred and waived interest payments of households

The measures taken to reduce the spread of COVID-19 reduced the income of many households. One measure that was introduced by financial corporations to mitigate the situation was to defer (postpone) or even waive interest payments on loans to households for a specific period. Such measures were often part of a broader agreement between governments and financial corporations (with or without government financial support) or alternatively they were agreed directly between financial corporations and their customers on an individual basis.

The recording of these measures in the national accounts was discussed in another guidance note released by Eurostat in relation to deferred and waived interest payments of households in the context of the COVID-19 crisis (Eurostat (2020g)); the main principles are summarised below.

DEFERRED INTEREST PAYMENTS

According to ESA 2010 paragraph 4.50, interest is recorded on an accrual basis, independently of when it is actually paid. Thus, deferred interest payments should be recorded when accrued, and added to the principal outstanding (in the financial account). Eurostat also advised that financial intermediation services indirectly measured (FISIM) between households and financial institutions should continue to be recorded in the normal way.

WAIVED INTEREST PAYMENTS

The situation where interest payments are waived, in other words, they do not have to be paid (at a later date), is not explicitly mentioned in ESA 2010. In general, the accrual recording of interest should be applied in this case as well. A capital transfer (D.99) of the same amount should be recorded in the same period from the financial institution to the customer, in order to remove the accrued interest from the financial stock positions at the end of the period. FISIM should be recorded in the normal way, as in the case with deferred interest payments (as described above).

GOVERNMENT FINANCIAL SUPPORT

Government financial support to financial corporations to provide an incentive for them to postpone or waive interest payments of households (in the form of loans, interest rate subsidies, and/or guarantees) should be recorded in accordance with the appropriate rules of ESA 2010 and Eurostat's *Manual on Government Deficit and Debt*.

2.5. Quarterly sector accounts

To support data compilers, Eurostat published a methodological note on the compilation of QSA statistics. Firstly, the note aimed to help national accountants navigate through the guidance notes that had already been made available by summarising the various aspects that were of relevance to the compilation of QSA, harmonising statistical and recording approaches. Particular focus was given to the recording of the various support schemes in the context of the COVID-19 crisis and how these were expected to impact the different sectors and different accounts. Secondly, the note identified specific challenges that the COVID-19 crisis presented to compilers of QSA statistics including: disruptions to the availability of standard data sources; disruptions to economic relationships that might pose difficulties for estimations; limited availability of information about a wide range of new national policy measures to be reflected appropriately in the statistics; potentially significant data revisions; and the increased need for statistical information to assess the impact of the pandemic and related policy measures.

2.6. Guidance on transmission aspects and metadata

Finally, Eurostat also provided a guidance note on data transmission and metadata within the context of the COVID-19 crisis (Eurostat (2020d)). As a general approach, the note stressed that it was essential that Eurostat and the EU Member States continued to ensure full transparency regarding the impact of the COVID-19 crisis on national accounts. It recommended that data compilers should (continue to) apply the European Statistics Code of Practice (Eurostat (2017)) and the Quality Assurance Framework of the European Statistical System (European Statistical System (2019)) concerning their news and data releases, stressing that these two documents on transparency and communication were even more relevant during the crisis. The ESS also agreed on how to ensure that strategic communications continued during the COVID-19 crisis (Eurostat (2020e)). National accounts data compilers were asked to ensure that the guidance was implemented within their domains in relation to: keeping users informed; providing innovative sources and products; finding common solutions and coordinating within the ESS; and widening the range of (official) communication channels.

Moreover, NSIs were asked to provide additional metadata to Eurostat when transmitting national accounts data on the impact of the COVID-19 crisis (in terms of the severity of containment measures, changes in data sources, estimation techniques and methods used) to allow Eurostat to assess the quality of data and also publish summarised information on these aspects to users. NSIs were also encouraged to complement their national publications (news releases, database updates, electronic publications, and so on) with crisis-relevant information (metadata) and to disseminate their data with appropriate flags and footnotes. Furthermore, Eurostat emphasised that communication actions remained indispensable not only before the release of data impacted by the crisis, but also during and after the crisis, once specific data issues were resolved.

3. Experience with quarterly national accounts estimates (including flash estimates)

This section reports on the production of estimates for quarterly national accounts (QNA) during the COVID-19 crisis. The first part of this section presents the development of GDP and employment for European aggregates up to the third quarter of 2020. It is followed by information on the stability of the production process and the reliability of GDP estimates before analysing developments for specific expenditure aggregates and employment estimates.

3.1. GDP and employment rates of change in the EU and the euro area

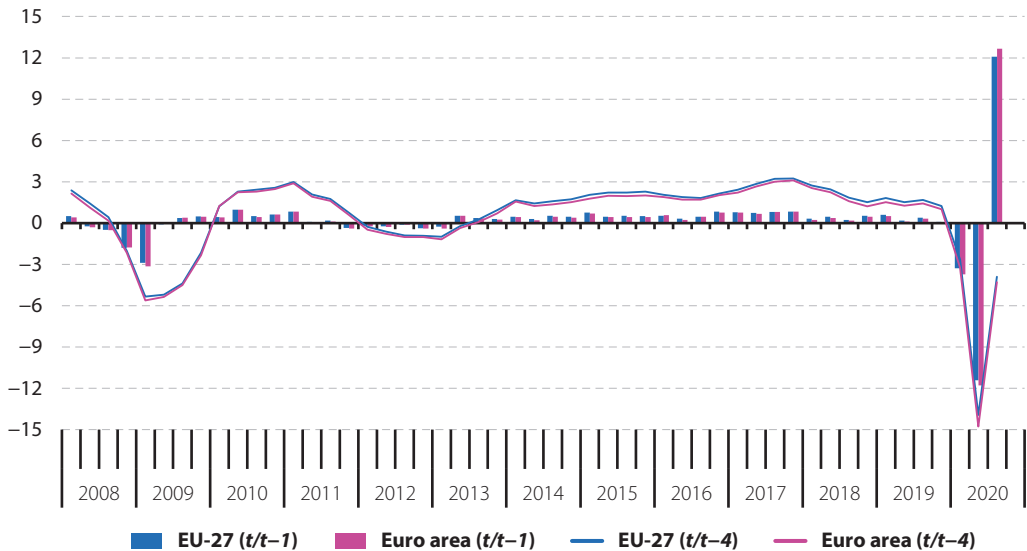
The changes in GDP and employment across the EU and the euro area during the first three quarters of 2020 were exceptional.

Within the EU, there was a decline in quarterly GDP during the first quarter of 2020 as the first effects of the COVID-19 crisis became apparent, as several EU Member States had introduced lockdowns during March 2020. However, the impact of the crisis was most clearly visible during the second and third quarters of 2020. On the basis of a comparison with the previous quarter, the EU's GDP fell sharply (down 11.4 %) during the second quarter of 2020 and then subsequently partially rebounded (up 12.1 %) in the third quarter. These were, by far, the largest quarter on quarter changes recorded since the beginning of the time series in 1995. To put the impact of the COVID-19 crisis into some context, the biggest contraction in output during the global financial and economic crisis was recorded in the first quarter of 2009, when there was a fall of 2.9 % in the EU's GDP. A comparison of the third quarter of 2020 with the third quarter of 2019 shows that GDP was still well below the pre-pandemic level, despite a rebound in activity during the third quarter of 2020.

Figure 2 shows a similar analysis but for employed persons. Compared with the changes observed for GDP, there was less volatility in the development of employment across the EU and the euro area. Nevertheless, once again the impact of the COVID-19 crisis was such that it resulted in the largest contraction and the biggest rebound in employment levels since the start of the time series in 1995. EU employment fell 2.7 % in the second quarter of 2020, followed by an increase of 0.9 % in the third quarter. To put these changes into some context, the biggest contraction in the number of persons in employment during the global financial and economic crisis was recorded in the first quarter of 2009, when there was a fall of 0.7 % in the EU. For hours worked, changes were generally even more important than for GDP (see Section 3.6).

There was a sizeable rebound in GDP and employment during the third quarter of 2020, although neither returned to their pre-crisis levels. This rebound could be associated with governments relaxing (at least in part) containment measures, as the virus was generally less prevalent in the EU during the summer months.

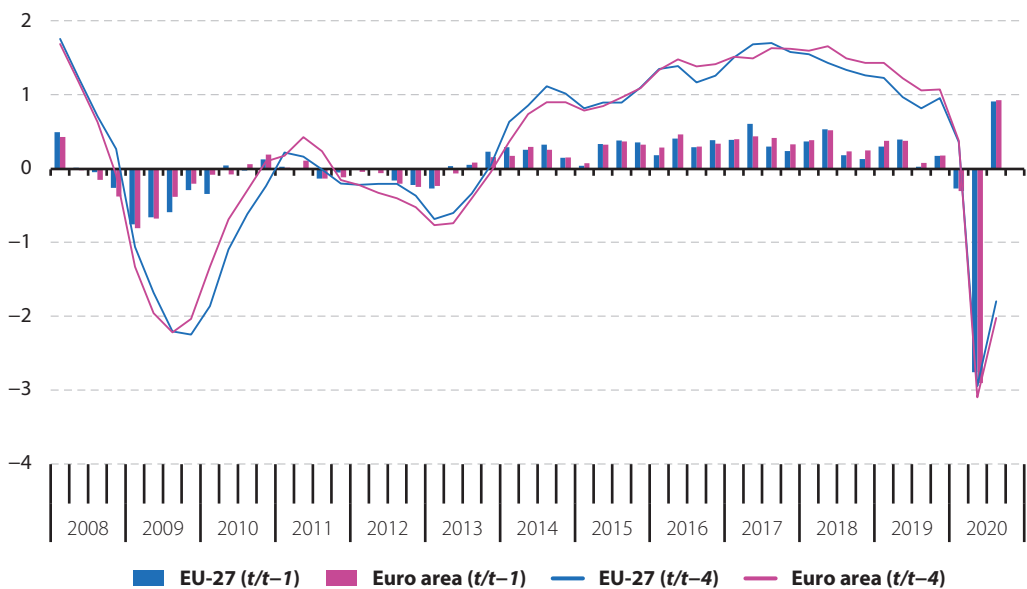
Figure 1: GDP growth rates, first quarter 2008-third quarter 2020
(% change, based on seasonally and calendar adjusted data)



Note: growth rates compared with the previous quarter and compared with the same quarter of the previous year — as presented in this figure — are generally based on seasonally and calendar adjusted figures since unadjusted data are usually not transmitted for the compilation of GDP flash estimates.

Source: Eurostat (online data code: [namq_10_gdp](#))

Figure 2: Employment rates of change, first quarter 2008-third quarter 2020
(% change, based on seasonally and calendar adjusted data for $t/t-1$ and on unadjusted data for $t/t-4$)



Source: Eurostat (online data code: [namq_10_a10_e](#))

3.2. Stable processes for regular GDP and employment estimates

Flash estimates for EU and euro area GDP and employment statistics are compiled and published by Eurostat about 30 (for GDP) and 45 (for employment) days after the end of each reference quarter. These are based on voluntary contributions from EU Member States. There was some concern that the usual contributions to these flash estimates could suffer during the COVID-19 crisis. However, this was not the case. During the early months of the crisis, contributions to Eurostat's flash estimates remained the same (as prior to the crisis). In fact, the situation improved in the second quarter of 2020 when Czechia, Germany and Portugal also started to publish GDP estimates at $t+30$ days. Eurostat therefore published flash GDP estimates for 10 EU Member States, namely Belgium, Czechia, Germany, Spain, France, Italy, Latvia, Lithuania, Austria and Portugal in the news release for the second quarter of 2020, which was very positively received by users, while also providing enhanced information on the impact of the COVID-19 crisis on national economies.

For the regular data transmission schedule foreseen for national accounts statistics ($t+2$ months), timeliness and completeness were also respected overall. Regarding the compilation of these European aggregates, no changes in methods were implemented. In other words, the European aggregates continued to be calculated with the data provided by the NSIs, using imputation methods when information was missing. All of Eurostat's estimates for GDP, as well as its main aggregates and employment data, were published on time, in accordance with the pre-announced release schedule for quarterly estimates of national accounts.

Across the EU Member States and EFTA countries, there was a varied picture in terms of how individual NSIs adapted to the COVID-19 crisis. Starting with the first quarter of 2020, Eurostat collected metadata in line with the guidance provided. Due to time constraints, the collection of metadata for QNA remains rather limited and covers only the main aspects. However, the metadata that were available were greatly appreciated by users and ensured that transparency concerning the effects of the crisis on national accounts was achieved. The latest available metadata provide an important source of information for interpreting national accounts; they are presented on [Eurostat's website](#) ⁽³⁾. A Statistics Explained article on the impact of COVID-19 was also published ⁽⁴⁾.

3.3. Reliability of GDP estimates during the COVID-19 crisis

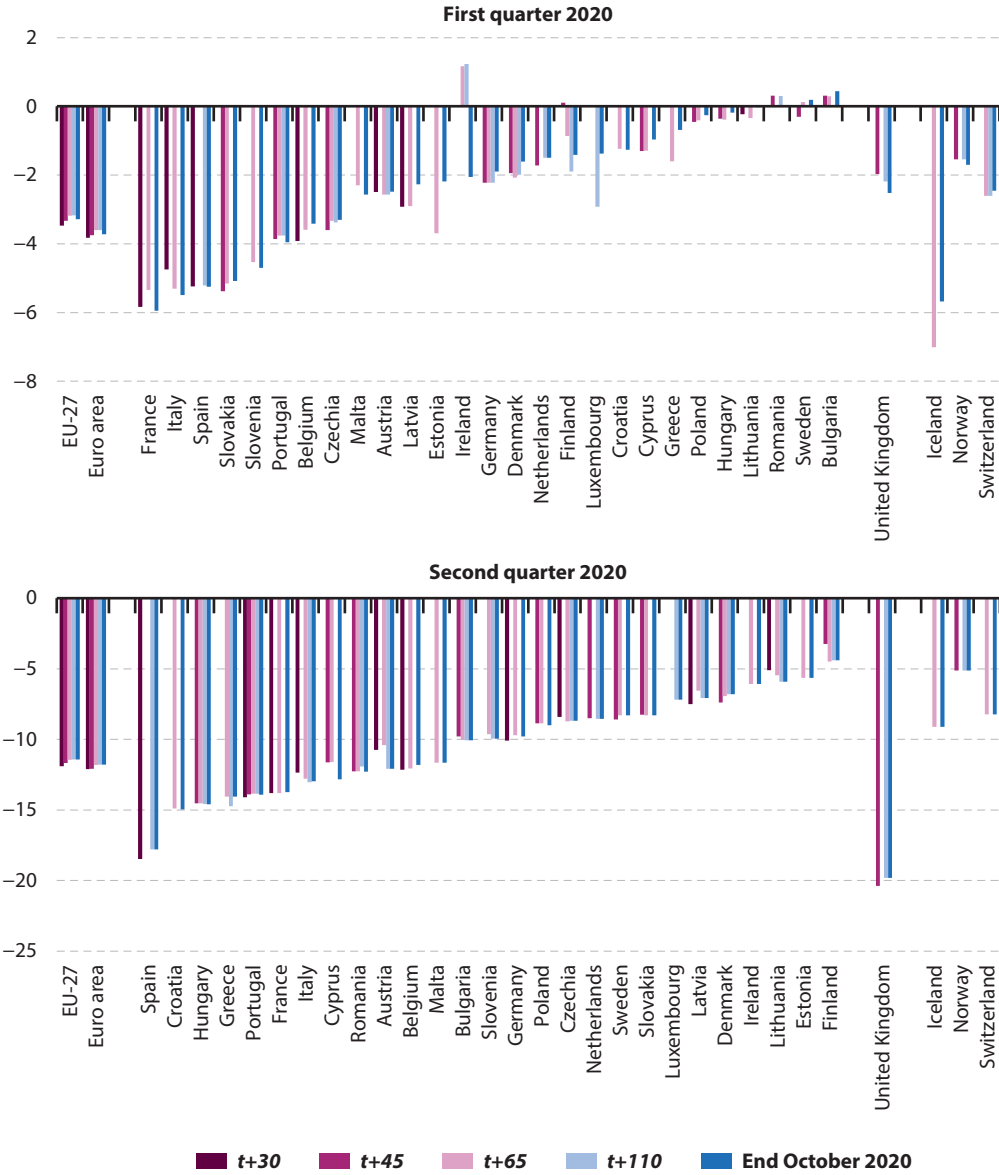
Since GDP is the most prominent indicator of economic activity, quarterly GDP growth estimates receive a lot of attention. As flash estimates, in particular, are based on incomplete information and often (partly) rely on econometric models, their reliability during the COVID-19 crisis was another source of concern. However, GDP estimates remained quite reliable during the first two quarters of 2020, not only for European aggregates but also for most EU Member States and EFTA countries. The graphs below show the developments of GDP estimates for the first and second quarters of 2020 at different points in time, in other words for different 'vintages' of the same data, detailing the data as released at $t+30$ days,

⁽³⁾ [Country specific metadata for the first quarter of 2020](#); [country specific metadata for the second quarter of 2020](#); [country specific metadata for the third quarter of 2020](#).

⁽⁴⁾ See: https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Impact_of_COVID-19_on_main_GDP_aggregates_including_employment.

Figure 3: GDP growth rates for different 'data vintages'

(% change compared with previous quarter, based on seasonally and calendar adjusted data)



Source: Eurostat (online data code: namq_10_gdp)

t+45 days, *t+65* days, *t+110* days and the end of October 2020. While absolute revisions were somewhat higher (than typical in the past), relative revisions were limited. For instance in the first quarter of 2020, the euro area rate of change for GDP (based on a comparison with the previous quarter) was revised from -3.8% at *t+30* days to -3.7% by the end of October 2020; for the EU the corresponding revision was from -3.5% to -3.3% . For most countries, GDP estimates also remained relatively stable across different vintages of data, with only a few countries showing larger revisions or a change in sign. For the second quarter of 2020, revisions were even more limited, although it should be noted that for both of these reference periods it is possible that further revisions could still be introduced in future.

While the above analysis shows that the COVID-19 crisis resulted in falling levels of GDP in most countries in the first quarter of 2020 and all of the countries in the second quarter of 2020, a more detailed analysis for specific expenditure aggregates reveals that there were some marked differences in terms of how the crisis impacted individual countries.

3.4. Analysis of main expenditure aggregates for the first quarter of 2020

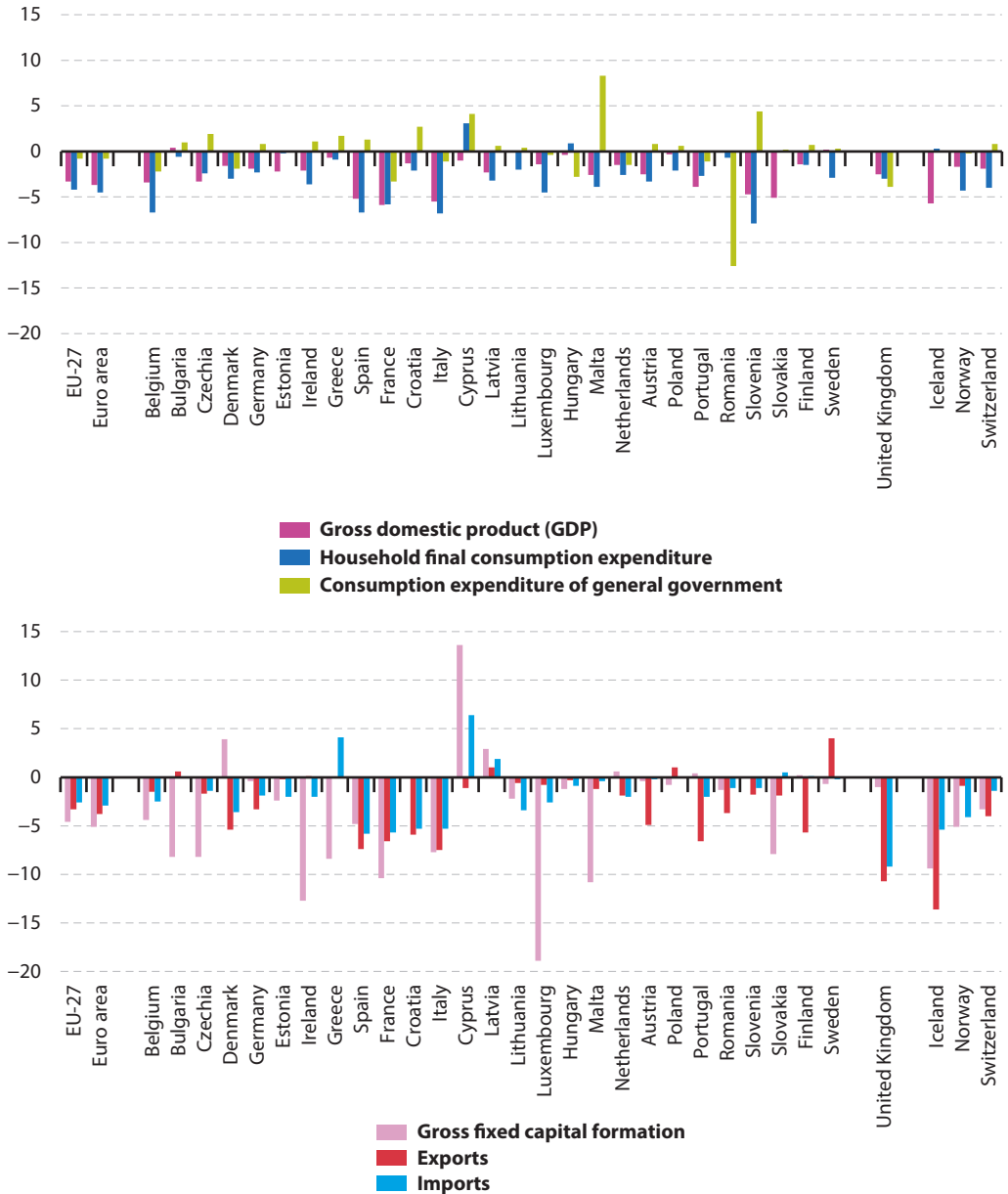
The analysis presented in Sections 3.4-3.6 for the first and second quarters of 2020 is based on regular estimates.

In the first quarter of 2020, the fall in household final consumption expenditure was greater in magnitude than the fall in GDP in most countries. This pattern reflected the implementation of restrictions on mobility and the closure of many (often non-essential) retail outlets and other businesses (such as hotels, restaurants and bars) during March 2020 with the aim of containing the spread of COVID-19. There was a mixed picture for the development of consumption expenditure of general government, with significant differences between countries. For the other main expenditure items — gross-fixed capital formation, exports and imports — there were significant decreases in activity during the first quarter of 2020 in most countries, with all three negatively impacted by the COVID-19 crisis.

3.5. Analysis of main expenditure aggregates for the second quarter of 2020

While compilers of national accounts gained important experience in dealing with the impact of the COVID-19 crisis during the first quarter of 2020, the largest impact in the early months of the crisis was generally felt during the second quarter of 2020. This pattern was apparent for most expenditure aggregates and for a majority of the countries, despite the gradual easing of some government containment measures towards the end of the second quarter. While the level of activity fell (often dramatically) in the second quarter of 2020 for GDP, household final consumption expenditure, gross fixed capital formation, imports and exports, there was a different development for consumption expenditure of general government, which increased in some countries and fell in others.

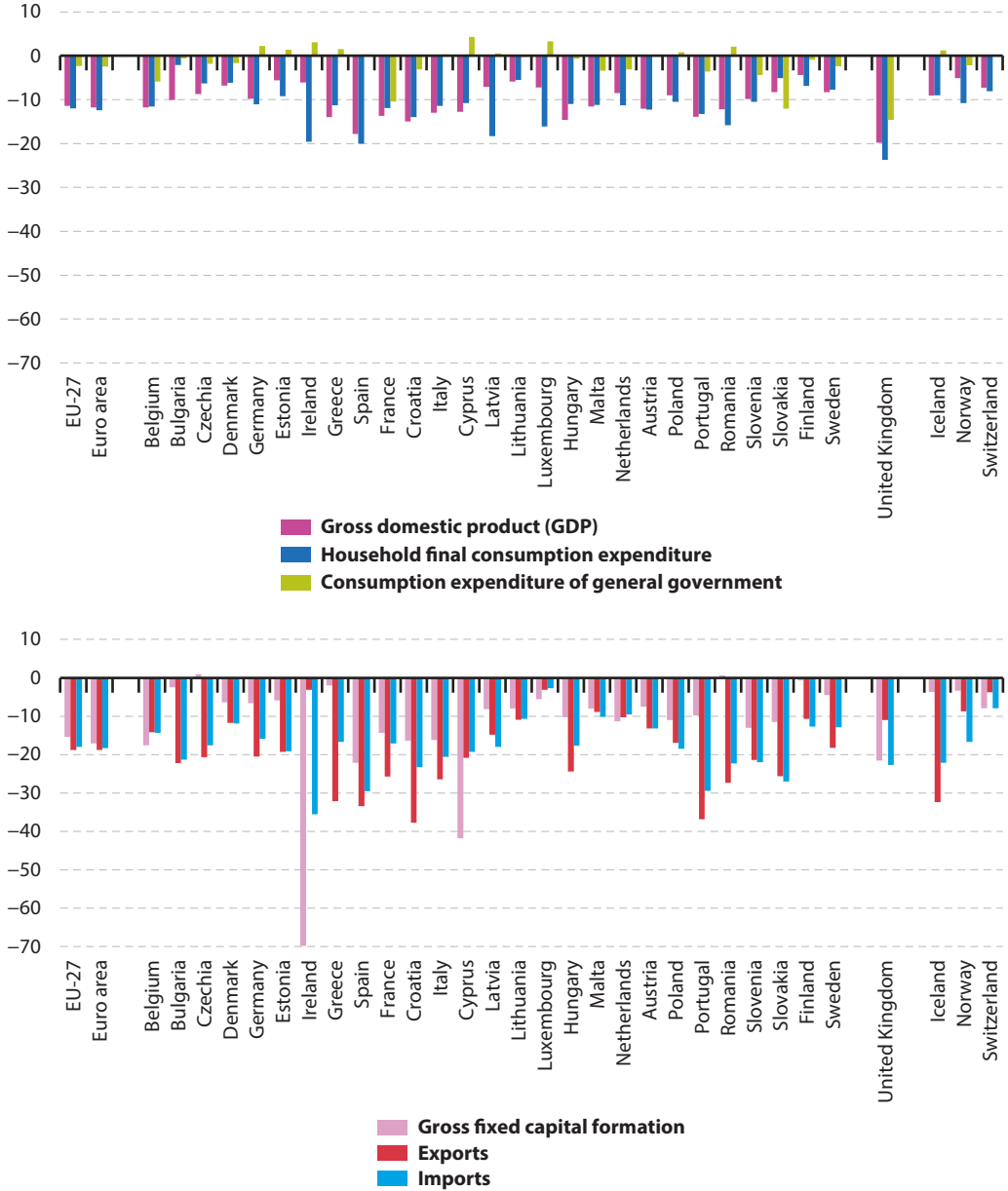
Figure 4: Impact of the COVID-19 crisis on GDP and the main expenditure aggregates, first quarter of 2020
 (% change compared with previous quarter, based on seasonally and calendar adjusted data)



Source: Eurostat (online data code: [namq_10_a10_e](#))

Figure 5: Impact of the COVID-19 crisis and its associated containment measures on GDP and the main expenditure aggregates, second quarter of 2020

(% change compared with previous quarter, based on seasonally and calendar adjusted data)



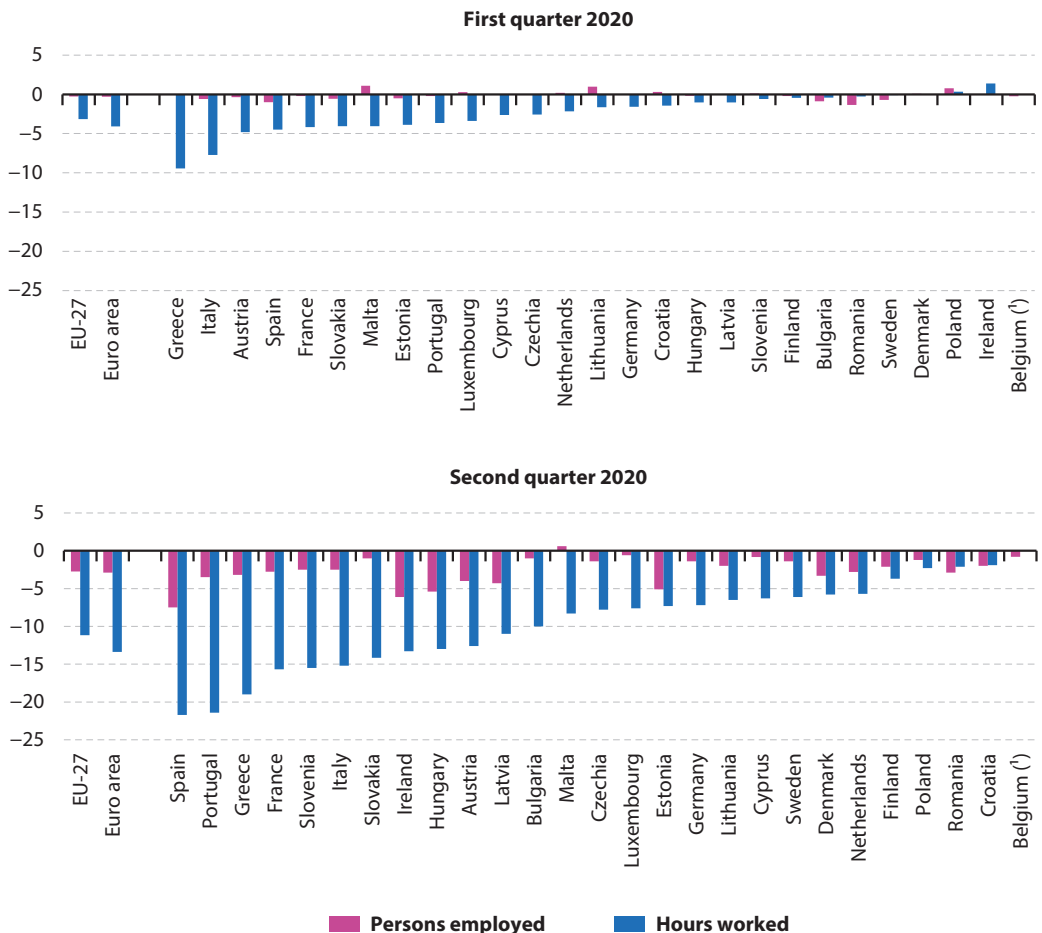
Source: Eurostat (online data code: [namq_10_gdp](#))

3.6. Employment estimates during the COVID-19 crisis

The final part of this section concerns an analysis of employment estimates from national accounts. There was little or no impact on the release of employment estimates for the EU due to the crisis. Subsequent revisions of employment statistics for European aggregates were limited.

However, in both the first and second quarters of 2020 there was a very large impact from the COVID-19 crisis on the number of hours worked in the EU. Indeed, this indicator fell to its lowest level since the start of the time series in 1995 for both the euro area and the EU. This was in contrast to the number of persons in employment, as government support measures sought to preserve employment during the crisis. The figures presented below show the initial impact of the crisis varied considerably across the EU Member States in the first quarter of 2020, whereas both measure of labour input — the number of persons in employment and the number of hours worked — declined in the second quarter of 2020 (except for a slight increase in the number of persons in employment in Malta).

Figure 6: Impact of the COVID-19 crisis on labour input
(% change compared with previous quarter, based on seasonally adjusted data)



(*) Hours worked: confidential.

Source: Eurostat (online data code: namq_10_a10_e)

4. Experience with estimates for quarterly sector accounts

Overall, the transmission of quarterly sector accounts (QSA) data during the COVID-19 crisis was very positive in terms of timeliness and coverage, given the circumstances. From the beginning of the COVID-19 crisis, Eurostat and the NSIs cooperated closely to safeguard the timeliness and quality of QSA.

Based on the discussions of possible issues and solutions with NSIs, Eurostat released a first set of guidance notes on COVID-19 related compilation processes for quarterly sector accounts. These included notes on QSA compilation (Eurostat (2020h)) and QSA transmission (Eurostat (2020d)) – see Section 2.5 for more details.

Together with the transmission of data for reference periods covering the first and second quarters of 2020, EU Member States also provided specific ad-hoc metadata related to the impact of COVID-19 crisis on sector accounts. These metadata described the main government support schemes in the context of the COVID-19 crisis and their classification within sector accounts, the availability of data sources and possible adaptations needed in methods, as well as an assessment of the overall impact of the COVID-19 crisis on the quality of results and expected revisions for the latest reference period.

According to the information received, a majority of EU Member States had put in place government schemes to support various enterprises and households by the end of March 2020. These schemes had a limited impact during the first quarter of 2020 for the majority of Member States but a larger one in the second quarter of 2020.

The vast majority of NSIs had access to their regular data sources for compiling quarterly sector accounts and were therefore able to use their standard estimation methods, even if for seasonal adjustment there was a need to make adjustments — in accordance with Eurostat's guidelines — for outliers in the latest quarter of specific time-series. In certain cases, the data availability for some variables was lower (than historically) and estimation methods had to be adapted accordingly.

For certain variables (for example, taxes and social contributions), it was expected that subsequent routine revisions might be larger than usual, as a result of the support schemes put in place by EU Member States. Based on the above, quarterly sector accounts for the first and second quarters of 2020 were considered to be of the same quality as usual in a majority of Member States. However, there were some Member States where the availability of data sources had an adverse impact on the overall quality of the QSA.

Metadata provided by compilers of QSA were greatly appreciated by users as they helped to understand better the recording of transactions within the sector accounts that were directly or indirectly impacted by the COVID-19 crisis, as well as to understand the impact on quality aspects of the QSA. The latest available metadata related to the impact of the COVID-19 crisis on the compilation of sector accounts are presented on [Eurostat's website](#) ⁽⁵⁾.

(5) [Country specific metadata for the second quarter of 2020.](#)

Eurostat also prepared a Statistics Explained article explaining the impact of the COVID-19 crisis on QSA for the first quarter of 2020, which was subsequently updated to include the second quarter of 2020 ⁽⁶⁾.

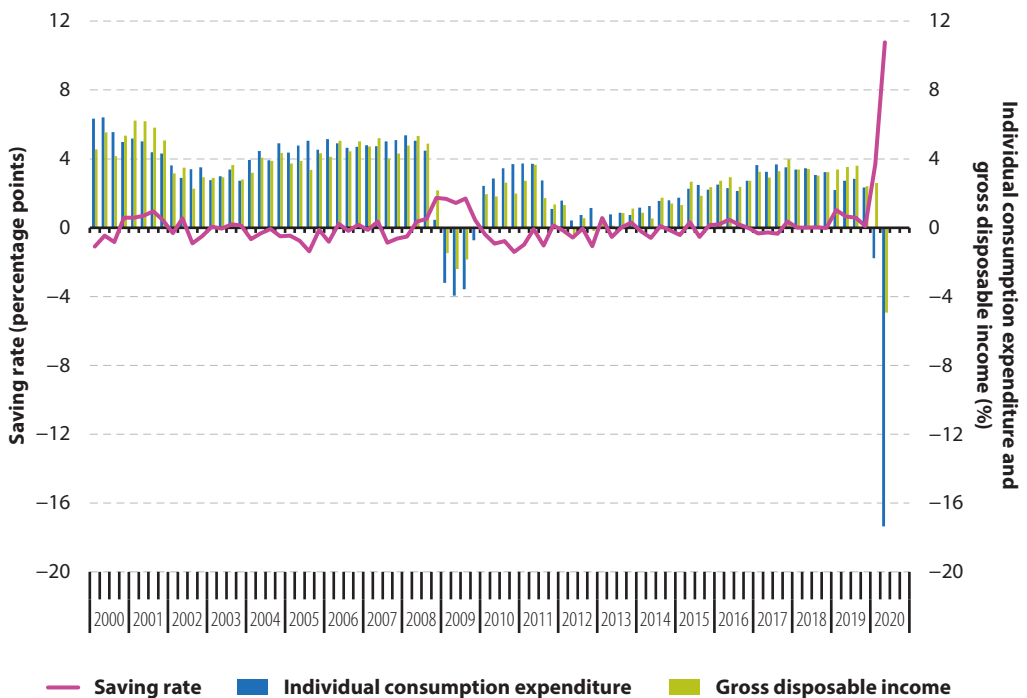
The two sections below provide an analysis of the impact of the COVID-19 crisis on quarterly sector accounts for the first and second quarters of 2020, detailing the latest developments for households and for non-financial corporations.

4.1. Households' gross disposable income, saving rate and investment rate

In the second quarter of 2020, the EU household saving rate recorded its highest increase compared with the same quarter of the previous year since the beginning of the time series in 1999. The EU household saving rate was 10.8 percentage points higher in the second quarter of 2020 than it had been in the second quarter of 2019. The main reason behind this change was the pronounced decrease in the level of household final consumption expenditure (−17.3 %), in stark contrast to relatively stable increases recorded every quarter during the period 2016-2019 (all within the range of 2-4 %; see Figure 7).

Figure 7: Development of the household saving rate, final consumption expenditure and gross disposable income, EU-27, first quarter 2000-second quarter 2020

(% change compared with the same quarter of the previous year, based on non-seasonally adjusted data)



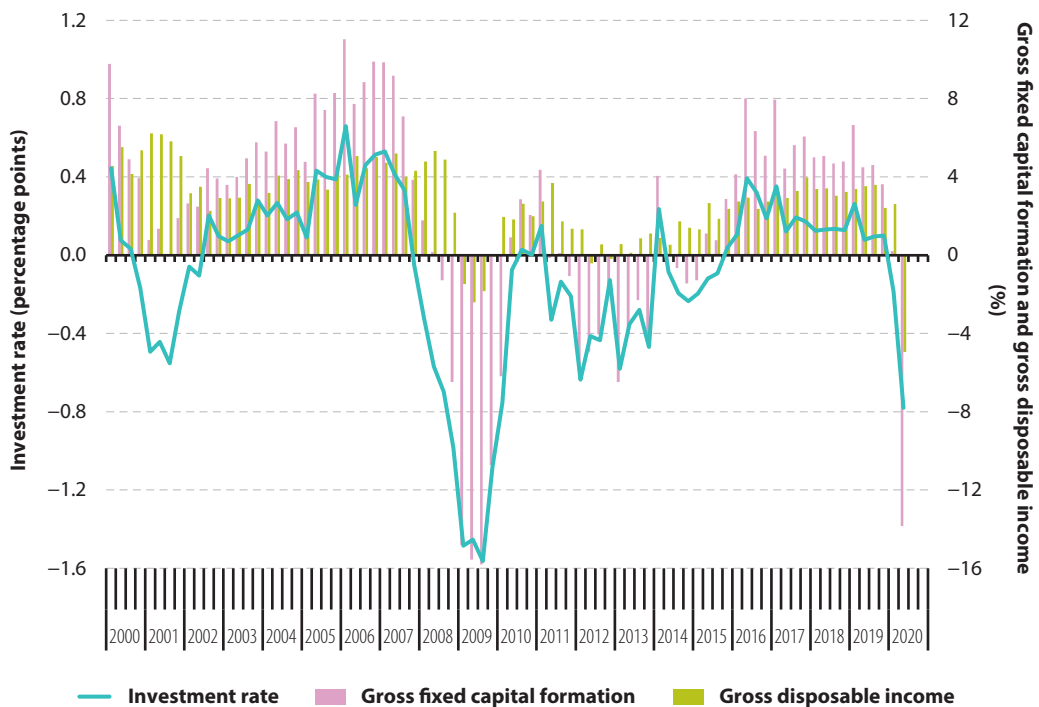
Source: Eurostat (online data codes: nasq_10_ki and nasq_10_nf_tr)

⁽⁶⁾ See: https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Impact_of_Covid-19_crisis_on_non-financial_corporation_and_household_accounts.

EU household gross disposable income continued to increase in the first quarter of 2020 (up 2.6 % when compared with the same quarter of a year before); this continued a pattern of positive rates apparent back to the first quarter of 2013. However, in the second quarter of 2020 there was a rapid contraction in gross disposable income, as it fell by 4.9 %; this was the largest contraction recorded since the start of the time series.

In the EU, the household investment rate decreased 0.2 percentage points in the first quarter of 2020. The rate of change accelerated in the second quarter of 2020, when there was a further fall in this rate (down –an additional 0.8 percentage points to 7.8 %). The declining household investment rate in the second quarter of 2020 is explained by the fall in household gross fixed capital formation (down 13.8 %) being considerably larger than the decrease in gross disposable income of households (see Figure 8).

Figure 8: Development of the household investment rate, gross fixed capital formation and gross disposable income, EU-27, first quarter 2000-second quarter 2020
(% change compared with the same quarter of the previous year, based on non-seasonally adjusted data)

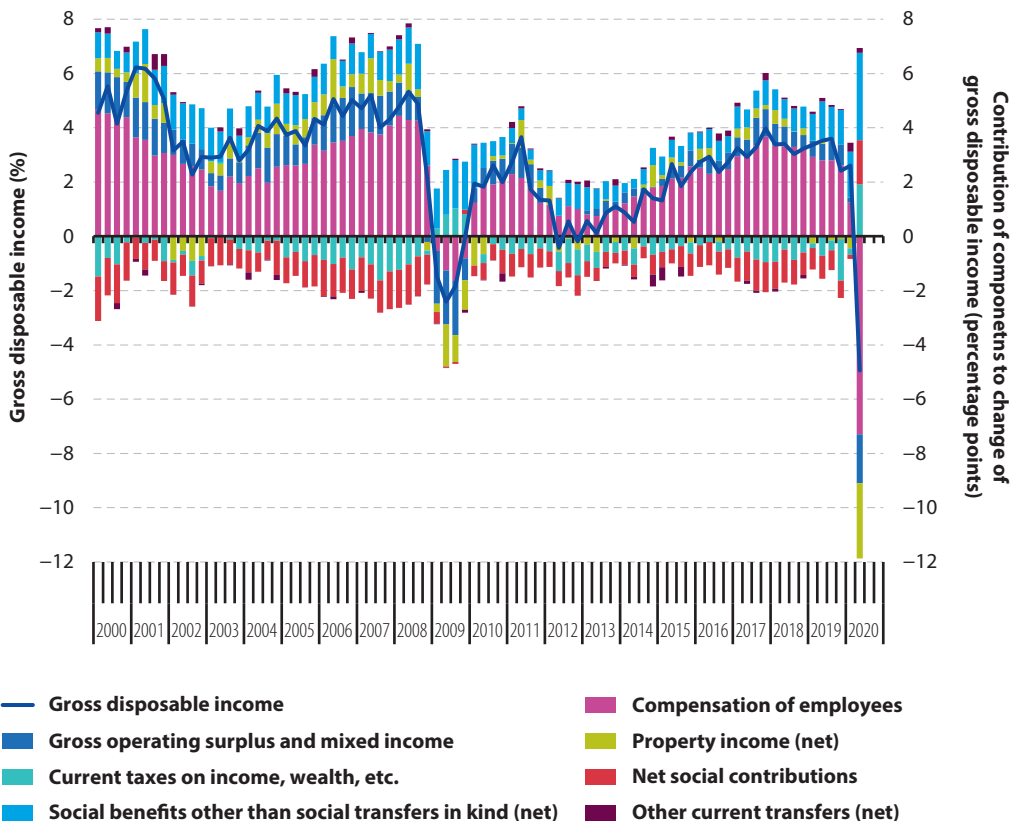


Source: Eurostat (online data codes: [nasq_10_ki](#) and [nasq_10_nf_tr](#))

EU household gross disposable income was 4.9 % lower in the second quarter of 2020 (than it had been in the second quarter of 2019). The main driver behind this change was the compensation of employees (down 7.3 percentage points), together with smaller contributions from falling property income and falling gross operating surplus and mixed income.

This latest development — falling EU household gross disposable income — was in contrast to the general pattern of rising income that had been witnessed during the vast majority of quarters since the start of the time series in 1999 (other than during the global financial and economic crisis; see Figure 9). There was also an abrupt change to the contributions of different components to the change in household gross disposable income. For example, previously the compensation of employees had generally made the largest positive contribution to changes in household gross disposable income and net social contributions had often made the largest negative contributions, but this pattern was reversed in the second quarter of 2020 (see Figure 9).

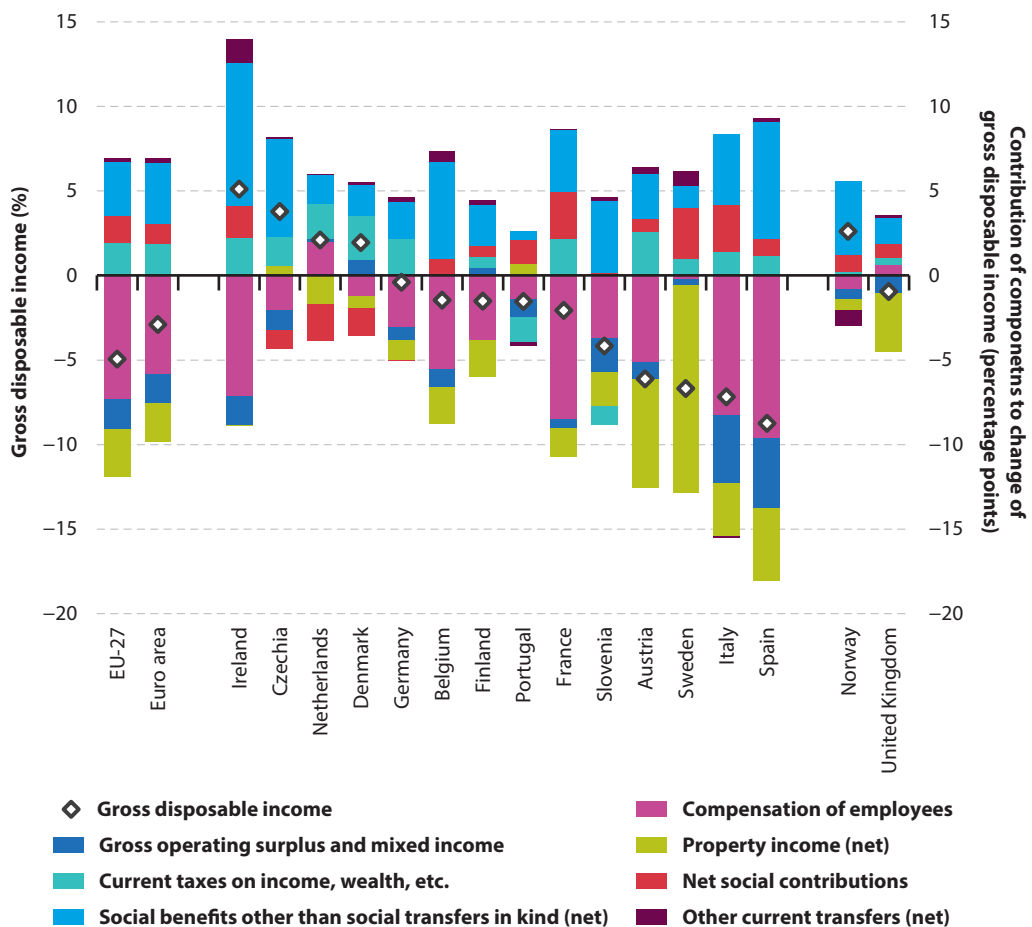
Figure 9: Contribution of components to the change in household gross disposable income, EU-27, first quarter 2000-second quarter 2020
(% change compared with the same quarter of the previous year, based on non-seasonally adjusted data)



Source: Eurostat (online data codes: nasq_10_ki and nasq_10_nf_tr)

Between the second quarter of 2019 and the second quarter of 2020, household gross disposable income increased in four of the EU Member States for which data are available (see Figure 10). The largest increases were recorded in Ireland (up 5.1 %) and Czechia (up 3.8 %). Among the other Member States — where household gross disposable income fell between the second quarter of 2019 and the second quarter of 2020 — the largest decreases were recorded in Spain (down 8.8 %), Italy (down 7.2 %), Sweden (down 6.7%) and Austria (down 6.1 %). In the majority of Member States, the change in the gross disposable income of households was mainly explained by the development of the compensation of employees (contributing negatively) and social benefits other than transfers in kind (contributing positively).

Figure 10: Contribution of components to the change in household gross disposable income, second quarter 2019-second quarter 2020
(% change compared with the same quarter of the previous year, based on non-seasonally adjusted data)



Source: Eurostat (online data codes: nasq_10_ki and nasq_10_nf_tr)

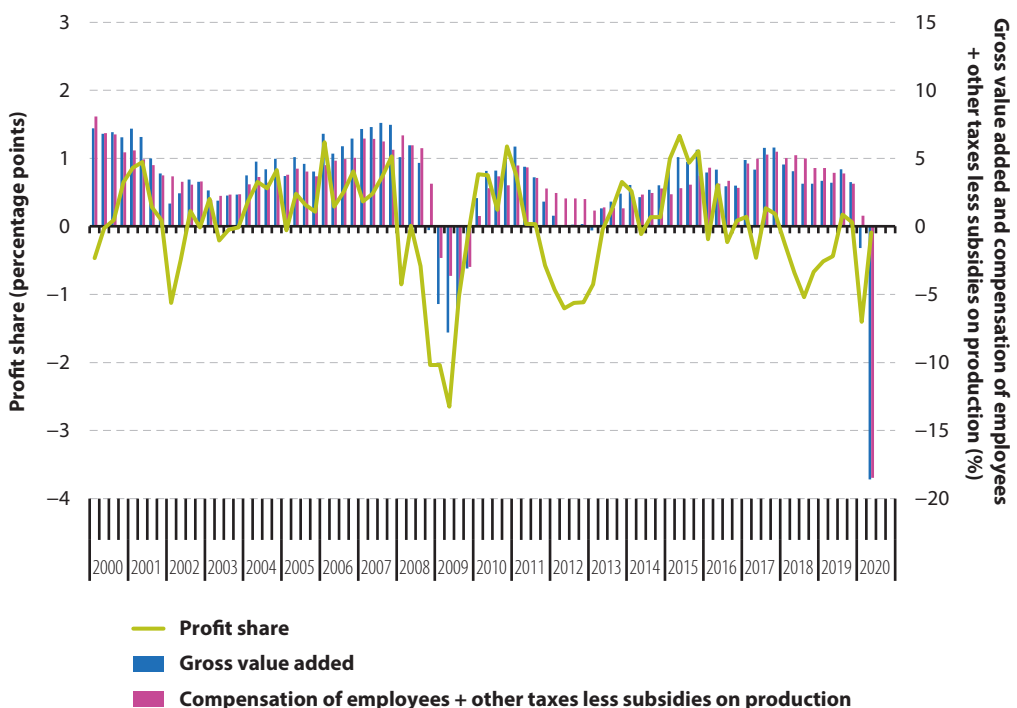
4.2. Non-financial corporations' gross operating surplus, profit share and business investment rate

Since the start of the time series, the development of the EU profit share for non-financial corporations fluctuated considerably. The most marked contractions could be linked to the global financial and economic crisis (in particular during 2008 and 2009).

Having fallen by 1.4 percentage points in the first quarter of 2020 (compared with the first quarter of 2019) the EU profit share for non-financial corporations fell by a further 0.1 percentage points in the second quarter of 2020. This modest decline could be explained by the compensation of employees and other taxes less subsidies on production falling by 18.5 %, which almost cancelled out the substantial fall in gross value added (down 18.6 %), see Figure 11.

Figure 11: Development of the non-financial corporation profit share, gross value added and the compensation of employees and other taxes less subsidies on production, EU-27, first quarter 2000-second quarter 2020

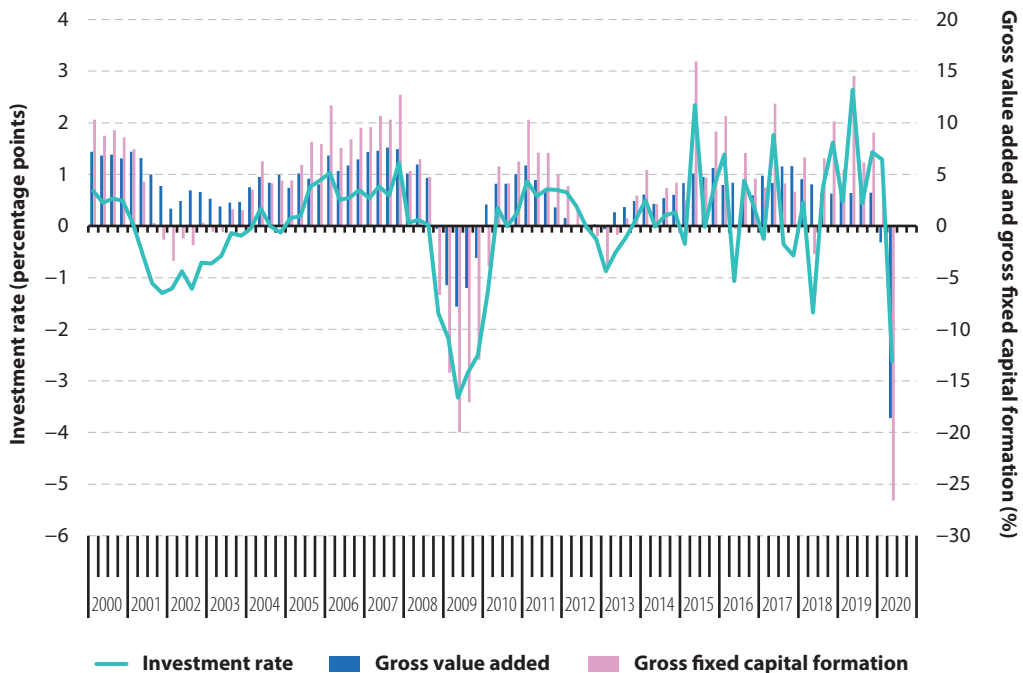
(% change compared with the same quarter of the previous year, based on non-seasonally adjusted data)



Source: Eurostat (online data codes: [nasq_10_ki](#) and [nasq_10_nf_tr](#))

The business investment rate of EU non-financial corporations was 24.0 % in the second quarter of 2020 having decreased by 2.6 percentage points compared with the second quarter of 2019. This downward path could be largely attributed to falling levels of gross fixed capital formation in most of the EU Member States, and in particular in Ireland. If the latest data for Ireland are excluded from the analysis, then the (rest of the) EU's business investment rate for non-financial corporations would have remained almost unchanged, as similar falls for gross value added and gross fixed capital formation (both down by around 20 %) would have all but cancelled each other out, see Figure 12.

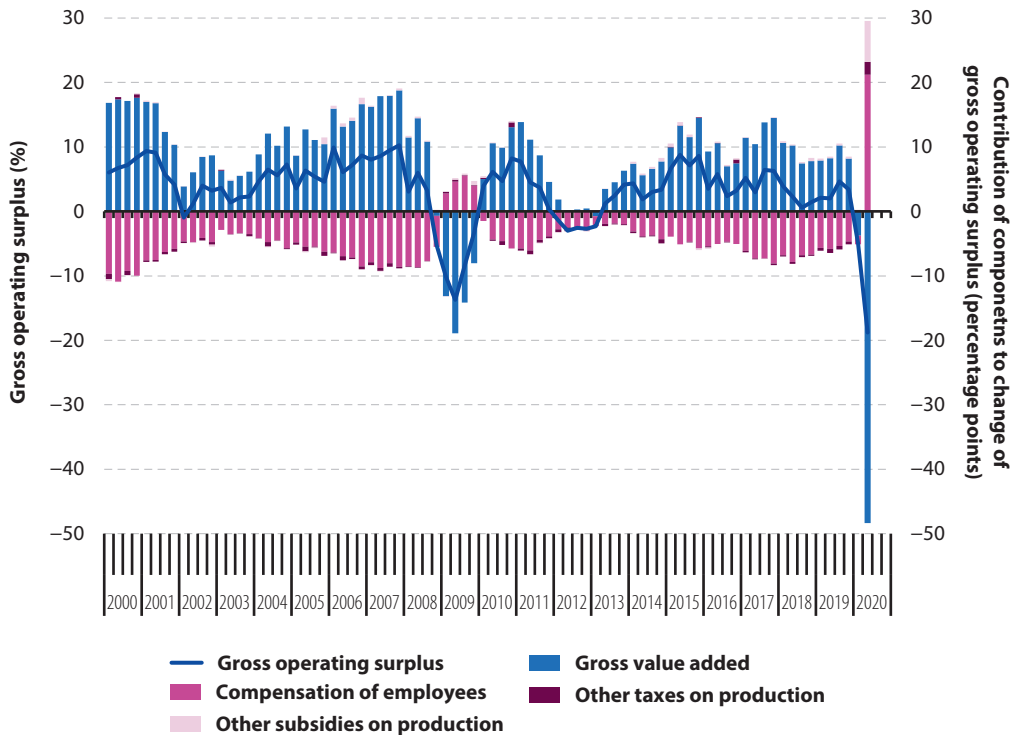
Figure 12: Development of the non-financial corporation investment rate, gross value added and gross fixed capital formation, EU-27, first quarter 2000-second quarter 2020
(% change compared with the same quarter of the previous year, based on non-seasonally adjusted data)



Source: Eurostat (online data codes: [nasq_10_ki](#) and [nasq_10_nf_tr](#))

In the second quarter of 2020, the EU gross operating surplus for non-financial corporations decreased by 18.8 % (compared with the same quarter of a year before). This was the largest decrease recorded since the beginning of the time series and marked a considerable acceleration in the rate at which the gross operating surplus was declining (as it had fallen by 4.9 % in the first quarter of 2020). The main contributory factor behind this change was the sizeable negative contribution of gross value added (which normally has a positive impact on the operating surplus). Gross value added of non-financial corporations in the EU was down by 48.4 % between the second quarter of 2019 and the second quarter of 2020. Conversely, both the compensation of employees (whose contribution is normally negative) and subsidies on production contributed positively, but they did not compensate fully for the reduction in gross value added (see Figure 13).

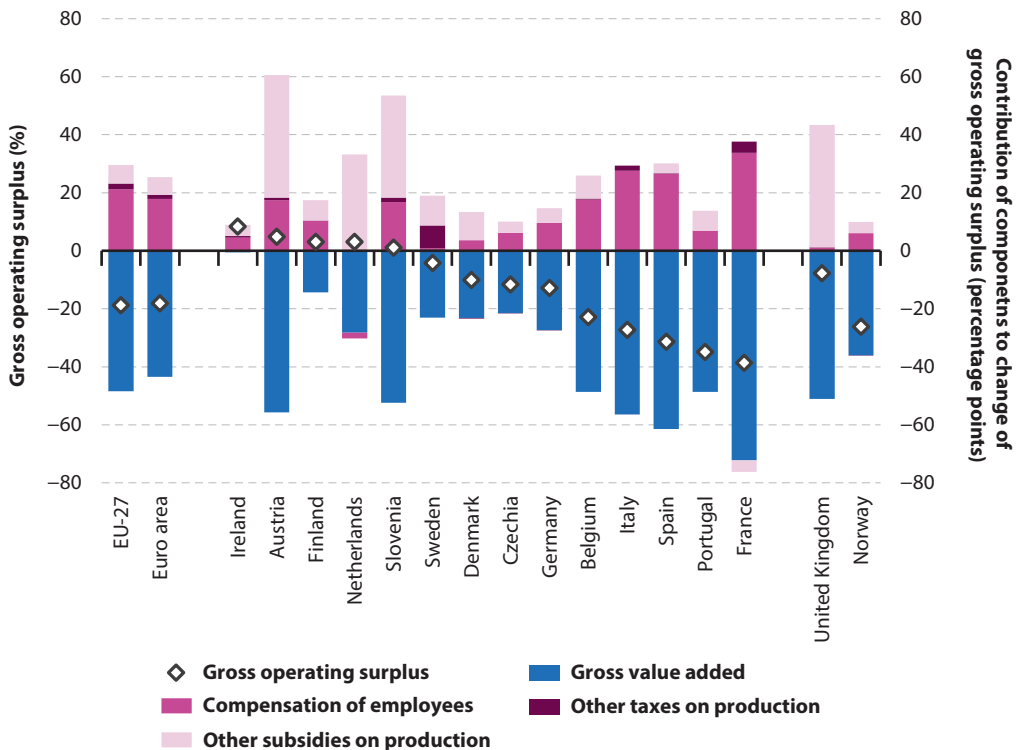
Figure 13: Contribution of components to the change in non-financial corporations gross operating rate, first quarter 2000-second quarter 2020
(% change compared with the same quarter of the previous year, based on non-seasonally adjusted data)



Source: Eurostat (online data codes: nasq_10_ki and nasq_10_nf_tr)

There were 10 EU Member States (among the 15 for which data are available) which experienced a decrease in the gross operating surplus of their non-financial corporations in the second quarter of 2020 (when compared with the second quarter of 2019). The largest contractions were recorded in France (down 38.6 %), Portugal (down 34.8 %) and Spain (down 31.4 %), with each of these Member States registering a substantial fall in their gross value added (see Figure 14) which was partially offset by a reduction in the compensation of employees. On the other hand, there were five Member States which recorded an increase in the gross operating surplus of their non-financial corporations in the second quarter of 2020. The highest increases were recorded in Ireland (up 8.4 % compared with the second quarter of 2019) and Austria (up 4.9 %).

Figure 14: Contribution of components to the change in non-financial corporations gross operating surplus, second quarter 2019-second quarter 2020
(% change compared with the same quarter of the previous year, based on non-seasonally adjusted data)



Source: Eurostat (online data codes: [nasq_10_ki](#) and [nasq_10_nf_tr](#))

5. Importance of further analysis and use of guidance

The COVID-19 crisis has affected key national accounts aggregates in unprecedented ways. On the positive side, the compilation of quarterly national accounts for the EU Member States and EFTA countries continued to function rather smoothly. Contributions to Eurostat's releases remained reliable in terms of timeliness and coverage. Early GDP and employment estimates have shown — so far — limited revisions over time, even though a lower reliability of estimates was initially expected in most countries (resulting from the impact of the COVID-19 crisis). More significant revisions can notably be expected when annual estimates for 2020 are based on more comprehensive source data than quarterly national accounts.

On the other hand, an analysis of detailed aggregates reveals some divergence in the impact of the COVID-19 crisis on specific estimates, for example the development of government consumption. Besides genuine differences in the impact of the COVID-19 crisis on government activities across EU Member States and EFTA countries, these variations could also partly reflect differences in the sources and methods used to obtain volume estimates of specific non-market services, notably for health and education services, which has some effect on the comparability of estimates. As the crisis develops, Eurostat and NSIs will continue to analyse estimates carefully in terms of reliability and comparability, aiming to draw lessons and further improve and harmonise estimates, where needed, in line with the guidance provided.

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2

Measuring inflation in the EU in times of COVID-19

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AND PAUL KONIJN ⁽¹⁾

Abstract: The COVID-19 crisis had a major impact on the measurement of inflation around the world, as price observation in shops became impossible and some markets completely closed down. This article looks at the measures taken during the crisis in 2020 to ensure the continued compilation of the European harmonised index of consumer prices, which is the comparable measure of inflation produced in all EU Member States and the key inflation target measure for European monetary policy. We describe the various principles underlying the overall approach, its practical implementation and provide an analysis of the impact on the overall inflation rate from some of the choices made.

JEL codes: C43, E21, E31

Keywords: consumer price index, HICP, COVID-19, imputations

⁽¹⁾ Eurostat, Unit C4 — Price statistics, purchasing power parities, housing statistics.

1. Introduction

The coronavirus disease 2019 (COVID-19) outbreak led governments to impose several measures, such as restrictions on the movement of people and the closure of outlets. These measures had a negative impact on the collection of prices that are needed to compile consumer price indices since price collectors could no longer visit shops and several goods or services were no longer available on the market. National statistical institutes (NSIs) had to take emergency measures to ensure the continued compilation of price statistics in such unprecedented circumstances. In the European Union (EU), it was quickly realised that such measures needed to be coordinated in order to maintain the comparability of statistics, in particular of the harmonised index of consumer prices (HICP), which is the key inflation measure used for monetary policy by the European Central Bank (ECB).

Eurostat and NSIs therefore developed a common approach for the compilation of the HICP during the pandemic, based on a common set of principles. All European NSIs that compile an HICP have followed these principles. The adopted principles were communicated to users through the Eurostat website (Eurostat (2020a) and Eurostat (2020b)). Coordination also took place at international level, through the publication of a guidance note produced by the six institutions that constitute the Inter-Secretariat Working Group on Price Statistics (IWGPS (2020)).

The objective of this paper is to present the approach followed to handle the challenges that the pandemic and accompanying restrictions (hereafter referred to as the crisis) posed (and still poses) to the compilation of the HICP and to analyse the impact of the crisis on the HICP. This paper is structured as follows. Section 2 describes the chosen approach and its practical implementation. A particularly important aspect of the approach is the guidance provided on imputations, in other words, how to make estimates for prices of products that could not be collected or are not available. Section 3 analyses how the guidance on imputations was implemented between March and September 2020 and how the choices made affected the overall HICP for the euro area. Finally, Section 4 highlights some of the main lessons learned and provides some concluding remarks.

2. Chosen approach

In order to deal with the difficulties associated with the compilation of the HICP in the context of the COVID-19 crisis, Eurostat developed, together with NSIs of the EU Member States, a set of methodological guidance notes (Eurostat (2020a) and Eurostat (2020b)). Parallel to this, a new metadata reporting system on imputations was developed ^(?). This section summarises the main principles underlying the approach that was followed to cope with market closures, price unavailability, and other problems that compilers of price indices had to face during lockdown and post-lockdown periods.

^(?) This metadata system is comprised of a file reporting information on imputations related to the COVID-19 crisis. The information taken from these files is summarised and published under the 'COVID-19 and HICP' section of the HICP methodology webpage (<https://ec.europa.eu/eurostat/web/hicp/methodology>).

2.1. Basic principles

The main principles guiding the response to the COVID-19 crisis are formulated in Eurostat (2020a). Although complemented by other guidance documents, this first note stands out as the backbone of the common response to the crisis. Three principles, each linked to one of the three building blocks of price indices (namely, prices, weights and indices), are explained in more detail below. A fourth principle, on transparency to users, is presented at the end of this section.

2.1.1. PRICES

The first principle simply underscores the idea that the number of imputed prices should be minimised. Following the outbreak of COVID-19, routine price collection activities started to fail. This happened because price collectors could no longer visit sampled outlets (because of government lockdowns or restrictions imposed to protect staff of NSIs), and because some services were no longer allowed to be offered (for example, flights or services provided by hairdressers).

The implementation of this principle meant that whenever possible, missing price observations should be replaced not by an imputation, as normally happens when a price is missing, but by prices from alternative data sources. In the case of manual price collection activities, obvious alternatives were to collect prices from outlet's websites, or by telephone and/or e-mail enquiries. The use of price information from scanner data (for those products where scanner data are not yet used) was another possible source for replacing some missing prices.

Of course, such strategies only worked in those cases where products continued to be transacted. In the case where sellers had to cease their activities and thus no transactions could take place at all, no alternative sources could be employed.

2.1.2. WEIGHTS

A second important principle was not to adjust the HICP weights during 2020 despite the impact of the COVID-19 crisis on expenditure. In fact, a key principle underlying the HICP compilation is that weights are kept fixed throughout the year. This is a consequence of the definition of the HICP as an annually chained Laspeyres-type index. HICP sub-indices are aggregated using weights reflecting the household final monetary consumption expenditure patterns of the previous year. HICP weights are updated every year, at the beginning of each year. These requirements are formalised in a Commission Implementing Regulation ⁽³⁾. Therefore, changing the HICP weights in the middle of the year would not have been consistent with the legal and conceptual framework of the HICP.

In addition to these considerations, it is unlikely that timely data sources to derive updated weights would have been available in a harmonised manner and with sufficient quality

⁽³⁾ Article 3 of [Commission Implementing Regulation \(EU\) 2020/1148](#) of 31 July 2020 laying down the methodological and technical specifications in accordance with Regulation (EU) 2016/792 of the European Parliament and of the Council as regards harmonised indices of consumer prices and the house price index.

across all EU Member States. This is in line with international guidance, with the IWGPS⁽⁴⁾ also discouraging Member States to make ad-hoc adjustments to the weights. Short-term adjustments to the weights or to the compilation methods would have created uncertainty about the way that the HICP is calculated. It would have generated practical problems and quality concerns all along the production process.

At the same time, it is widely acknowledged that consumption patterns have significantly changed because of the COVID-19 crisis. Several studies that mainly rely on credit card data (for example, Carvalho et al. (2020) and Cavallo (2020)) found that during lockdown periods, households spent relatively more on food and less on recreation services, restaurants, or travelling. Some of these changes persisted, to some extent, even after lockdown periods ceased as households adjusted their behaviour to the new situation. These developments pose challenges for users (see for example ECB (2020a)) as the official inflation figures do not instantaneously take into account such shifts in consumer behaviour.

Diewert and Fox (2020) discuss three practical proposals for compiling a consumer price index (CPI) under these circumstances, depending on data availability. A first scenario consists in calculating a price index by excluding from the basket those products that are unavailable. Technically, this is equivalent to setting the weights of unavailable products to zero and redistributing their weights across the remaining products in a proportional manner. Some of the simulations provided in Section 3.3 follow this scenario. A second scenario consists in updating the weights using additional data sources and linking in a new basket of goods and services. Technically, this corresponds to the procedure that is typically conducted in the HICP at the beginning of each year. In a third scenario, weights are updated every month and a (chained) Fisher price index is calculated. This is the most advanced scenario and requires monthly expenditure data.

More specifically, ECB (2020b) estimated monthly expenditure shares for the HICP using retail turnover data and calculated experimental Fisher price indices. The French statistical institute (INSEE) calculated Paasche-type indices by using a monthly weighting scheme derived from credit card data and other data sources (INSEE (2020)). A similar exercise was also conducted by the United Kingdom Office for National Statistics (ONS (2020)). Reinsdorf (2020) concludes that changing expenditure patterns during 2020 led to an underestimation of inflation in most countries.

⁽⁴⁾ The IWGPS notes the following: 'While COVID-19 has affected expenditure patterns, current expenditure data are not available, and ad hoc adjustments to the weighting structure are therefore not recommended. Ad hoc weight adjustments are not consistent with the fixed basket approach used as the basis for compiling consumer price indexes.'

2.1.3. COMPILATION OF INDICES

The third and last principle refers to the compilation of HICP sub-indices and the way the HICP is calculated from its lower-level building blocks into final inflation figures. Due to the crisis, prices for some categories of products, such as flights and international package holidays, were non-existent and indices based on observed prices could not be compiled. It was decided to compile the HICP on the principle that all sub-indices for the full European classification of individual consumption according to purpose (ECOICOP) structure should be compiled, even when for some categories of this classification, no prices and products were available on the market (Eurostat (2020a)). This decision should also be seen against the many important uses of the HICP, in particular for monetary policy and for contractual indexation of bonds, pensions, wages, and so on. In other words, not compiling the HICP or only partly compiling the HICP were not seen as feasible options.

It should also be noted that, in particular due to its use for contractual indexation, revisions to the HICP are generally to be avoided. Thus, filling in the missing prices afterwards, for example when new information becomes available or by backwards extrapolating prices observed post-lockdown, was not desirable either (for the same reason, it was not possible to revise indices retrospectively on the basis of new weights information).

The implementation of this principle implies that unavailable prices or price indices needed to be imputed ⁽⁵⁾. The imputations that were used in the compilation of HICP sub-indices are described in Eurostat (2020b), pp. 3-7. These were divided into two broad categories: the first comprised methods applied to products for which it was possible to find products on the market (although their prices could not be observed), while the second included those applied for the imputation of products that were not transacted. In relation to this last group, the imputation of products known to follow pronounced seasonal patterns, such as package holidays or accommodation services, received particular attention in the note. Section 2.2 describes the different imputation methods in more detail.

⁽⁵⁾ The choice of this approach also had the advantage of not imposing extra operational costs in the sense that it would not require an adaptation of national compilation systems, which had generally not been designed or were not flexible enough to cope with situations in which one or more sub-indices of the ECOICOP were absent from HICP compilation.

2.1.4. TRANSMISSION AND DISSEMINATION OF INFORMATION ON IMPUTATIONS

The need to inform users about the impact of COVID-19 and its accompanying restrictions on the HICP led Eurostat to develop a reporting system in which NSIs were asked to flag, in their HICP data transmission files and in a new metadata file, all indices considered to have been significantly affected by COVID-19 related imputations. This system was designed to provide relevant information without overburdening NSIs with new reporting demands, as they were already dealing with considerable problems associated with the compilation of their price indices.

More precisely, EU Member States were asked to flag sub-indices for which the share of imputations exceeded 50 %, either in terms of the weight of the imputations or in terms of the number of underlying price observations. Any such sub-index was flagged with a 'U' and regarded as having 'low reliability'. These flags were included in Eurostat's dissemination database and propagated to aggregate levels. European aggregates were flagged if more than 50 % (in terms of HICP weights (item weight for the Member State multiplied by the Member State's weight)) of their constituent indices were flagged.

As mentioned above, an additional metadata reporting file was developed to provide more information on imputations. This included information on the types of imputation methods used and NSIs also provided an indication of the share of imputations for sub-indices (in cases where a sub-index was identified with a 'U' flag) and for the overall index ⁽⁶⁾.

Information on imputation shares can be calculated either in terms of the number of prices or in terms of expenditure weights. For example, an imputed elementary aggregate within a subclass may represent 10 % of the weight of that subclass, but perhaps 20 % of the prices collected in that subclass. Although a preference was given to the reporting of imputation shares based on weights, NSIs were also given the option to provide imputation figures based on the number of prices. There was also the need to clarify some borderline cases on the definition of an imputation. For example, prices that were previously collected in the field were sometimes replaced with prices from an alternative data source. This treatment should, in principle, not be counted as an imputation if the data source was reliable enough to adequately portray price changes of the product (in other words, it had sufficient coverage of the market).

⁽⁶⁾ The share of imputations in a specific country depends on national circumstances, such as the extent of COVID-19 related restrictions, price collection arrangements, index compilation practices, or the availability and use of alternative data sources.

2.2. Imputation and flagging of the data

As discussed in the previous section, in cases where prices were not available, they had to be estimated (?) so that a price index could still be compiled, as the weights were kept fixed. There are different imputation techniques that can be applied and these are discussed in Eurostat (2020a).

- **Same product or nearest aggregate imputation**

This standard imputation technique consists in imputing the monthly price change for the missing prices based on the price change of the same or similar products (typically the price change of the nearest higher aggregate in the index hierarchy).

- **All reliable sub-indices imputation**

In this method, the monthly change of an overall index based on all reliable sub-indices (in other words, those for which products are available on the market and a sufficient number of prices are observed) is used as a basis for imputation.

- **Carry forward imputation**

This imputation technique consists in carrying forward the last observed price.

- **Seasonal pattern imputation**

The prices of some products are known to follow pronounced seasonal patterns. Examples are flights, package holidays or accommodation services. The aim of this imputation method is to ensure that the imputations take into account the seasonal pattern of the series concerned.

A distinction was made between products that were still transacted in the market but where price collection failed, and products that were not transacted anymore.

In the first case, the recommendation was to use the same product or nearest higher aggregate imputations and, where justified, carry forward. In the second case, it was recommended to impute with all reliable price indices. The advantage of this approach was that, if applied to all sub-indices for which there was no market, the monthly price change of the all-items index was driven only by the price changes of reliable sub-indices. As a second best approach, carry forward could also be considered. Although carry forward is a transparent method that is easy to implement and to explain, its use makes price indices converge towards no price change. The more prices are imputed with carry forward, the more the all-items monthly price change converges towards zero.

Moreover, a special treatment was foreseen for unavailable products that normally have pronounced seasonal patterns. Using an imputation with all reliable sub-indices would most likely not preserve the seasonal pattern and could distort the annual rate of change. It was therefore agreed to impute prices so that the seasonal pattern of the series was preserved. In practice, the seasonal pattern could be preserved by basing the imputation on the annual rate of change observed for other products. A variant would be to estimate the monthly change of the seasonal index using the monthly change for the same index observed in the previous year, or, if possible, using seasonal factors obtained by estimating an econometric model.

(?) Article 9 of [Commission Implementing Regulation \(EU\) 2020/1148](#) foresees the use of estimated prices for the HICP in those cases where prices cannot be observed.

Table 1, which is taken from IWGPS (2020), illustrates the outcomes of different imputation methods for a seasonal product. It was critical that the imputations for products with seasonal patterns were implemented in a harmonised way by the EU Member States.

Table 1: Imputation for items with strong seasonal pricing patterns

	2019		2020	
	March	April	March	April
All-items excluding accommodation services	100.0	100.5	102.0	103.5
<i>Monthly rate of change</i>				1.5 %
<i>Annual rate of change</i>				3.0 %
Option 1: All reliable sub-indices imputation				
Accommodation services	100.0	112.0	101.0	101.0 * 103.5 / 102.0 = 102.5
<i>Monthly rate of change</i>				1.5 %
<i>Annual rate of change</i>				-8.5 %
Option 2a: Seasonal pattern imputation (imputing with the annual rate of change of all reliable sub-indices)				
Accommodation services	100.0	112.0	101.0	112.0 * 103.5 / 100.5 = 115.3
<i>Monthly rate of change</i>				14.2 %
<i>Annual rate of change</i>				3.0 %
Option 2b: Seasonal pattern imputation (imputing with the monthly rate of change from the previous year for accommodation services)				
Accommodation services	100.0	112.0	101.0	101.0 * 112.0 / 100.0 = 113.1
<i>Monthly rate of change</i>				12.0 %
<i>Annual rate of change</i>				1.0 %

2.3. Issues emerging from the lifting of lockdown measures

Eurostat (2020b) identified five issues stemming from the gradual lifting of the initial restrictions in the EU. The first issue revolved around the renewed availability of prices for products that were not on the market. As described above, prices were imputed during the lockdown because products were unavailable or because prices could not be collected in the field. As actual prices became observable again, it was emphasised that the imputation methods that had been used should be self-correcting, meaning that the change between the last pre-lockdown price and the first post-lockdown price should be correctly captured, independently of the prices imputed during the lockdown.

Two other issues that were identified in Eurostat (2020b) were the existence of COVID-19 related fees associated with the provision of certain products (for example reservation fees in restaurants) and changes in the quality of products. As a rule, extra charges were taken into account and recorded as a price increase in the HICP whenever it was not possible to obtain the product without the payment of the additional charge. Moreover, decisions on whether a price should be quality adjusted were to be made on a case-by-case basis, keeping in mind that, since the direction of quality changes can have contradictory signs, the estimation of the magnitude of the quality change could be difficult to estimate in practice.

The two last issues discussed in Eurostat (2020b) clarified that the target sample of the HICP could be updated to include newly significant products such as face masks and disinfectant, and discussed how services that become available again but in a very different market situation (for example air travel, package holidays, accommodation services) could be treated.

2.4. HICP weights for 2021

As discussed in Section 2.1.2, the HICP is an annually chain-linked Laspeyres type index. This implies that the weights of the sub-indices need to remain fixed during the year, but are updated at the beginning of each year. The weights need to be representative for the year prior to the current year, in other words, $t-1$. Thus, HICP weights that are used in 2021 should be representative of household consumption expenditure for 2020.

In practice, national accounts data for year $t-2$ are used as the basis to estimate expenditure shares for $t-1$. In normal times, structural changes between $t-2$ and $t-1$ are limited so that $t-2$ data can be used to approximate $t-1$. Clearly, this is not the case when consumption expenditure changes significantly, both in level and structure, between $t-2$ and $t-1$, such as during the current crisis.

NSIs thus have to make an additional effort to produce the best estimates possible for household consumption expenditure patterns in 2020. These should be based partly on preliminary data for quarterly national accounts, complemented by other short-term statistics related to, for example, retail trade, services, tourism, energy and transport. Scanner data, credit card data or data from high-frequency household budget surveys may also be used. Eurostat (2020c) provides guidance to NSIs on the estimation process, in order to ensure the comparability of the results.

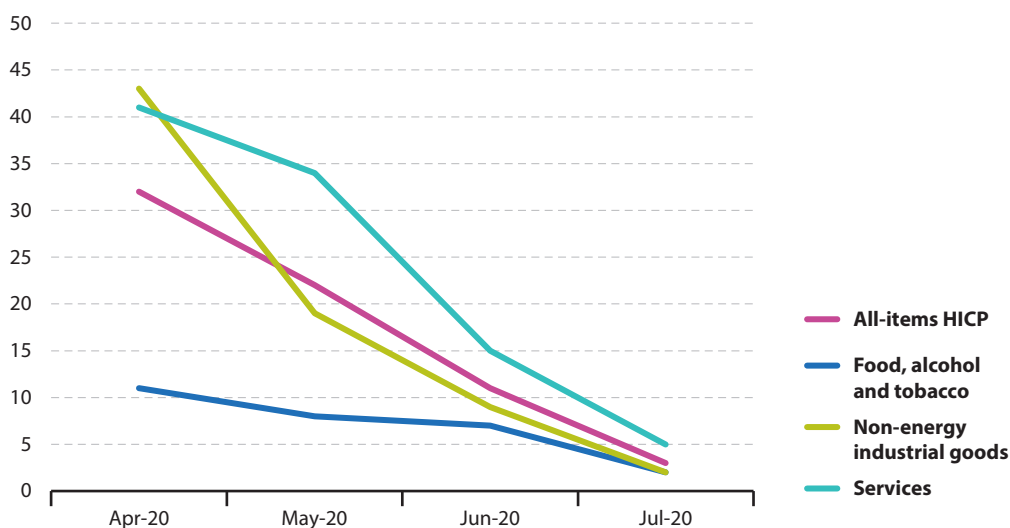
3. Analysis of COVID-19 imputations

This section summarises and explores the information collected on imputations between March and September 2020. The analysis is based on data published on Eurostat's website ⁽⁸⁾.

3.1. Imputation shares

NSIs provided Eurostat with information on the share of imputations for sub-indices flagged with a 'U', as well as for the all-items index. Based on this detailed reporting, Eurostat estimated the share of consumption expenditure in the all-items basket for European aggregates that was imputed due to the COVID-19 crisis. The calculations followed a two-step approach. First, based on the best available information, shares for the main special aggregates were calculated for each EU Member State. These shares were then combined taking into account weights for the Member States. Figure 1 shows the development of imputation shares from April to July 2020 (the months for which information on the imputation shares for the all-items index was collected).

Figure 1: Imputation shares for the all-items HICP and selected special aggregates, euro area (%)



As Figure 1 shows, the imputation shares for the all-items HICP peaked in April 2020, at the height of the lockdowns, when more than 30 % of the index was composed of imputations. This share had decreased to 3 % by July 2020, by when many of the restrictions (from the first wave of the crisis) had been lifted. The index for services was generally the most affected in terms of the imputations share.

⁽⁸⁾ Data for the imputations are available at <https://ec.europa.eu/eurostat/web/hicp/methodology> under 'COVID-19 and HICP'.

3.2. Data on imputations

As explained above, a 'U' flag was used to identify HICP sub-indices for which the share of imputations, in terms of weight or the number of prices, exceeded 50 %. These were the HICP components that were most affected (in terms of availability) by the COVID-19 crisis and it is possible to characterise the impact of these imputations on the compilation of the HICP. Table 2 gives an overview of the development of 'U' flags in euro area countries from March 2020 — the month in which COVID-19 first started to cause problems for price index compilers — to September 2020.

Table 2: Overview of 'U' flags for HICP sub-indices, euro area

	Mar-20	Apr-20	May-20	Jun-20	Jul-20	Aug-20	Sep-20
Number of 'U' flagged sub-indices (count)	49	942	430	165	37	31	24
Share of 'U' flagged sub-indices in the total number of sub-indices (%)	0.9	16.8	7.7	2.9	0.7	0.6	0.4
Broken down by ECOICOP division							
Share of 'U' flagged sub-indices in the total number of sub-indices (%)							
01 Food and non-alcoholic beverages	0.3	3.6	1.1	0.3	0.0	0.0	0.0
02 Alcoholic beverages, tobacco	0.0	2.0	0.4	0.0	0.0	0.0	0.0
03 Clothing and footwear	3.9	38.6	11.0	2.6	0.0	0.0	0.0
04 Housing, water, electricity, gas and other fuels	0.0	9.2	3.9	0.7	0.0	0.0	0.0
05 Furnishings, household equipment and routine household maintenance	0.7	22.4	7.4	1.8	0.0	0.0	0.0
06 Health	0.0	16.5	5.6	1.9	0.0	0.0	0.0
07 Transport	0.9	16.7	9.2	5.5	1.3	0.9	0.9
08 Communication	0.0	3.3	1.0	1.0	0.0	0.0	0.0
09 Recreation and culture	1.1	23.2	13.0	6.3	2.2	1.9	1.5
10 Education	2.6	21.9	14.0	6.1	0.9	1.8	0.9
11 Restaurants and hotels	4.4	62.3	50.0	16.7	3.5	3.5	1.8
12 Miscellaneous goods and services	1.5	24.0	9.3	2.5	0.5	0.2	0.2

Note: the figures shown refer to 'U' flags reported by individual euro area countries, rather than for the euro area aggregate itself.

As Table 2 shows, April 2020 stood out as the month in which the level of imputations had its biggest impact on the compilation of the euro area HICP. For this month, 16.8 % of euro area sub-indices had more than 50 % of their weight or prices imputed due to reasons associated with the COVID-19 crisis. In March 2020, the level of imputations had not been so large, reflecting the fact that, with the exception of Italy, most of the euro area countries were able to complete their price collection activities in a fairly normal way during the first half of the month.

On a more disaggregated level, the ECOICOP divisions that were most affected by imputations in April 2020 were: restaurants and hotels (62.3 %), clothing and footwear (38.6 %), miscellaneous goods and services (24.0 %) and recreation and culture (23.2 %).

Table 3 provides information on the 10 HICP sub-indices that were most affected by imputations in April 2020.

Table 3: Sub-indices with the highest percentage of ‘U’ flags, euro area

(%)

ECOICOP	Description	Mar-20	Apr-20	May-20	Jun-20	Jul-20	Aug-20	Sep-20
07.3.3.2	International flights	10.5	94.7	94.7	84.2	15.8	15.8	15.8
09.4.2.1	Cinemas, theatres, concerts	5.3	89.5	89.5	73.7	36.8	31.6	10.5
09.6.0.2	International package holidays	15.8	89.5	94.7	94.7	47.4	47.4	52.6
11.2.0.1	Hotels, motels, inns and similar accommodation services	10.5	84.2	84.2	31.6	5.3	5.3	5.3
12.1.1.2	Hairdressing for women	5.3	84.2	26.3	5.3	0.0	0.0	0.0
09.4.2.2	Museums, libraries, zoological gardens	5.3	78.9	47.4	5.3	0.0	0.0	0.0
12.1.1.1	Hairdressing for men and children	5.3	78.9	26.3	5.3	0.0	0.0	0.0
12.1.1.3	Personal grooming treatments	5.3	78.9	26.3	5.3	0.0	0.0	0.0
09.4.1.1	Recreational and sporting services — attendance	10.5	73.7	73.7	31.6	15.8	10.5	10.5
09.4.1.2	Recreational and sporting services — participation	0.0	73.7	73.7	21.1	5.3	5.3	0.0

Note: the figures shown refer to the 10 sub-indices with the highest share of ‘U’ flags, as measured by the number of ‘U’ flags across euro area countries divided by the total number of sub-indices for euro area countries in April 2020.

Unsurprisingly, this ranking includes some of the activities that were most impacted by the implementation of restriction measures. These include, on the one hand, services that are associated with travelling and tourism (international flights, package holidays and accommodation services) and, on the other, the provision of leisure and recreation services (for example provided by cinemas, theatres, concerts and museums) and services associated with personal care (for example, those provided by hairdressers). In September 2020, there were still a considerable number of national price indices for international package holidays that were impacted by imputations and flagged with a ‘U’ (52.6 %); this was a slight increase in relation to the previous month (47.4 %).

The data collected on imputations also included information on the particular type of imputations made. Table 4 provides a summary of the number of times each one of the methods was used from March to September 2020 in euro area countries.

Table 4: Count of imputation methods by ECOICOP division, euro area (number)

Imputation method	ECOICOP division												Total
	01	02	03	04	05	06	07	08	09	10	11	12	
Based on same product	51	4	49	12	135	5	34	10	115	2	13	42	472
Based on nearest aggregate	5	2	23	3	10	4	12	0	22	3	21	10	115
Based on all reliable sub-indices	0	0	11	14	14	4	22	0	51	6	5	27	154
Based on carry forward	0	0	32	20	85	42	24	1	169	35	55	119	582
Based on seasonal pattern	0	0	12	9	0	1	92	0	120	0	65	5	304
Other	6	0	0	0	0	6	0	0	7	7	2	5	33
Information not provided	0	0	1	2	1	2	5	0	2	2	1	2	18
Total	62	6	128	60	245	64	189	11	486	55	162	210	1 678

Note: for a description of the imputation methods, see section 2.2. For the designation of the ECOICOP divisions, see Table 2.

Imputation based on carry forward and imputation based on available prices for the same product were the two imputation methods that were most often used during the period under consideration (582 and 472 times, respectively). As may be expected, imputation based on a seasonal pattern was most often applied in recreation and culture (120 times), transport (93), and restaurants and hotels (64). These divisions included components with strong seasonal patterns, such as international flights, package holidays and accommodation services.

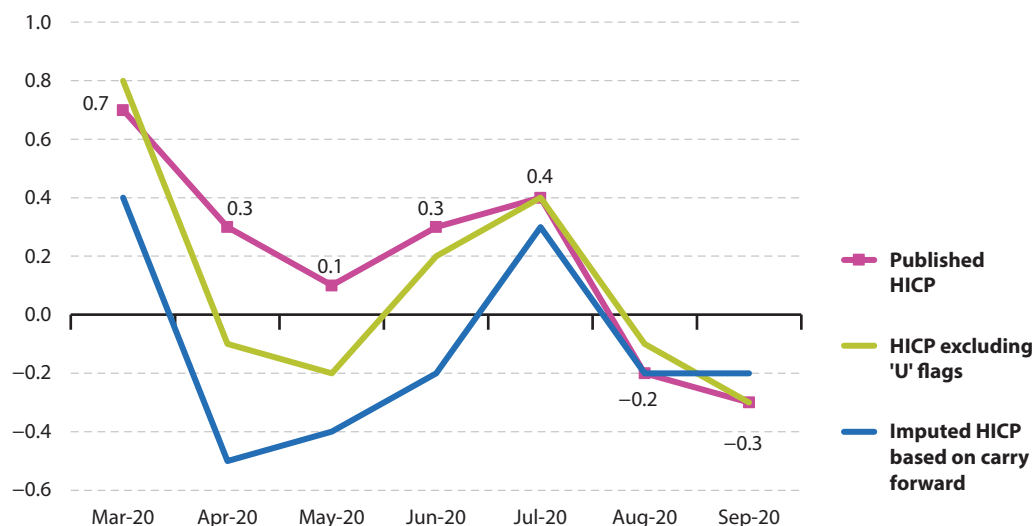
3.3. Impact of the imputations

In order to assess the impact of the imputations that were made for the HICP, an experimental index was calculated, which assumed that all sub-indices with 'U' flags were imputed using carry forward. Another experimental index was calculated based on an adjusted basket of goods and services that excluded the sub-indices with 'U' flags. Note that all of the simulations presented in this section are consistent with standard HICP compilation procedures.

In the first simulation, an experimental index was calculated where, successively in each month, all sub-indices with 'U' flags were replaced by their index value of the previous month. This provides a contrast with the published sub-indices with 'U' flags that were based on different imputation methods and that sometimes included a combination of both estimated and observed prices. A euro area HICP derived solely from using such a carry forward imputation mechanism would have resulted in lower inflation rates. Adopting carry forward on such a large-scale would have had a significant dampening effect on annual inflation rates.

The second simulation consisted of excluding all the sub-indices with 'U' flags from the basket of goods and services used to compile the HICP⁽⁹⁾. Note that the set of sub-indices with a 'U' flag varied from one EU Member State to another, and from one month to the next. Therefore, the basket underlying the index compilation also changed from one month to another. For example, for March 2020, an index was compiled based on a basket that excluded all of the sub-indices with a 'U' flag for March 2020. The following month, the basket was updated by excluding the 'U' flags reported for April 2020, and so on. Excluding the sub-indices with 'U' flags was equivalent to setting the weights for these products to zero. The weights of the remaining products relative to each other were kept unchanged. Again, annual inflation rates for the euro area derived from baskets restricted in this way were lower than the published annual rates for the HICP, but the impact was less than for an HICP based on carry forward imputations (see Figure 2).

Figure 2: Annual rates of change for the published HICP and alternative measures, euro area (%)

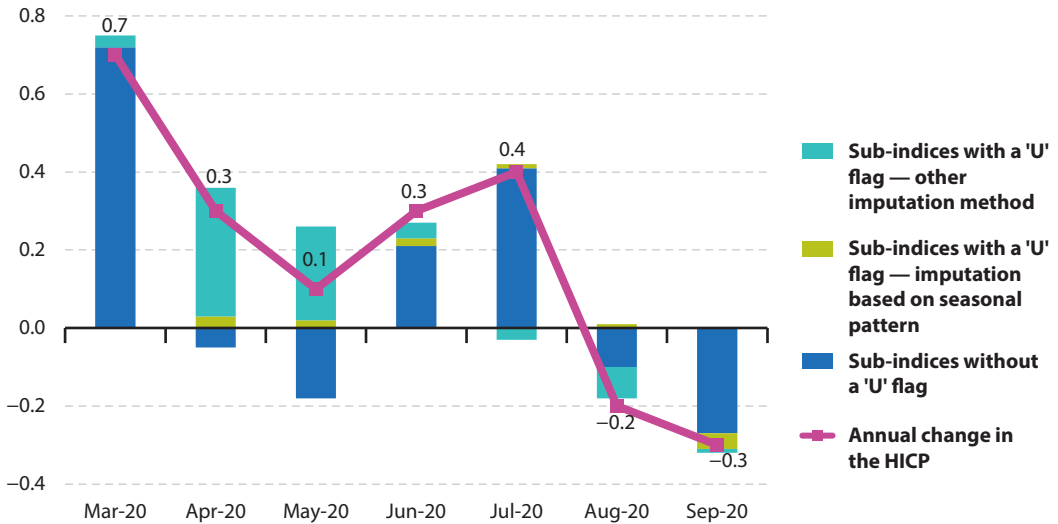


The published annual rates of change for the all-items HICP can be decomposed into contributions with respect to three components: (i) the sub-indices not flagged with a 'U'; (ii) the sub-indices flagged with a 'U' that were imputed using a seasonal pattern; and (iii) the sub-indices flagged with a 'U' that were imputed using another imputation method. This analysis confirms that the contribution to the published annual rates from sub-indices imputed using a seasonal pattern was very limited. Figure 3 shows that despite the quite pronounced month-on-month changes in prices for products with a seasonal pattern, the impact on the annual rate was rather limited.

⁽⁹⁾ Technically, only the lowest-level sub-indices were considered in this analysis. The all-items HICP can be obtained as a weighted average of these lowest-level sub-indices. Instead of summing over all of the lowest-level categories of the ECOICOP, an index was derived from the lowest-level sub-indices that did not have a 'U' flag.

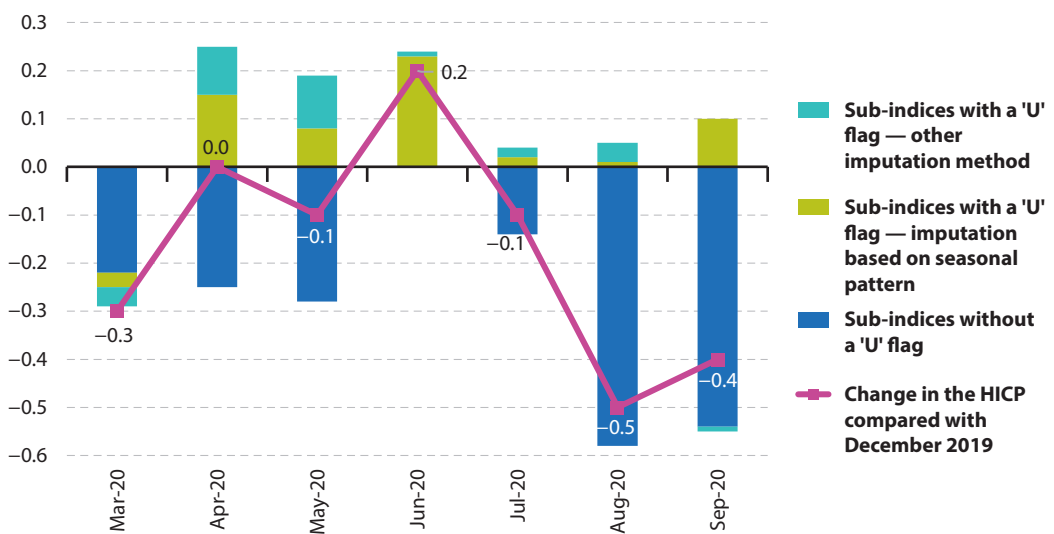
A different picture was obtained when decomposing the price change with respect to December 2019. Price changes compared with this fixed reference period included seasonal effects. In comparison to the contributions to the annual rate of change, there was now a larger, and usually positive, contribution of seasonally imputed sub-indices (see Figure 4).

Figure 3: Contribution of imputations to annual changes in the HICP, euro area (%)



Note: the rate of change is based on the HICP for a particular month compared with the same month of the previous year.

Figure 4: Contribution of imputations to changes in the HICP compared with December 2019, euro area (%)



Note: the rate of change is based on the HICP for a particular month compared with the HICP for December 2019.

4. Conclusions

Despite the huge and complex challenges posed by the COVID-19 crisis, NSIs across the EU Member States have continued to compile the HICP. It was decided at an early stage of the crisis that maintaining the full set of HICP sub-indices was essential for users, even if this meant that a significant share of indices would need to be imputed. As a consequence, users needed to be fully informed about the imputations made and the impact of the crisis on the HICP. NSIs thus compiled and delivered detailed and comprehensive metadata on imputations that they made and these were published on Eurostat's website.

These metadata show that the impact of the crisis on the HICP was indeed significant: at the height of the first wave of the crisis, in April 2020, around 30 % of the HICP for the euro area was imputed. This share decreased steadily (during and after the first wave of the crisis) and by September 2020, the main sub-indices that continued to be imputed included those for international flights, for cinemas, theatres and concerts, and for package holidays.

The impact of imputations on the all-items HICP, measured as the difference between the official (published) index and an index that excluded imputed sub-indices, was most significant (during the first wave of the crisis) for the months of April and May 2020. The chosen imputation method for seasonal products ensured that imputations did not materially affect annual inflation rates.

NSIs were innovative in finding alternative data sources for the prices of products that were still being transacted, but could not be collected in the normal way. This was particularly true for data collected from the internet, either by web scraping or manually, while scanner data were also used. Some of these data sources continued to be used after the end of the first wave of the crisis.

The COVID-19 crisis has shown that NSIs need to have contingency plans in case of calamities. In particular, information technology systems for statistical data collection and compilation have been tested and any resulting weaknesses need to be addressed. Given the unprecedented nature and scale of the COVID-19 crisis, it can be concluded that NSIs have shown their resilience and that the HICP has, so far at least, weathered the storm.

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3

The role of satellite accounting in expanding the System of National Accounts

JAMES TEBRAKE ⁽¹⁾

Abstract: In recent years, there has been a rapid increase in the number of satellite accounts produced by national statistical organisations. The aim of this paper is to help understand the reasons for this increase and identify the need for further guidance and coordination. The paper presents the role of satellite accounting in the broader framework of the System of National Accounts (SNA) and suggests a typology that can be used to classify the different satellite accounts. Further, the paper provides a summary of international activities related to satellite accounting and a detailed overview of national practices collected through a survey which gathered responses from more than 80 countries. Finally, the paper identifies recommendations and possible next steps regarding the future development of satellite accounting and discusses the (potential) role of the international statistical community in improving this national accounting tool.

JEL codes: E01, E16

Keywords: System of National Accounts, satellite accounts

⁽¹⁾ International Monetary Fund (IMF); the author worked for Statistics Canada when the survey of national practices and the preparatory work for this paper were carried out.

1. Introduction

The digital economy, clean technology, culture, ecosystems, tourism, sport and recreation: each day national accountants receive requests for data to address an ever-increasing, complex set of questions posed by policymakers, businesses, think tanks, non-profit organisations and citizens. The System of National Accounts, 2008 (2008 SNA) is a powerful analytical tool containing a rich set of information, but this richness is not always apparent or sufficient. Often this information needs to be reworked, reconstructed, repackaged, or expanded in order for it to be effectively used to address these, more specific, policy questions.

Whither GDP, beyond GDP, is GDP still relevant? There is a growing debate about the validity of gross domestic product (GDP) and the SNA framework, more generally, and whether this system is sufficient to measure economic progress and even more so social progress. Much of the recent discussion has been driven by a substantial increase in ‘free information goods’ and advances in health care and communication over the last few years whereby individuals experience positive changes but do not see these reflected in the economic data released by national statistical organisations (NSOs). Equally, the SNA framework is often criticised for not addressing negative externalities that affect the sustainability of the economy. The latter may not only relate to the sustainability of the environment, but also to possible negative impacts such as the social sustainability of increasing inequalities.

It could be argued that much of the current debate around the validity of GDP dates back to The Commission on the Measurement of Economic Performance and Social Progress (CMEPSP). The CMEPSP was commissioned by Nicholas Sarkozy, President of the French Republic, who was *unsatisfied with the present state of statistical information about the economy and society*. The aim of the commission was to *identify the limits of GDP as an indicator of economic performance and social progress, including the problems with its measurement; to consider what additional information might be required for the production of more relevant indicators of social progress; to assess the feasibility of alternative measurements tools*.

Society and the economy are increasingly complex and changing at a rapid pace. Valid concerns are being raised as to whether the 2008 SNA can capture all the information required by citizens, businesses and governments to fully understand these changes. Users, at times, find it difficult to navigate through the sequence of national accounts or alternatively find that the accounts are too aggregated to allow them to answer their questions about a specific activity or sector. While the 2008 SNA is a powerful tool and provides users with highly relevant information, it has ‘boundaries’ which determine what gets measured and what does not get measured.

One way to expand the 2008 SNA is by allowing for the development of satellite accounts. Satellite accounts provide national accountants the flexibility to look outside the rigours of the core concepts and methods recommended by the 2008 SNA and experiment with new ideas and measures. Given rapid economic and social change, NSOs seem increasingly to be drawn by their users to look outside of the standard SNA framework and to develop an ever-increasing variety of satellite accounts.

This apparent proliferation of satellite accounts is raising questions from national accountants and international organisations as to the motivation behind the increase. Is the increase in

satellite accounting an indication that there is a problem with the scope and detail available in the core national accounts? Or alternatively, does the increase in the number of satellite accounts reflect the maturation of national accounting where improved methods and access to data are enabling national accountants to develop new products that respond to increased information needs? Or is it simply a case of NSOs further aligning their national systems with international standards where they use satellite accounts as a way to test out these new concepts and methods with users before integrating them into their core programmes?

Originally a country survey was conducted and this paper was prepared at the request of the Bureau of the Conference of European Statisticians (CES) to allow them to review national practices related to the development and processing of satellite accounts. The paper was prepared by Statistics Canada with inputs from Eurostat, the International Monetary Fund (IMF), the Organisation for Economic Co-operation and Development (OECD), the United Nations Economic Commission for Europe (UNECE) and the United Nations Statistics Division (UNSD). It first presents the role of satellite accounting in the broader framework of the SNA and suggests a typology that can be used to classify the different satellite accounts to help frame the discussion. Section 4 presents the results of the country survey of national practices in satellite accounting and provides the current 'state of play' in satellite accounting. In conclusion, the paper outlines outcomes from discussions at the CES Bureau and presents an agreement on further work to be conducted in the area of satellite accounting.

2. Satellite accounting and the 2008 SNA

One of the strengths of the 2008 SNA lies within its flexibility. While the system lays out the concepts, accounts and accounting rigour required to produce a set of integrated and internally consistent set of accounts, it does afford the compiler the flexibility to vary and, in a sense, 'expand' the framework to address a specific need. At the limit this 'expansion' is referred to as satellite accounting.

The 2008 SNA distinguishes between two types of satellite accounts. One type of satellite account involves a rearrangement of the classifications or presentation (for example, more detail and alternative aggregations) of the core national accounts and the possible addition of complementary information. This type of satellite account does not fundamentally change the underlying concepts of the core national accounts^(?) but provides an expanded perspective on a particular sector, group of products or activity (2008 SNA paragraph 29.5).

The second type of satellite account seeks to expand or supplement the underlying concepts of the core national accounts. This could involve, for example, expanding the concept of production (for example, including unpaid household services or volunteer activities as production), consumption or capital formation (for example, including human capital within the asset boundary). While this type of satellite account may also involve the use of new classification systems and presentations, the focus of this type is on alternative concepts (2008 SNA paragraph 29.6).

(?) There are some cases where concepts such as the production boundary could be extended without affecting GDP, such as the internal production and use of certain goods and services.

The development of a satellite account involves extracting or enhancing detail contained in the core national accounts, so the results are directly comparable with established national accounts aggregates. Since the data, for the most part, are extracted from the core national accounts, the satellite accounts also inherit the high-quality nature of the national accounts.

As noted in paragraph 1.73 of the 2008 SNA, satellite accounts are also an excellent tool for national accountants to *explore new methodologies and work out new accounting procedures that, when fully developed and accepted, may become absorbed into the main SNA in the course of time*⁽³⁾. In many ways they afford both the compiler and the user the possibility to experiment and test out new ideas. When those ideas have been fully tested and formed, they can then be integrated into the core national accounts.

In general, a large array of data is used to construct standard macroeconomic accounts. The data go through rigorous data quality validation and are integrated, reconciled and balanced in the process of producing national accounts. The production of satellite accounts from such data helps to ensure a high degree of quality and overall consistency within the system as a whole.

Most importantly for users, satellite accounts help them analyse a specific sector of the economy that they may not have been able to analyse using the core national accounts. In the absence of satellite accounts users are often left trying to reconcile data from different surveys and statistical products in order to get a complete picture of the size and structure of a particular sector. Often these data are not coherent and difficult to interpret. Satellite accounts can remove the confusion by bringing these data together in a common framework and ‘forcing them into line’.

A final positive externality of satellite accounts is that they often spur data development activity or investment that improves the quality of source data. These data developments not only benefit the satellite account programme but can have positive spill-over effects on the original data source and a countries’ core national accounts programme.

3. A typology of satellite accounts

Prior to analysing the results of the survey on national practices in the compilation of satellite accounts, which follows in Section 4, it is important to establish a typology to help frame the discussion. As noted above, the 2008 SNA identifies two broad types of satellite accounts (2008 SNA paragraph 29.5). These two types provide a starting point for developing a typology for satellite accounts. While the SNA distinguishes between these two types (referred to as Type 1 and Type 2) of satellite accounts it provides little guidance regarding nomenclature and terminology.

⁽³⁾ More details are provided in Chapter 29 of the 2008 SNA.

3.1 Thematic accounts (Type 1)

Various statistical authorities have, over the years, referred to a certain group of satellite accounts as thematic satellite accounts. Thematic satellite accounts generally restrict their scope to a specific activity or group of activities or sector^(*), and are predominantly constructed within boundaries of the conceptual framework of the 2008 SNA. Examples of thematic accounts include tourism satellite accounts, culture satellite accounts, or sport and recreation satellite accounts. These accounts tend to be activity based and involve regrouping, rearranging and repackaging existing national accounts information in a way that is more intuitive and accessible for users. They generally do not deviate in any significant way from the production, consumption and asset boundaries of the 2008 SNA or from the market price valuation principle. These types of satellite accounts are hereafter referred to as thematic accounts; see P. van de Ven (2019).

3.2 Extended national accounts (Type 2)

While the international community is gravitating towards using the term thematic accounts to represent 2008 SNA Type 1 satellite accounts, the same cannot be said for Type 2 accounts which tend to extend the core concepts of the 2008 SNA. A term that adequately describes Type 2 satellite accounts has not yet emerged. A common language for subgroups of individual accounts seems to be emerging such as well-being accounts, household accounts or ecosystem accounts, but a common term describing this family/group of accounts is not yet evident.

The common feature of Type 2 accounts is that they tend to extend or expand the concepts and boundaries of the 2008 SNA. For example, satellite accounts related to human capital extend the asset boundary of the 2008 SNA, while satellite accounts related to unpaid household work extend the production boundary of the 2008 SNA. This idea of going beyond the core concepts is common among Type 2 satellite accounts. They often go beyond measuring monetary, pseudo-monetary or even economic transactions. Another commonality is that they often involve imputing values for non-market products such as household own-account services, leisure time or ecosystem assets, and assets like human capital or social capital. Given the common theme of expansion and the fact that these satellite accounts tend to extend beyond standard macroeconomic transactions, for the purposes of this paper, they are hereafter referred to as extended national accounts — to convey the idea that they go beyond the generally accepted conceptual boundaries identified in the 2008 SNA.

^(*) Not to be confused with institutional sectors as defined by the 2008 SNA. Paragraph 29.21 of the 2008 SNA notes that in the context of satellite accounts *it is common practice to refer to such groupings of industries as 'sectors' even though they do not constitute institutional sectors as the term is used in the SNA.*

3.3 Standard system of national accounts (SSNA)

While the proposed typology distinguishes between the different types of satellite accounts, a term is also needed to reference the recommended accounts in the 2008 SNA. The term ‘core’ could be used (and is in fact used in the first part of this paper) but this could be understood to imply that these accounts are ‘correct’ or ‘of higher quality’ or ‘of greater importance’ than satellite accounts. Given this is not necessarily the case it is proposed to refrain from calling them the ‘core national accounts’. Since these accounts are economic by nature and they are ‘generally accepted’ by the international community as the standard set of accounts that countries should aspire to produce, it is proposed to refer to them hereafter as the standard system of national accounts (SSNA). It should be emphasised that this proposal does not alter the current 2008 SNA in any way — rather, a comprehensive typology is proposed to facilitate the description of satellite accounts. The result is three high level classes of accounts:

- the standard system of national accounts;
- thematic accounts; and
- extended national accounts.

Thematic accounts are broadly within the scope of the SSNA. In addition, one thematic account can overlap with another thematic account. For example, a thematic account related to tourism can overlap with a thematic account related to culture since some tourism activity is often also cultural activity. The relationship between the SSNA and thematic accounts is depicted in Figure 1.

Extended national accounts encompass the SSNA as well as a selected set of sustainability and well-being accounts. Similar to thematic accounts, the various extended national accounts can overlap. For example, a set of ecosystem accounts can overlap with a set of well-being accounts that quantify the positive or negative impacts that pollution has on the goods and services that can be derived from ecosystems. The idea of extended national accounts is depicted in Figure 2. The key question that needs to be addressed is whether or not to designate a set of such accounts as the ‘official’ extended system and encourage countries to develop these extended national accounts using internationally agreed concepts and methods.

Figure 1: Standard system of national accounts

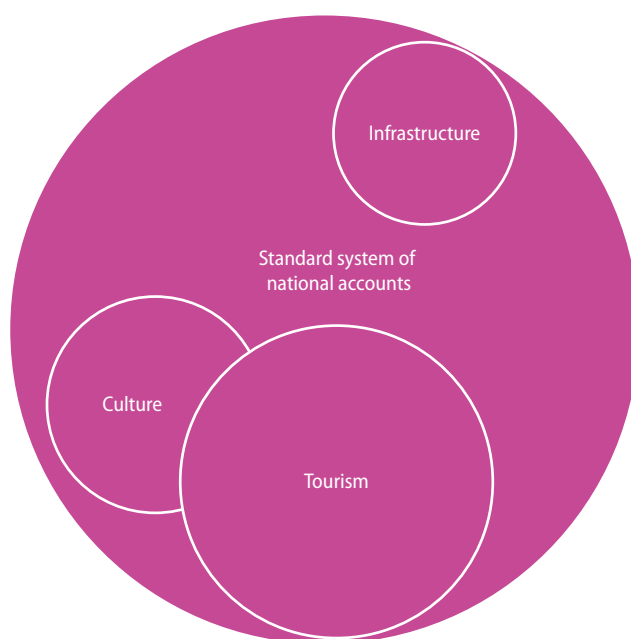
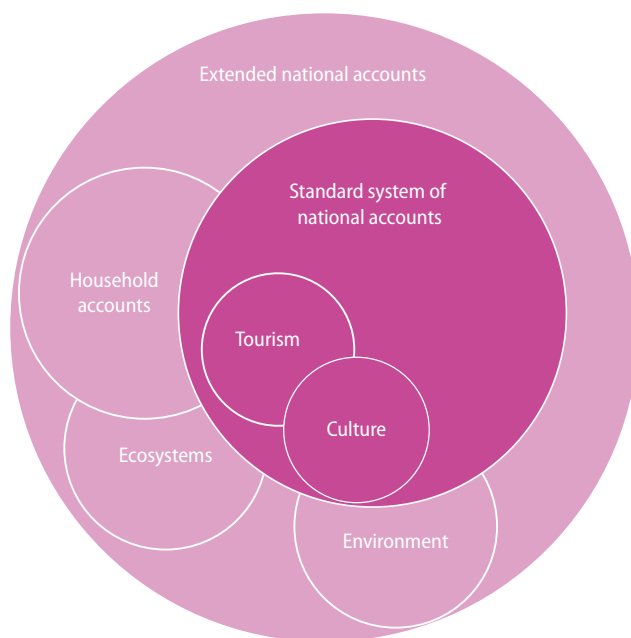


Figure 2: Extended national accounts



The above typology was used to analyse the results of the survey of national practices in satellite accounting. Table 1 shows the range of satellite accounts reported by survey respondents along with how each of the accounts was subsequently designated (thematic accounts or extended national accounts). It should be noted that the range of topics that were listed in the survey was not exhaustive and in some cases the topics did not align well with the concept of a satellite account; nevertheless, they are included in the list and analysis for completeness.

Table 1: Complete list of satellite accounts in the survey

Satellite account	Class
The following list of satellite accounts was included in the survey and respondents were asked to identify which of these satellite accounts they produced	
Environmental-economic accounts (SEEA including ecosystem accounting)	Extended
Non-profit institutions and volunteering	Extended
Human capital	Extended
Health accounts	Extended
Unpaid household activities	Extended
Education accounts	Extended
Social protection	Extended
Social accounting matrices	Extended
Distributional national accounts	Thematic
Tourism accounts	Thematic
Natural resource accounts	Thematic
Culture accounts	Thematic
Sport and recreation accounts	Thematic
Illegal/informal sector	Thematic
Agriculture	Thematic
Digital economy	Thematic
Transport accounts	Thematic
Ocean coastal economic accounts	Thematic
Technology	Thematic
Education and training	Thematic
Intangible capital	Thematic
The following list of satellite accounts was not included in the original list for the survey but were spontaneously identified by NSOs	
Care economy	Thematic
Softwood lumber	Thematic
Cannabis	Thematic
Pensions	Thematic
Water	Thematic
Sea	Thematic
Fisheries	Thematic
Telecommunication	Thematic
Travel and tourism	Thematic
Arts and culture	Thematic
Outdoor recreation	Thematic

4. State of play in satellite accounting — results of the country survey

4.1 International inventory of satellite accounts

As noted earlier, over recent years there has been an apparent increase in demand from users to develop satellite accounts, either because they no longer find the concepts in the SSNA appropriate or they are masking or do not properly account for emerging economic phenomena. In order to address these two questions the abovementioned survey on national practices in the compilation of satellite accounts was conducted. The questionnaire was developed through consultation with international bodies (UN, UNECE, IMF, OECD, Eurostat) and selected individuals from various NSOs. In addition to developing an international inventory of satellite accounts, the survey collected information for six themes:

- sponsorship/financing of satellite accounts;
- the work unit responsible for producing satellite accounts;
- the relationship between the satellite account and the 2008 SNA;
- frequency and timeliness of satellite accounts;
- data sources and methods used to construct satellite accounts;
- data gaps and demand for satellite accounts.

Over 80 countries responded to the survey on national accounts practices related to satellite accounts. In total, the respondents reported having developed 241 satellite accounts (covering over 20 different topics) — most of which continue to be actively worked on. The number of satellite accounts produced by a given country varied from 1 to 15. The median number of satellite accounts in production for a given country was 2, and the mean was 4 (3.7).

Figure 3: How many countries and satellite accounts were surveyed?
(count)

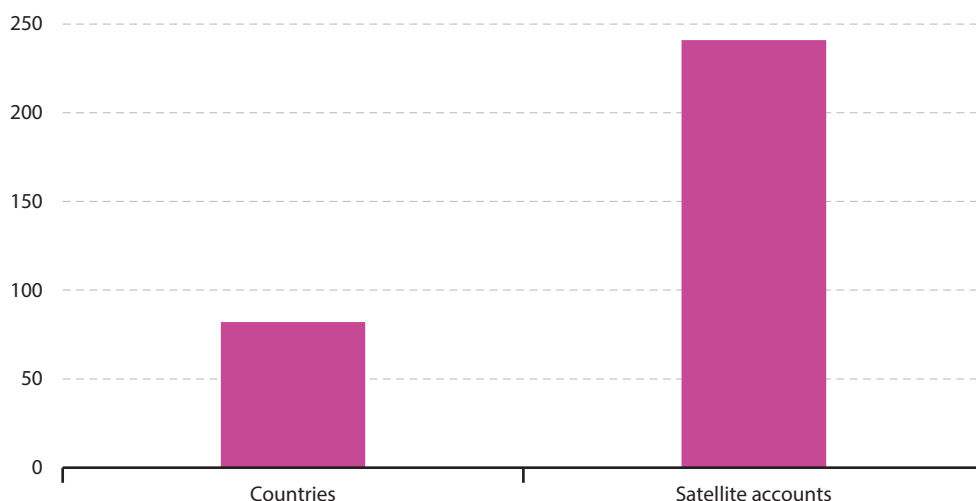
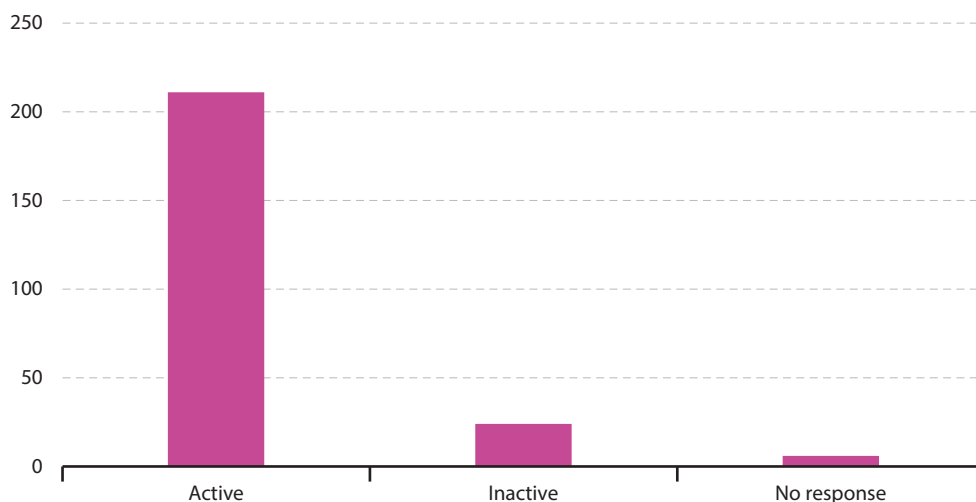


Figure 4: How many of these satellite accounts were active/inactive?

(count)



Certain satellite accounts were widespread across European countries. This can be explained by European Union legislation which sets common standards and serves common policy purposes. Examples of such legislated accounts include agricultural satellite accounts or environmental satellite accounts. Some other satellite accounts in Europe are implemented on a voluntary basis by countries which have a national interest in a specific field, like tourism or social protection satellite accounts. For these voluntary European satellite accounts, a harmonised methodology also exists.

The countries that were most active in satellite accounting are listed below. As noted above, European countries are quite prevalent in the list. Other countries actively engaged in satellite accounting included Canada, Columbia, Israel, Australia, China and Mexico.

The typology outlined in the previous section was used to classify each satellite account as either a thematic account or an extended national account. In certain cases, the accounts were considered to be both thematic and extended national accounts; in these cases, the account was classified under extended national accounts even if the account focused on a specific sector. Out of the 241 satellite accounts reported by survey respondents, the number of satellite accounts classified as thematic accounts was almost the same as the number of extended national accounts.

Tourism satellite accounts were the most common satellite account produced by NSOs followed by environmental-economic accounts. Satellite accounts that involve expanding the asset boundary for the 2008 SNA, such as human capital accounts, were less prevalent among the countries surveyed.

The survey also examined the reference periods covered by satellite accounts. The majority of the satellite accounts related to reference periods for 2000 or later. In total, nine satellite accounts covered reference periods prior to 1980, 40 covered reference periods in the 1980s and 1990s, and 148 covered reference periods for 2000 or more recent years. Most of the development over the last two decades was focused on health, tourism and environmental accounts.

Figure 5: Which countries were actively engaged in producing satellite accounts?
(count of different satellite accounts)

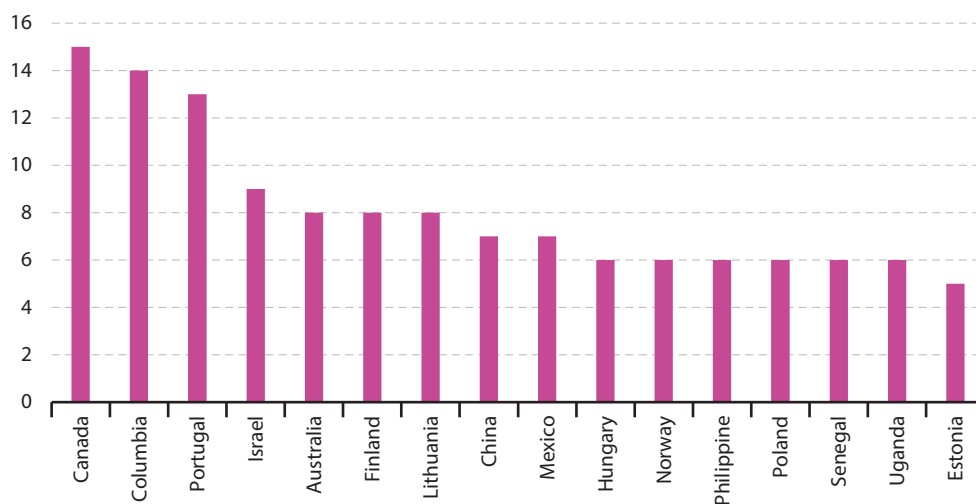


Figure 6: What were the most common topics covered by satellite accounts?
(count)

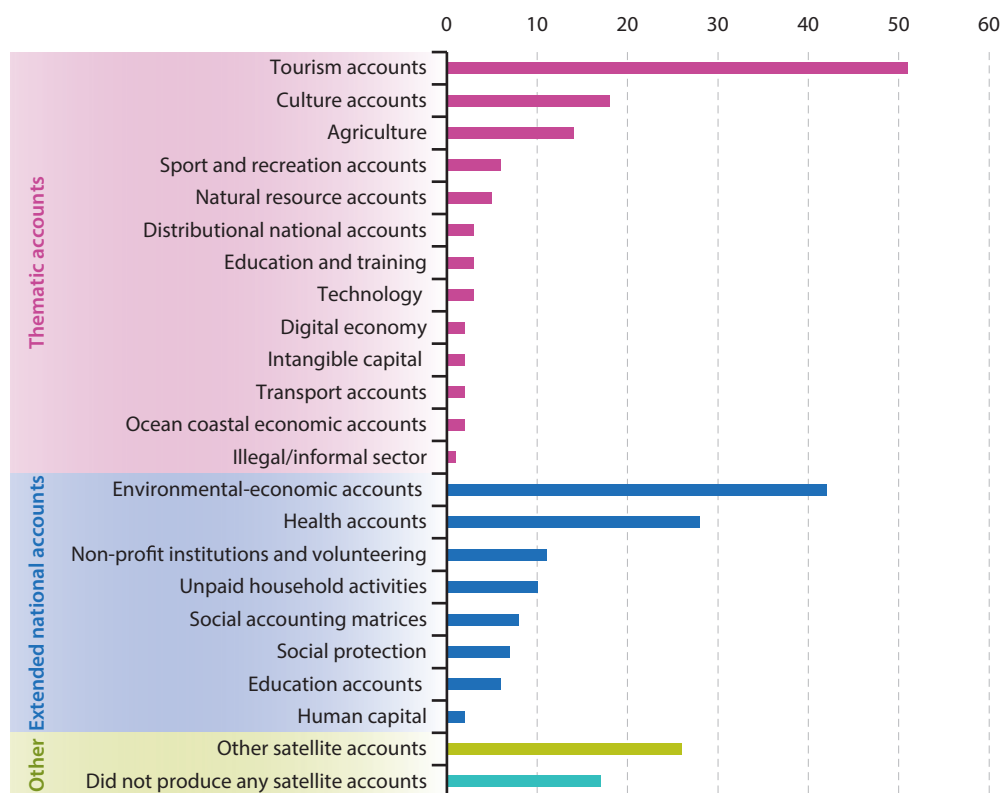
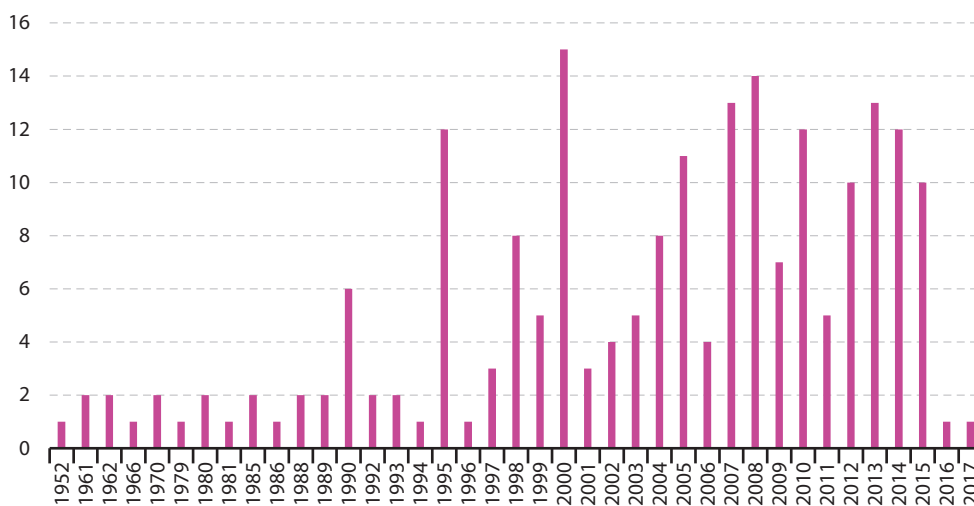


Figure 7: Which reference periods were covered by satellite accounts?

(count)



Note: for those reference years that are not shown on the x-axis, there were no satellite accounts produced by the NSOs that formed part of the survey.

4.2 Sponsorship and funding

The second part of the survey focused on sponsorship and sources of funding. The survey asked NSOs to indicate if the satellite account was sponsored by an organisation outside the national accounts programme and if the sponsor(s) contributed funds.

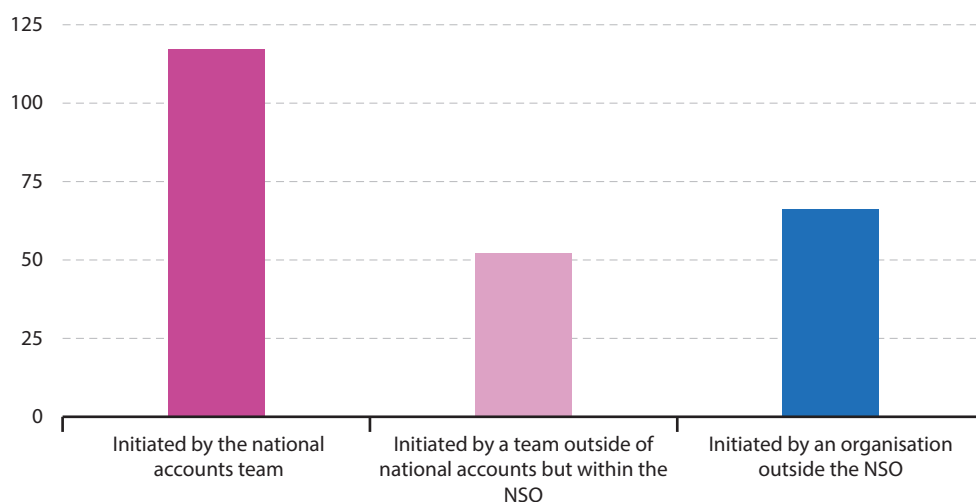
The results of the survey showed an almost even split between those accounts initiated by the national accounts programme located within the NSO and those satellite accounts initiated by organisations outside of the national accounts programme. Of the 241 satellite accounts represented in the study, 117 were initiated by the national accounts programme, 52 by a work unit outside the national accounts programme but within the NSO, and 66 by organisations outside the NSO; there were six satellite accounts where the body initiating the account was unknown.

Of the satellite accounts commissioned by organisations outside the NSO, most were related to thematic accounts. It appears that sponsorship and funding was more forthcoming when the product was closely aligned with the sponsoring organisation's mandate. Extended national accounts have a broader use and therefore sponsorship of these types of accounts was less prevalent. For example, in most countries there is not a logical sponsor for a human capital satellite account — while this account may be considered important to shed light on the comprehensive wealth of a country, it is unlikely that a specific organisation would sponsor its development.

Countries were also asked about the work units and areas responsible for producing satellite accounts within their national context. This area of questioning was intended to see if countries used the same national accountants to produce satellite accounts as for the production of their SSNA. The line of thought was that the satellite accounts would be more likely to receive the same rigour that goes into developing the SSNA data if they were organisationally embedded within the same work unit as the team responsible for the SSNA.

Figure 8: Who initiated the development of satellite accounts?

(count)

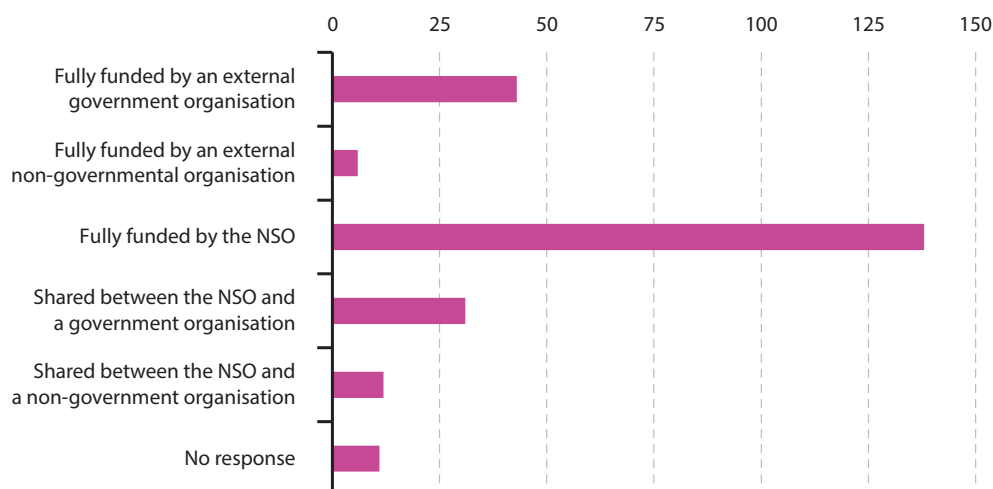


NSOs were also asked a number of questions relating to funding. In the majority of cases, the NSO indicated that the satellite accounts they compiled were fully funded internally by the NSO. This could have either been out of the NSO's ordinary budget or through special funds that were allocated to the NSO for the purpose of developing the satellite account. There were fewer instances where the satellite account was funded (partially or fully) by transfers from an outside organisation (government or non-governmental) directly to the NSO.

This is an important result given that one of the concerns about satellite accounting is that they can become politicised. If satellite accounts are sponsored by an outside organisation, there may be a tendency, real or perceived, for the accounts to be 'bent' to support a political point of view or outcome. If the funding is at 'arm's length', then this perception may be reduced and it could lend more credibility to the exercise.

Figure 9: How were the development costs for satellite accounts funded?

(count)



4.3 Periodicity and frequency

NSOs were also asked to report on the periodicity and frequency of the satellite accounts they produced. This line of inquiry was intended to determine if users demanded the same periodicity and frequency for satellite accounts as they did for the SSNA. Not surprisingly, the periodicity and frequency of satellite accounts differed substantially from the situation for the SSNA. This is an indication that satellite accounts help users understand the structure of an economy/society and the overall impact of an activity rather than growth or cyclical evolution of an activity or sector. Most satellite accounts were produced on an annual basis and released 12-24 months following the reference period. There were a few sub-annual satellite accounts and indicators released on a more frequent basis: these were most often within the domain of tourism and culture.

Figure 10: At what frequency were satellite accounts produced?

(count)

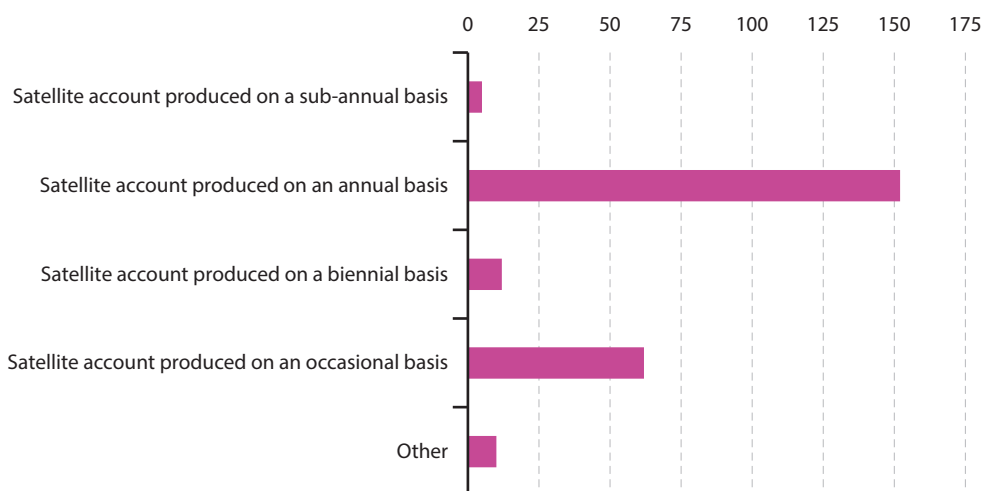
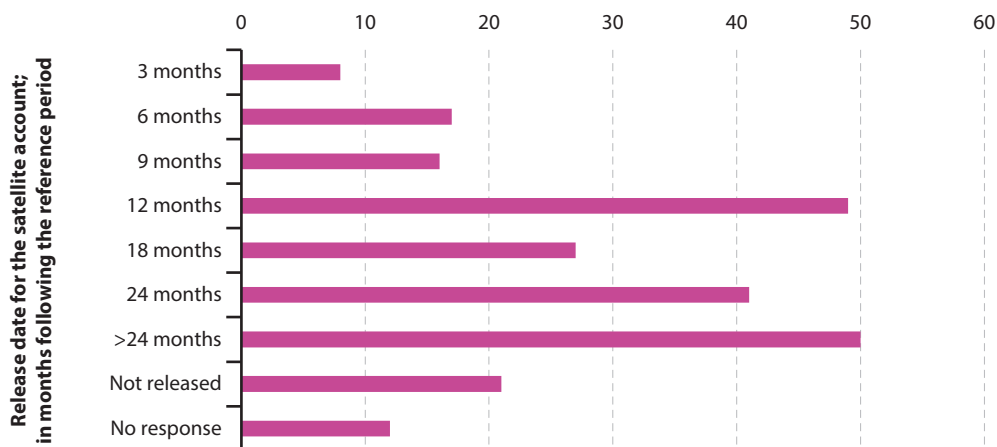


Figure 11: How timely was the release of data for satellite accounts?

(count)



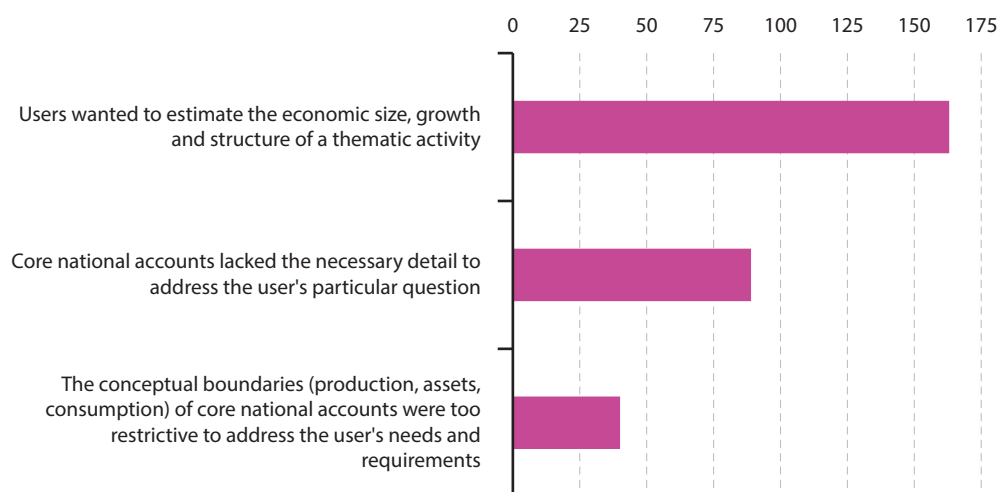
4.4 Motivation

A key objective of the survey was to understand better the motivation behind the development of satellite accounts. Respondents were asked to report on the main drivers behind the demand for their satellite accounts. Most respondents indicated that users requested satellite accounts to better illuminate a specific activity or sector that could not be easily analysed using the SSNA classifications. When users explore the SSNA to look for specific information on, for example, tourism or culture they only find a limited selection of the information they require. Users request satellite accounts so that data from the SSNA are rearranged to suit the type of analyses they would like to undertake.

Much of the motivation behind these user requests is to have an estimate for the weight of an activity or sector in relation to total economic activity. Being able to provide users with the share of thematic activity in relation to GDP is often a key motivation in the development of satellite accounts; this was apparent for both thematic accounts and extended national accounts. In many cases, users were interested in the size of an activity that was not conceptually covered by the SSNA. Is the stock of human capital larger than the stock of physical capital? What is the level of training when including in-house training activities by employers? In addition to the overall size of an activity or sector, respondents also indicated that users often requested a time-series (the longer the better) so they could understand how a sector was changing over time.

Over 55 % of the respondents reported that satellite accounts were developed to give more prominence to a particular activity by estimating its economic size, growth and structure. Very few respondents indicated that satellite accounts were developed because users felt the conceptual boundaries of the 2008 SNA were too restrictive and did not capture, for example, the welfare effects of free goods, or seamless access to information.

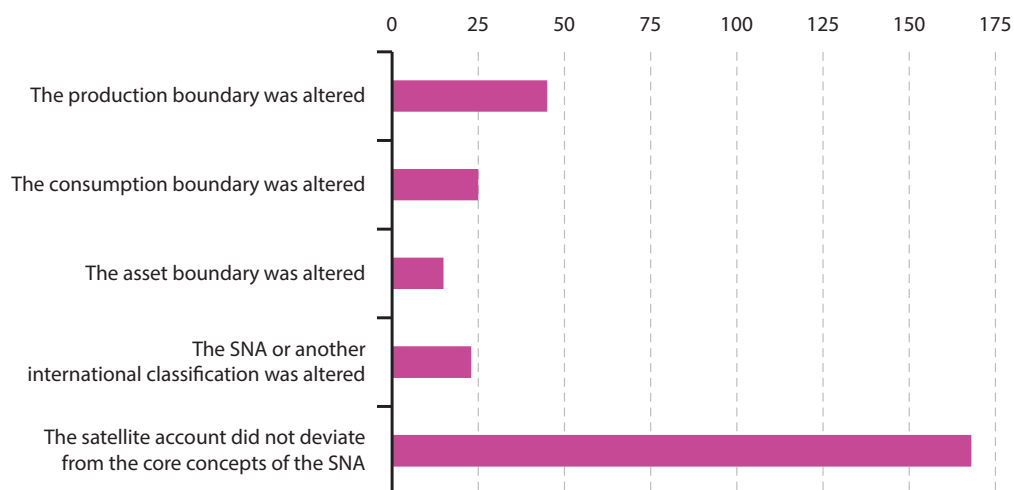
Figure 12: What was the primary reason for the development of a satellite account?
(count)



This is an important finding, given most of the discussion around the usefulness of GDP centres on its 'restricted' production boundary, which does not adequately capture certain benefits (for example, better health outcomes or increases in consumer surplus due to technological advancement), or does not appropriately account for negative externalities. This is not to say that these are not important areas of investigation. Indeed, the absence of responses may be more an indication of a lack of conceptual development in these areas making attempts at producing satellite accounts related to well-being and sustainability less credible and therefore evoking less demand from users.

In 61 % of cases, the satellite account did not deviate from the core concepts of the 2008 SNA. In cases where satellite accounts deviated from the core concepts of the 2008 SNA, most often the production boundary was expanded. In 16 % of cases, the production boundary was altered (such as giving a value to volunteering), followed by changes to the consumption boundary (9 %) and changes to the asset boundary (such as including human capital; 5 %).

Figure 13: How did the satellite account deviate from the core concepts of the 2008 SNA?
(count)

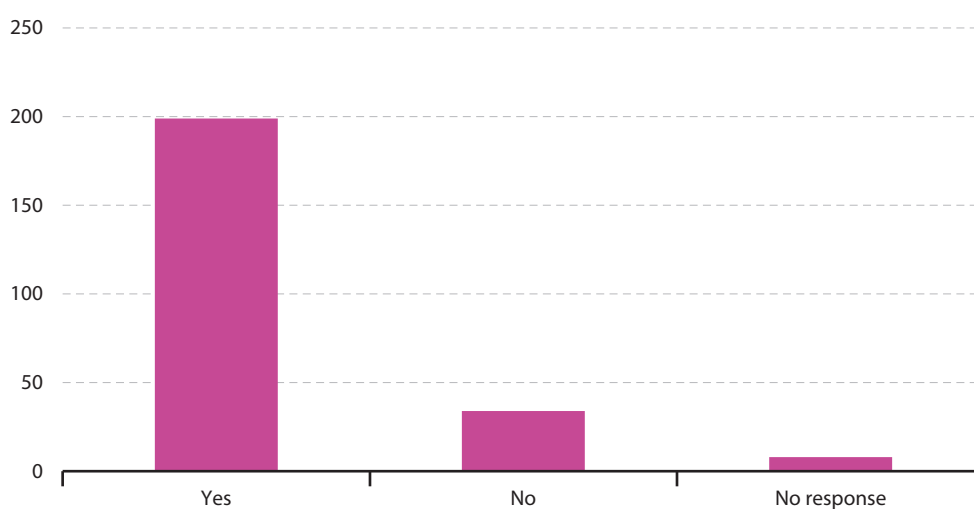


4.5 Guidance

NSOs and satellite account compilers were asked a number of questions about their compilation practices. Specifically, respondents were asked if they received guidance from the international community and whether or not satellite account sponsors either contributed to the development of the framework or provided metadata that helped in the construction of the satellite account.

In the vast majority of cases, users indicated that international guidance was available and that they used this guidance to help them construct their satellite accounts. Most of the motivation for following international guidance was related to their desire to ensure their final product compared with similar products produced by other countries.

Figure 14: Was international guidance available for developing the satellite account?
(count)



A significant amount of guidance exists regarding the sources and methods national compilers can use to construct satellite accounts. Much of this guidance is relatively recent and has been updated so that it is aligned with the 2008 SNA. An Appendix contains an inventory of such guidance made available to countries as well as the date that these handbooks, guides and manuals were published and the international organisation/group that developed the guidance.

Satellite account compilers also received input from government organisations outside the NSO or from non-government organisations. The survey explicitly asked about four types of input received when compiling satellite accounts. These four types were: inputs related to concepts and statistical methods; inputs related to definitions and classifications; the provision of data to help compile the satellite account; and other inputs. In general, compilers received inputs on all aspects for the design of satellite accounts. In a majority of cases, compilers received at least two key inputs for the development of satellite accounts and in at least 60 cases they received i) inputs related to concepts/methods, definitions and classifications and ii) data to help construct the account.

Figure 15: What type of inputs were received from organisations outside the NSO to help compile the satellite account?

(count)

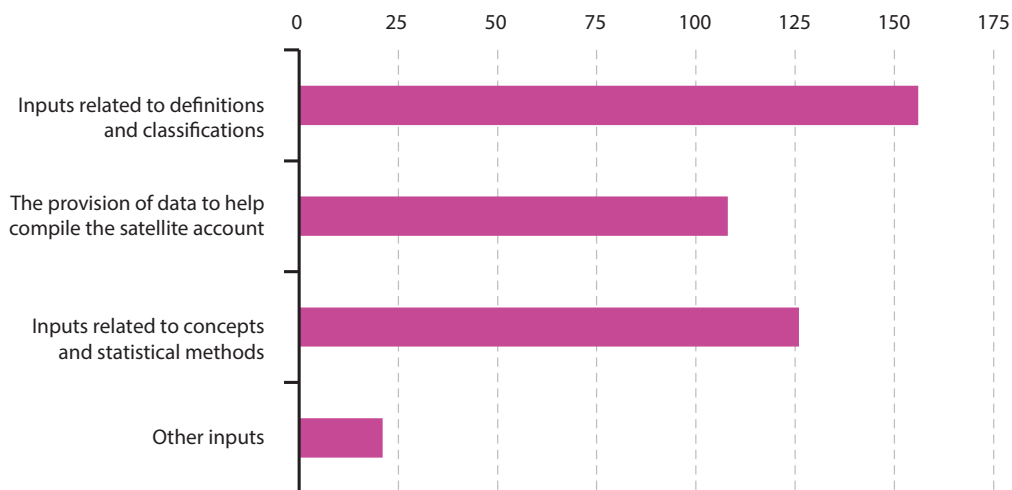
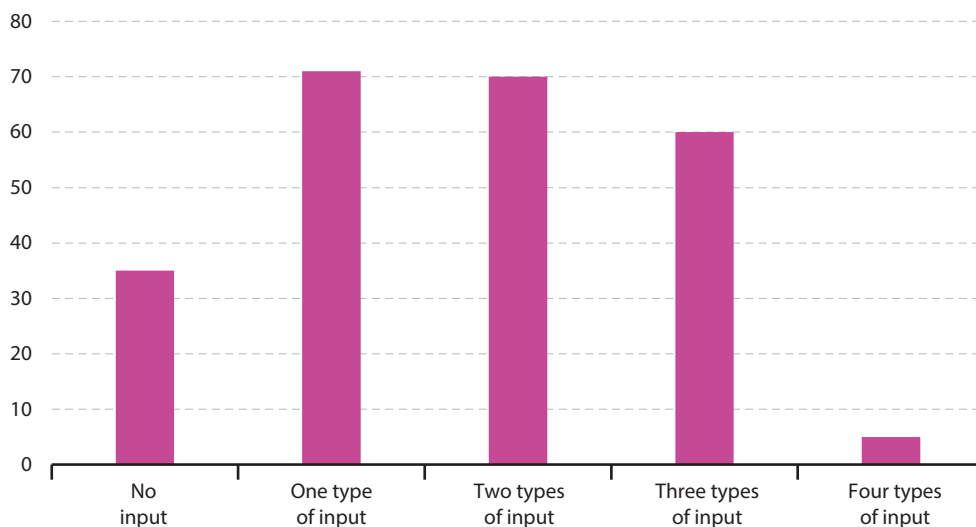


Figure 16: How many different types of input were received to help compile the satellite account?

(count)



4.6 Unmet demand

NSOs were asked to identify cases where a satellite account was requested but they were unable to respond to the demand due to various circumstances. In total, NSOs indicated there were 130 cases where a user requested a satellite account for which they were unable to meet user demand. This unmet demand was quite evenly split between thematic accounts and extended national accounts.

Figure 17: Unmet demand for the development of satellite accounts
(count)

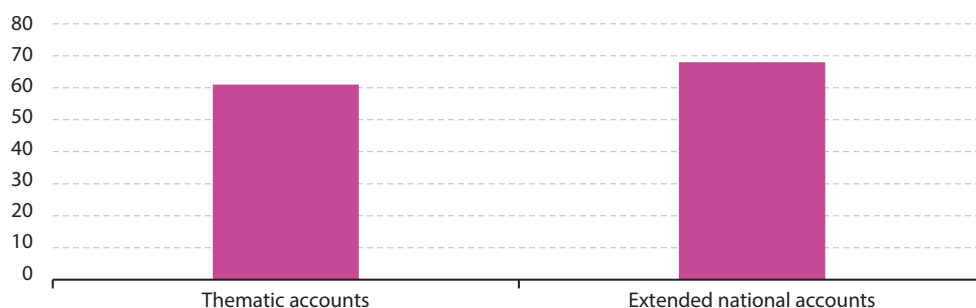
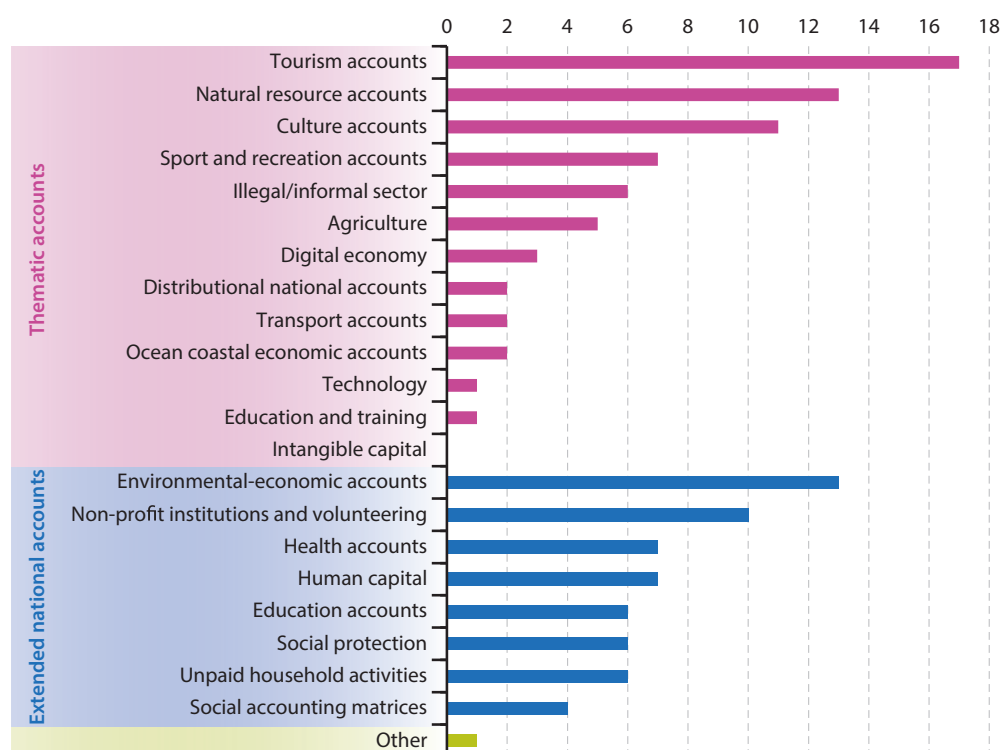


Figure 18: Unmet demand for the development of satellite accounts according to type of account
(count)



5. Conclusions

First, this paper demonstrates that national compilers of satellite accounts use guidance when available. This helps them ensure that satellite accounts do not become overly politicised since the compiler can reference international standards when identifying the definitions and boundaries of the satellite account under production or development. While a significant amount of guidance exists for various satellite accounts, these guides are developed independently. It may be useful for the international statistical community to develop a general guide to satellite accounting. This guide would recognise that there exists a standard set of concepts, terms, definitions, methods and techniques that are common (or should be common) across all satellite accounts. Such a general guide could be accompanied by and linked to existing guides provided for specific themes such as tourism, culture or infrastructure (each of which details specific information on sources and methods). A first draft of guidance for the compilation of thematic accounts was developed by the OECD during 2019, using the example of transport satellite accounts, see van de Ven (2019). The guidance describes the main steps to arrive at an enlarged set of the traditional supply and use tables as well as possible extensions of the institutional sector accounts. After consultation with various international partners, there are plans to finalise the guide and to make it available to the national accounts community during 2021.

Second, Statistics Canada and UNECE, in consultation with the author of this paper, are developing a wiki page presenting core information collected by the country survey. The page will serve as a reference providing information on existing international guidance for various satellite accounts. The wiki page will be maintained by the UNECE secretariat. There are plans to update it on a continuous basis in collaboration with the UNSD in order to enable the exchange of best practices across all countries and world regions. It is expected that this initiative will provide an opportunity to follow-up on the implementation of the OECD's general guide to satellite accounting and to take note of new innovations in satellite accounting (which may be beneficial for discussions in expert meetings). This online inventory of international guidance should be made public at the beginning of 2021.

Third, in order to increase the rigour and encourage the development of internationally important satellite accounts, a set of satellite accounts (existing or to be developed) should be identified and presented to the UN Statistical Commission for endorsement, in order to encourage their compilation by countries. This endorsed set of economic, social and environmental accounts would focus on addressing some of the well-being and sustainability gaps that are present within the current 2008 SNA (such as the measurement of unpaid household activities, environmental externalities, health and education).

Acknowledgements

The author would like to thank and acknowledge contributions from Catherine Van Rompaey (World Bank, formerly Statistics Canada), Andre Loranger (Statistics Canada), Tihomira Dimova (UNECE), Ilaria Di Matteo and Herman Smith (both UNSD), Peter van de Ven (OECD) and Andreas Dollt (Eurostat). The author would also like to thank two anonymous reviewers for their useful suggestions.

References

van de Ven, P. (2019), *Developing Thematic Satellite Accounts — The Example of a Thematic Satellite Account for Transport*, paper for the 13th Meeting of the Advisory Expert Group on National Accounts, 1-3 October 2019.

Appendix: inventory of international guidance for developing satellite accounts

Topic	Publication	Date published	Responsible organisation(s)/ group(s)
Environment and natural resource accounts			
Environment	System of Environmental-Economic Accounting 2012 — Central Framework https://seea.un.org/sites/seea.un.org/files/seea_cf_final_en.pdf	2012	UN, FAO, European Commission, OECD, IMF and World Bank
Environment	System of Environmental-Economic Accounting 2012 — Experimental Ecosystem Accounting https://seea.un.org/sites/seea.un.org/files/websitedocs/eea_final_en.pdf	2012	UN, FAO, European Commission, OECD and World Bank
Environment	Technical Recommendations in support of the System of Environmental-Economic Accounting 2012 — Experimental Ecosystem Accounting (White Cover) https://seea.un.org/sites/seea.un.org/files/technical_recommendations_in_support_of_the_seea_eea_final_white_cover.pdf SEEA-Water — System of Environmental-Economic Accounting for Water https://unstats.un.org/unsd/publication/seriesf/Seriesf_100e.pdf	2012	UNSD
Environment	Environmental taxes — A statistical guide https://seea.un.org/sites/seea.un.org/files/taxes_ks-gq-13-005-en.pdf.pdf	2013	Eurostat
Environment	Environmental subsidies and similar transfers — Guidelines https://seea.un.org/sites/seea.un.org/files/subsidies_ks-gq-15-005-en-n.pdf	2015	Eurostat
Environment	SEEA-Energy — System of Environmental-Economic Accounting for Energy https://seea.un.org/sites/seea.un.org/files/documents/seea-energy_final_web.pdf	2015	UNSD
Environment	Environmental goods and services sector accounts — HANDBOOK https://seea.un.org/sites/seea.un.org/files/egss_handbook_ks-gq-16-011-en-n.pdf	2016	Eurostat
Environment	System of Environmental-Economic Accounting 2012 — Applications and Extensions https://seea.un.org/sites/seea.un.org/files/ae_final_en.pdf	2017	UNSD
Environment	Environmental protection expenditure accounts — HANDBOOK https://seea.un.org/sites/seea.un.org/files/epea_ks-gq-17-004-en-n.pdf	2017	Eurostat
Agriculture	Manual on the economic accounts for agriculture and forestry EEA/ EAF 97 (Rev. 1.1) https://ec.europa.eu/eurostat/en/web/products-manuals-and-guidelines/-/KS-27-00-782	2000	Eurostat
Agriculture/ forestry	System of Environmental-Economic Accounting for Agriculture, Forestry and Fisheries (White Cover version published March 2018) https://seea.un.org/file/16260/download?token=wK_7dO4w	2018	UNSD and FAO

Topic	Publication	Date published	Responsible organisation(s)/ group(s)
Natural resources	Guide to Analyze Natural Resources in the National Accounts https://www.imf.org/external/pubs/ft/qna/na.htm	2017	IMF
Natural resources	Economy-wide material flow accounts — HANDBOOK https://seea.un.org/sites/seea.un.org/files/ks-gq-18-006-en-n.pdf UN Environment version coming soon	2018	Eurostat
Natural resources	Satellite account for the ocean	Under development	ESCAP and UNSD
Natural resources	Not available		
Human capital, education, health			
Human capital	Guide on Measuring Human Capital https://www.unecce.org/fileadmin/DAM/stats/publications/2016/ECECESSTAT20166_E.pdf	2016	UNECE
Education and training	Satellite Account for Education and Training: Compilation Guide http://www.unecce.org/index.php?id=53957	2020	UNECE
Education	Methodology of national education accounts (UNESCO, UNESCO IIEP, UNESCO UIS) http://unesdoc.unesco.org/images/0024/002457/245781e.pdf	2016	UNESCO
Health	A System of Health Accounts https://www.who.int/health-accounts/documentation/sha2011.pdf?ua=1	2011	OECD, Eurostat and WHO
Household accounts (including distributional aspects)			
Households	Handbook of National Accounting — Household Accounting: Experience in Concepts and Compilation, Volume 2, Household Satellite Extensions https://unstats.un.org/unsd/publication/SeriesF/SeriesF_75v2E.pdf	2000	UN
Generations	National Transfer Accounts Manual — Measuring and Analysing the Generational Economy http://www.un.org/en/development/desa/population/publications/development/NTA_Manual.shtml	2013	UN
Unpaid work	Guide on Valuing Unpaid Household Service Work https://www.unecce.org/fileadmin/DAM/stats/publications/2018/ECECESSTAT20173.pdf	2017	UNECE
Disparities	Manual on distributional national accounts	Under development	OECD
Non-profit institutions			
Non-profit institutions	Satellite Account on Non-profit and Related Institutions and Volunteer Work https://unstats.un.org/unsd/nationalaccount/docs/UN_TSE_HB_FNL_web.pdf	2018	UNSD
Globalisation and digitalisation			
Digital economy	Satellite account for the digital economy	Under development	OECD
Globalisation	Handbook on Accounting for Global Value Chains	Under development	UNSD

Topic	Publication	Date published	Responsible organisation(s)/ group(s)
Other industry/sector accounts			
Tourism	Tourism Satellite Account: Recommended Methodological Framework 2008 https://unstats.un.org/unsd/publication/SeriesF/SeriesF_80rev1e.pdf	2010	UN, UNWTO, Eurostat and OECD
Tourism	Statistical Framework for Measuring the Sustainability of Tourism	Under development	UNWTO and UNSD
Culture	Culture Satellite Account http://uis.unesco.org/en/topic/culture-satellite-account	Under development	UNESCO
Transport	International Transport Forum Task Force (ITF TF) on Transport Satellite Accounts (TrSA) aims to produce a manual https://www.itf-oecd.org/3rd-international-transport-statistics-meeting	Under development	ITF TF
Aviation	Aviation Satellite Account	Under development	ICAO and ITF TF
Technology (for example clean technology, artificial intelligence)	Not available		
Sport and recreation	Not available		

4

Pension data in European national accounts: ESA 2010 Table 29

FILIPPO GREGORINI (1)

Abstract: The need for statistics on pensions is increasing as populations age and the choice of available pension schemes widens in many European Union (EU) Member States. As a response to this need, statistical authorities in the EU have been compiling a snapshot of future pensions (accrued entitlements) of households in pension schemes in Table 29 of the European System of National and Regional Accounts (ESA 2010). Information is compiled for both private and public schemes, including pay-as-you-go, defined benefit and social security pension schemes, for which figures are published in Eurostat's reference database and also nationally. Individual retirement schemes, not related to occupation, are excluded from the table.

Pension figures crucially rely on a number of assumptions about the future, including the discount rate and life expectancies. Table 29 data transmission includes a sensitivity analysis to variations in the discount rate: this analysis provides information on how pension entitlements in defined benefit schemes would change in the case of a +/-1 percentage point change in the discount rate.

The communication strategy for Table 29 data is considered to be crucial. Being calculated in terms of accrued-to-date liabilities, these statistics do not tell us anything about the sustainability of pension schemes themselves and conceptually should not be linked to government (Maastricht) debt. By contrast, enhanced pension reporting through Table 29 makes possible a comprehensive overview of households' pension entitlements, which comprise an important part of households' wealth and are therefore relevant for an analysis of households' consumption and saving behaviour.

JEL codes: E21, G51, J11, M41

Keywords: national accounts, pensions, social insurance, household wealth, demographic trends, actuarial methods

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1. Introduction

There is high public and policy interest in how people are providing for their future retirement, and the impact that this has on their current consumption and saving behaviour. As populations age in the European Union (EU) ⁽²⁾ and the choice of available pension schemes widens, the availability of statistics on pensions becomes increasingly important.

A broad range of statistics on pensions already existed before the implementation of Table 29 of the European System of National and Regional Accounts (ESA) 2010, for example as part of those for social protection ⁽³⁾. However, these statistics are based on flows during the year — contributions and benefits paid — and not on a forward-looking basis concerning pensions that will be paid in the future. EU Member States have been filling this gap by compiling a snapshot for future pensions (accrued entitlements) of households in pension schemes. A first compilation of pensions data took place in 2018 with reference to year 2015, and a second exercise is expected to take place by the end of 2020.

One of the improvements introduced in ESA 2010 (Eurostat (2013)) ⁽⁴⁾ was enhanced statistical reporting on pensions and Table 29 of the ESA 2010 transmission programme (Eurostat (2014)) reflects this improvement.

Table 29 provides information on both private and public pension schemes, including social security pension schemes, which operate on a collective model, in other words they are for a group of households (not individual's private pensions) and are contributory. Pensions paid irrespective of contributory history are termed 'social assistance' and are not included in Table 29 ⁽⁵⁾.

These statistics rest upon a number of assumptions about the future, for example how to value them in today's money (discounting) and how long people will live (life expectancy), and thus need to be treated carefully as model-based estimates. In particular, changing the assumed discount rate may have large effects on the estimated accrued entitlements in defined benefit schemes. Based on 2015 Table 29 data, a 1 percentage point decrease in the discount rate makes pension entitlements increase by a rate between 14 % and 28 % across EU Member States — as compared with the base case. Equally, a 1 percentage point increase in the discount rate makes them decrease by a rate between 11 % and 20 %.

⁽²⁾ In the EU-27, persons aged 65 years or over had a 20.3 % share of the total population in 2019, showing an increase of 2.9 percentage points compared with 2009. This share also increased in the United Kingdom, EFTA and EU candidate countries during the same period https://ec.europa.eu/eurostat/statistics-explained/index.php/Population_structure_and_ageing#The_share_of_elderly_people_continues_to_increase.

⁽³⁾ See <http://ec.europa.eu/eurostat/web/social-protection/overview>.

⁽⁴⁾ The European System of National and Regional Accounts (ESA 2010) is the European statistical standard for compiling national accounts. The structure of ESA 2010 is consistent with the worldwide guidelines on national accounting set out in the System of National Accounts (SNA 2008; European Commission, International Monetary Fund, Organisation for Economic Co-operation and Development, United Nations, World Bank, 2009).

⁽⁵⁾ Social assistance is not part of social insurance. Social assistance benefits are payable independently of participation in a social insurance scheme, i.e. without qualifying contributions having been made to a social insurance scheme (Eurostat, 2013, § 17.04).

Pension entitlements are reported in Table 29 in terms of accrued-to-date liabilities (ADL), and therefore these statistics do not tell us anything about the sustainability of pension schemes themselves and conceptually should not be linked to government (Maastricht) debt. Nevertheless, enhanced pensions reporting in national accounts, following the implementation of ESA 2010, can serve several purposes.

It provides a comprehensive overview of households' pension entitlements, which comprise an important part of households' wealth and are therefore relevant for an analysis of households' consumption and saving behaviour. It reflects the impact of social insurance systems — by different types of pension schemes — to ensure income at retirement; social insurance systems cover employment-related and social security schemes. Moreover, reporting enhances international comparability of data on households' pension entitlements across countries by applying harmonised assumptions for the recording of unfunded government pension schemes.

The statistical and policy debate in the EU concerning national accounts in general and gross domestic product (GDP) more specifically has focused since (at least) a decade on the necessity to go 'beyond GDP' — due to a concentration on the production side — and focus more on the 'household perspective' (among other issues). Several dedicated working groups in the EU context (under different formal agreements) were established during this period. Most of them in their conclusions/recommendations pointed out that households' entitlements related to unfunded pension schemes — pay-as-you-go defined benefit and social security pension schemes — were not recorded in the system of national accounts before the implementation of ESA 2010, although they represented significant assets for households. Table 29 therefore makes it possible to add relevant information to the measurement of the total financial wealth of households. Given its precise coverage it is, of course, not the full picture.

The aim of this article is to present the statistical recording of pensions in the EU through ESA 2010 Table 29 and to discuss its features, including elements of novelty, data, methodological issues, possible use for policy analysis and the way forward.

2. Recording pension schemes in EU national accounts

2.1 The content of Table 29

ESA 2010 Table 29 includes information on social security pension schemes and employment-related pension schemes; it excludes individual pension schemes as well as non-contributory social security schemes (which are not considered as social security schemes in national accounts terms, but as social assistance and are therefore outside the scope of Table 29). Information on social security pension scheme assets of households were collected for the first time in the context of national accounts, as shown in Table 1 below.

Table 1: Pension schemes included in Table 29

1st pillar Social security pension schemes	2nd pillar Employment-related pension schemes
Not recorded as assets of households before the implementation of ESA 2010 Table 29 [not in the core national accounts].	<p>Pension entitlements (AF.63)</p> <p>Definition: pension entitlements comprise financial claims that current employees and former employees hold against either:</p> <ul style="list-style-type: none"> (a) their employers; (b) a scheme designated by the employer to pay pensions as part of a compensation agreement between the employer and the employee; or (c) an insurer.

Source: Eurostat (2013)

In other words, Table 29 covers social insurance schemes where participants *are obliged, or encouraged, by their employers or by general government, to take out insurance against certain eventualities or circumstances that may adversely affect their welfare or that of their dependants. In such schemes social contributions are paid by employees or others, or by employers on behalf of their employees, in order to secure entitlement to social insurance benefits, in the current or subsequent periods, for the employees or other contributors, their dependants or survivors* (Eurostat (2013) § 4.88).

In particular, two types of social insurance may be identified: The first pillar consists of social security schemes covering the entire community, or large sections of the community, that are imposed, controlled and financed by government units. Pensions payable under such schemes may or may not be related to levels of salary of the beneficiary or history of employment. Non-pension benefits are less frequently linked to salary levels. The second pillar consists of other employment-related pension schemes. *Such schemes derive from an employer-employee relationship in the provision of pension and possibly other entitlements that are part of the conditions of employment and where responsibility for the provision of benefits does not devolve to general government under social security provisions* (Eurostat (2013) § 4.89).

It is worth mentioning that schemes organised by government units for their own employees are classified as other employment-related schemes (since there is an employment relationship) and not as social security schemes; however, in many EU Member States civil servants are members of the general social security scheme ⁽⁶⁾ and treated accordingly in Table 29.

Statistical reporting on pensions can be presented in many ways, depending on the purpose of the analysis. Data on pensions in national accounts present an ‘accounting’ perspective. They show social insurance pension entitlements accrued by the end of a reporting period by the current workforce and retired persons broken down by:

- type of pension scheme — defined contribution schemes and defined benefit schemes;
- institutional sector and type of pension manager — private sector and government;
- type of recording — pension schemes recorded in the national accounts framework (all funded and private unfunded employment-related schemes) and pay-as-you-go schemes of general government (social security schemes and unfunded schemes for general government employees).

Table 29 is therefore organised as shown in the following tables.

Table 2: Table 29 columns

Recording	Core national accounts							Not in the core national accounts	Total pension schemes	Counterparts: entitlements of	
Pension manager	Non-general government			General government						resident households	non-resident households
	Defined contribution schemes	Defined benefit schemes and other non-defined contribution schemes	Total	Defined contribution schemes	Defined benefit schemes for general government employees			Social security pension schemes			
					Classified in financial corporations	Classified in general government	Classified in general government				
Column number	A	B	C	D	E	F	G	H	I	J	K

Accounting information are reported for each column, including stocks and flows leading to changes in entitlements.

⁽⁶⁾ In many European countries national accounts stocks information on schemes organised by government units for their own employees was also missing before the implementation of ESA 2010 Table 29, either because it is an employment-related scheme based on a pay-as-you-go approach, or forms part of a social security scheme.

Table 3: Table 29 rows

1	Pension entitlements
2	Increase in pension entitlements due to social contributions
2.1	Employer actual social contributions
2.2	Employer imputed social contributions (Defined benefit schemes only)
2.3	Household actual social contributions
2.4	Household social contribution supplements
2.5	Pension scheme service charges
3	Other (actuarial) change of pension entitlements in social security pension schemes
4	Reduction in pension entitlements due to payment of pension benefits
5	Changes in pension entitlements due to social contributions and pension benefits
6	Transfers of pension entitlements between schemes
7	Change in entitlements due to negotiated changes in scheme structure
8	Changes in entitlements due to revaluations
9	Changes in entitlements due to other changes in volume
10	Pension entitlements

2.2 Accrued-to-date liabilities

Table 29 reports on accrued-to-date pension entitlements (of pension beneficiaries) or liabilities (of pension providers) in social insurance and this concept of recording is not suitable for inferring the sustainability of pension schemes. A sustainability analysis of pension schemes requires different, more forward-looking calculation approaches, notably considering future flows of social contributions.

In particular, in the literature on pension liabilities (Franco (1995)), three main concepts of pension obligations can be identified:

- **accrued-to-date liabilities (ADL)** — pension entitlements contain the present value of pensions to be paid in the future on the basis of accrued rights. Accrued pension rights arise from already paid social contributions by current and past workers and normally depend on factors such as salary and length of employment service.
- **current workers' and pensioners' liabilities (CWL)** — allowance is made for the pension scheme to continue until the last current contributor dies. This concept covers ADL and the present value of pension entitlements that will be accrued by current contributors due to their future contributions. However, new entrants are excluded.
- **open-system liabilities (OSL)** — this liability concept also includes the present value of pensions of new workers entering the respective pension scheme. It is assumed that the pension scheme will be continued under current rules for a relatively long time horizon. The present value of OSL may be compiled over an infinite time horizon. For practical reasons, however, a limited perspective is typically chosen.

ADL figures therefore include future pensions of people already retired and future pensions of people working at present, corresponding to accrued rights, but exclude future pensions of people working at present corresponding to rights to be accrued over the rest of their career and future pensions of people not yet working/born.

In order to compile appropriate indicators for the sustainability of pension schemes, it is necessary to have information on future pensions and contributions based on an open system. In contrast, ADL figures should be simply interpreted as the amount of resources that would have to be set aside today in order to finance all pension rights which have been earned up to a given year (which is sometimes referred to as a 'scheme closure' scenario) ⁽⁷⁾.

Furthermore, the figures reported in Table 29 should not be considered part of government debt, as they are not of the same nature as debt instruments such as debt securities and loans (the level of pension entitlements may change due to assumptions and to government reforms).

2.3 Actuarial assumptions

Pension entitlements are recorded as positions in national accounts representing future payments of pension benefits. Moreover, the changes in positions between two points in time are also registered; these changes cover transactions, revaluations and other changes in the volume of assets.

Positions in pension entitlements are derived by applying actuarial estimation methods which are based on the net present value concept. Such actuarial estimation methods are used for all pension schemes. For pension schemes managed by non-government units, position data on pension entitlements are usually available based on business accounting and/or supervisory data sources. For defined benefit schemes for general government employees and for social security pension schemes, such data are not available and need to be compiled based on data taken from government finances and information on the number of people in each scheme. For such estimations various assumptions have to be made.

First, a suitable discount rate has to be chosen since pension entitlements are calculated in present value terms — in other words they reflect the discounted sum of present and future flows compared with a certain base year. Another key assumption concerns future wage growth. Often, the development of future pension levels is highly dependent on wage assumptions, for example via pension indexation. Further, demographic assumptions play a significant role in estimating pension entitlements. Finally, some other assumptions such as assumed inflation and (un)employment rates are also relevant to derive ESA 2010 Table 29 figures.

⁽⁷⁾ It is useful to note that a large (small) amount of ADL does not necessarily imply unsustainable (sustainable) pension schemes. In addition, where a country's ADL appears low in comparison to other countries, this may reflect a younger population structure. In this case, the ADL may experience stronger growth than countries with a more mature (elderly) population structure, as demographic developments take effect.

2.3.1 DEMOGRAPHIC ASSUMPTIONS

There are three principal indicators that are considered relevant in relation to demographic assumptions from population projections ⁽⁶⁾: life expectancy, the fertility rate and migration.

Assumed future life expectancy plays a crucial role. It determines the expected number of years the pension annuity is to be paid out. Consequently, pension entitlements may vary considerably if different life expectancies are applied. Life expectancies are calculated based on mortality tables already established for the modelling of pension and life insurance schemes. In the case of social security pension schemes covering a large part of the population, demographic data provided by Eurostat ensure a comparable data set across EU Member States.

The modelling of some pension schemes may involve the use of other demographic assumptions such as future fertility rates. Assumptions on the total fertility rate may play a role in certain benefit formulas under specific pension schemes, where, for example, future pensions might be linked to demographic developments, which are partly determined by projected fertility rates (or the projected number of births).

Migration is another factor that might be relevant for the estimation of pension entitlements. In some countries, individual pension levels may differ if contributors migrate. Different pension rules may apply to pensioners who choose to emigrate. Also, migration may play a role in the pension benefit formula — for example if a sustainability factor is applied as in notional defined contribution schemes. Here, those working on modelling at a national level have to make assumptions about how migration will develop in the future.

2.3.2 WAGE GROWTH

To estimate the pension entitlements of defined contribution schemes, no assumptions regarding wage growth are required. In such systems, pension entitlements depend solely on the financial assets accumulated through contributions, including the income from the investment of such assets.

By contrast, defined benefit schemes usually apply a formula to the member's salary (final salary, an average over a period of years, or lifetime earnings) to determine the level of the initial pension. Assumptions as to the future development of wages may have a significant impact on the level of pension entitlements when the approach recommended by IPSAS 39 is used ⁽⁷⁾. Generally, two factors lead to future wage growth: promotions/career progression and general wage growth in the economy.

There are two actuarial methods to measure the impact of wage increases: the 'accrued benefit obligation' (ABO) and the 'projected benefit obligation' (PBO). The former records only the benefits actually accrued to date, while the latter considers future promotions that a person is likely to receive and calculates the pensions-relevant salary accordingly. PBO is

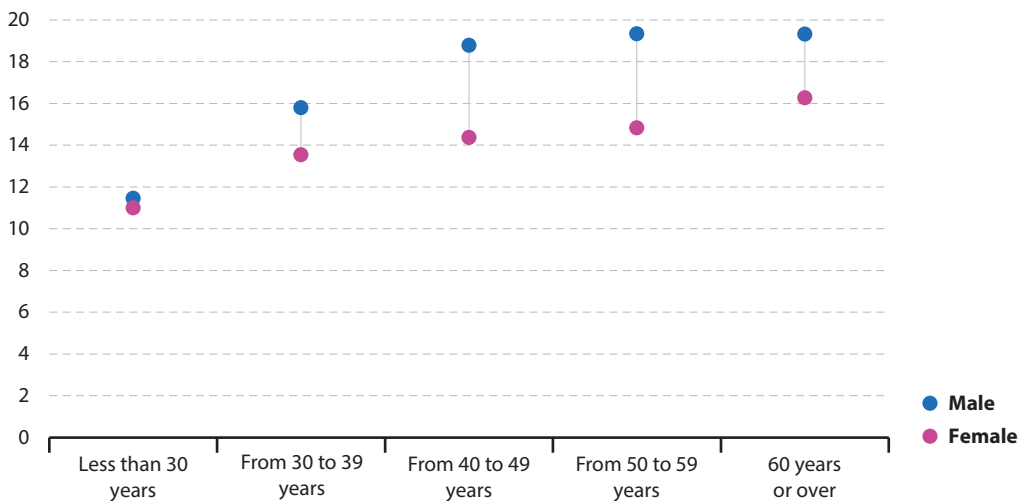
⁽⁶⁾ Detailed information on the methodology applied can be found at: <https://ec.europa.eu/eurostat/web/population-demography-migration-projections/population-projections-data>.

⁽⁷⁾ The International Public Sector Accounting Standards (IPSAS 39) recommends accounting for any estimated future salary increases that affect the benefits payable to measure pension obligations of defined benefit plans; see: <https://www.ipsasb.org/publications/ipsas-39-employee-benefits-2>.

always higher than ABO until the moment of retirement when the ABO catches up with the PBO. The choice between the two concepts may have a significant impact on the level of pension entitlements.

The career path of individuals is usually relatively age-specific. The earnings profile of people living in EU Member States generally increases during the employment cycle. In the EU, younger cohorts (defined here as those aged less than 30 years) generally earned less than their older counterparts in the workforce. With increasing age, average earnings tended to rise and they reached a maximum close to the end of working life. To approximate future career paths, it is useful to take the earnings profile for the base year as the basis. It is assumed that the present age- and sex-specific earnings profile will remain constant over time.

Figure 1: Age- and sex-specific earnings profile, 2014
(mean hourly wages in EUR)



Source: Eurostat (online data code: [earn_ses_hourly](#))

Based on Eurostat information from the structure of earnings survey, it may be observed that a male individual aged less than 30 years in 2014 in the EU could expect, on average, to earn almost 70 % more by the end of his career. A female individual aged less than 30 years could expect to earn almost 50 % more by the end of her career.

Career progression might differ between members of government-managed pension schemes for its employees and members of social security pension schemes. This is mainly due to differences in promotions between the private sector and the public sector. Therefore, earnings' profiles should distinguish between private and public sector employees, if possible.

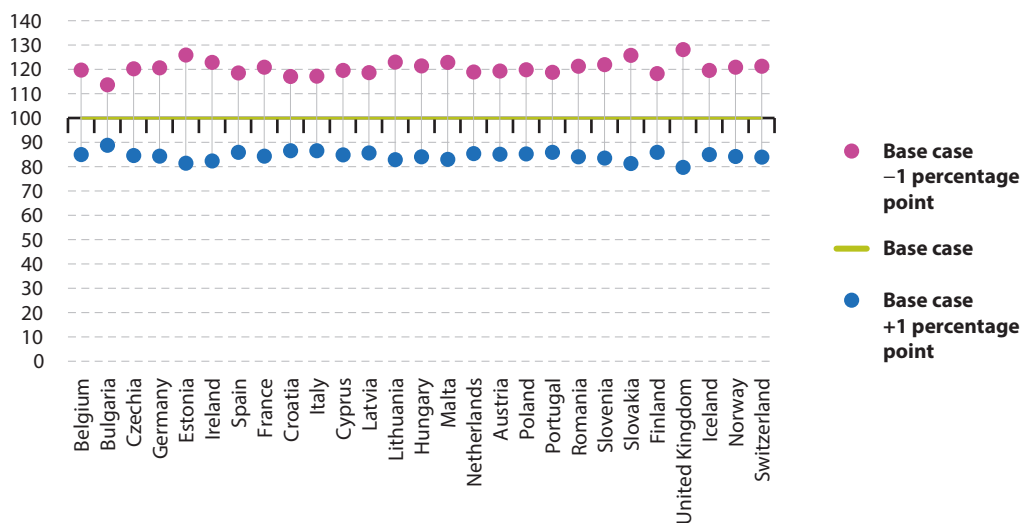
General wage growth in the economy also affects future pension levels. Since the development of future wages is uncertain, assumptions have to be made here as well. Generally, it is assumed that, over the long-term, wages will follow labour productivity growth per capita across the economy.

2.3.3 THE DISCOUNT RATE

The choice of the discount rate is one of the most crucial assumptions for estimating pension entitlements of general government employees and social security pension schemes, since its accumulated impact over many decades is quite high, as shown in the data published for Table 29.

Figure 2: Discount rate impact on pension entitlements of general government employees and social security pension schemes, 2015

(% change compared with the base case scenario)



Note: the base case is a real rate of 3 % (5 % nominal); the discount rates used for the first Table 29 data transmission (December 2017 for 2015 data) were based on the 2018 Ageing Report recommendations (European Commission (2017); European Commission (2018)).

Source: Eurostat (online data code: [nasa_10_pens2](#))

Pension entitlements are compiled based on the net present value method, in other words they reflect the value of a future payment stream for a given base year. For valuing a future stream of payments the discount factor (DF) may be used. It is calculated via the following equation:

$$(1) \quad DF_t = \frac{1}{(1+r)^{s-t}}$$

The discount rate r as part of the denominator determines the level of the DF . To calculate the present value in year t of a future pension benefit in year s this future payment needs to be multiplied by DF_t .

From the point of view of the creditor who earns the pension entitlements, the discount factor reflects the time value of money. It is the value of a future payment in terms of a present payment. Present payments are seen as worth more than future payments due to opportunity costs and possible risks associated with future payment streams. This means that the discount factor is generally smaller than one. From the debtor's point of view the discount rate is used to calculate the pension reserves to be set aside today to finance future pension obligations.

When coming to the choice of the discount rate for government-managed pension schemes, central government debt securities provide a suitable basis for r . Moreover, the choice of the discount rate should be based on the following criteria:

- in order to obtain a suitable proxy for a risk-free interest rate, it is advisable to base it not on central government debt securities of a single country but on a basket of central government debt securities of EU Member States;
- the maturity of these debt securities should be similar to that of pension entitlements, in other words at least 10 years, but preferably longer;
- in order to guarantee comparability across countries, the same discount rate should be applied to all EU Member States and all government-managed pension schemes (including social security pension schemes) at whatever level of government;
- a stable discount rate should be applied to avoid the noise resulting from frequent changes.

For the EU, in line with the above criteria, an Ageing Working Group⁽¹⁰⁾ recommended setting the discount rate at 3 % in real terms and 5 % in nominal terms for the first Table 29 data transmission (December 2017 for 2015 data). It may be noted that this discount rate will only be revisited periodically, thereby ensuring a degree of stability that is appropriate for projections over many years.

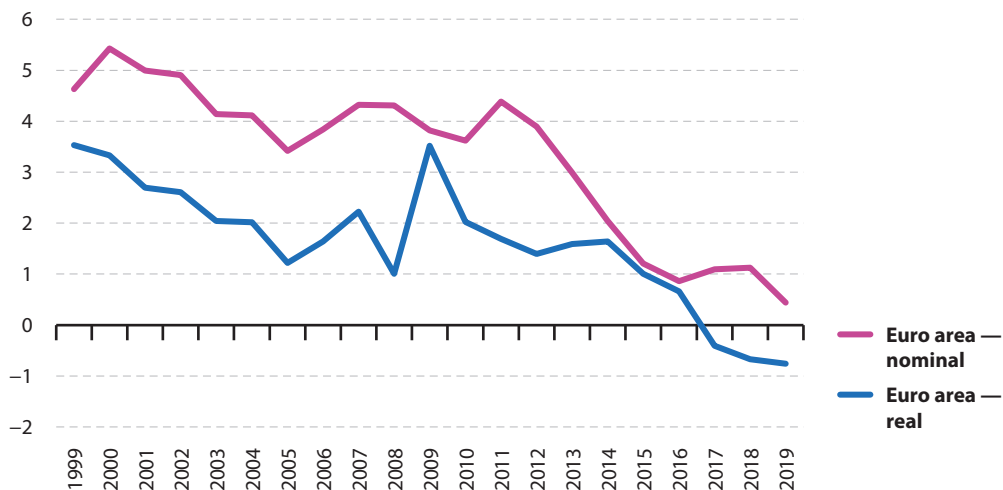
⁽¹⁰⁾ The Economic Policy Committee's Working Group on Ageing Populations and Sustainability (AWG) is constituted to contribute to improving the quantitative assessment of the long-term sustainability of public finances and economic consequences of ageing populations in the EU Member States, so as to assist policy formation. It is responsible for the publication of the Ageing Report, where the 'European' discount rate for the calculation of pension entitlements is set.

Considering recent developments in sovereign bond markets across the EU and following the most recent recommendations of the Ageing Working Group, lower discount rates, of 2 % and 4 % respectively (in real and in nominal terms) have been fixed for the next Table 29 data transmission exercise (December 2020 for 2018 data); this will likely lead to higher values for pension entitlements and liabilities.

Based on both the sensitivity analysis and the illustration of recent developments in sovereign bond markets in the EU, the importance of a common and realistic discount rate is crystal clear.

Figure 3: Maastricht criterion interest rates, 1999-2019

(%)



Note: based on monthly data. Interest rates in real terms are derived from the nominal rates minus the harmonised index of consumer prices (2015 = 100).

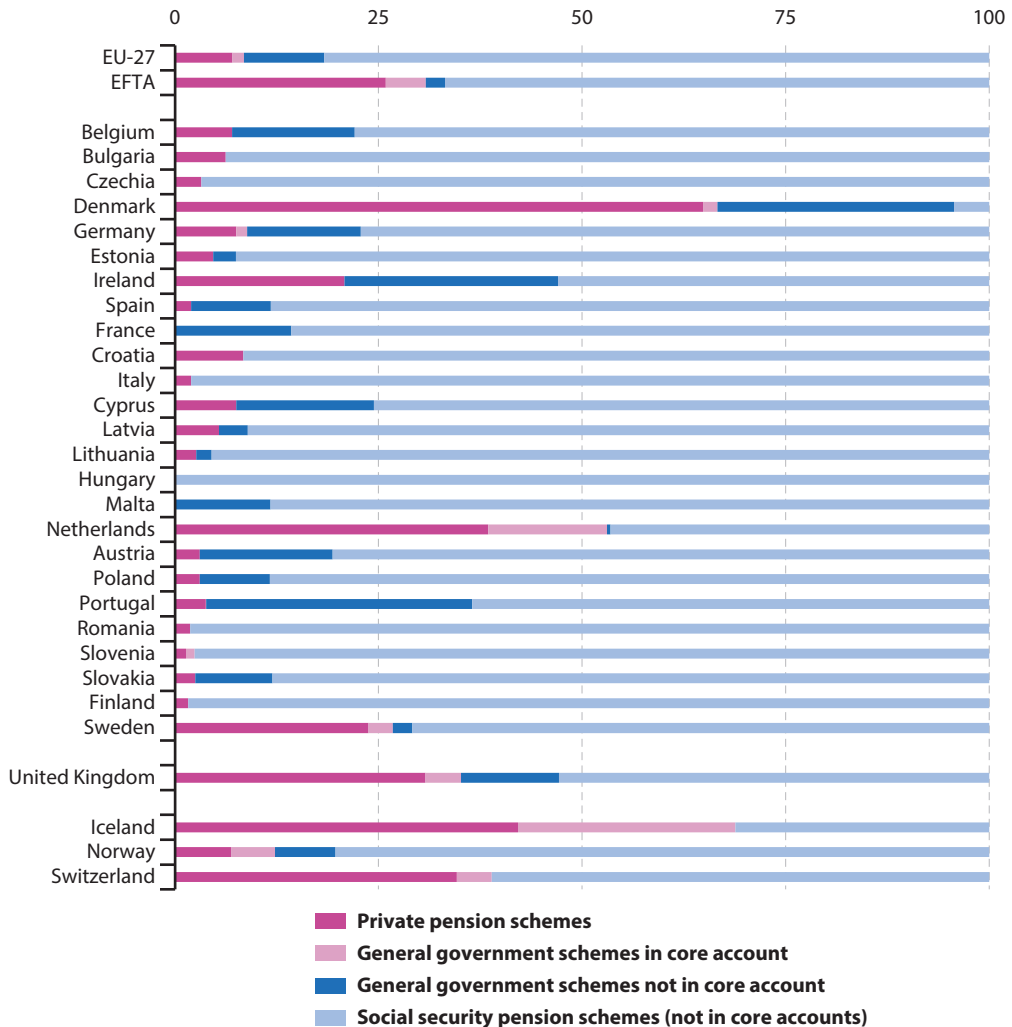
Source: Eurostat (online data codes: [irt_lt_mcby_m](#), [irt_lt_mcby_m](#) and [prc_hicp_aind](#))

3. Pension data in ESA 2010

3.1. Table 29 results

Since each national pension system has its own history and its own uniqueness, figures published for Table 29 show heterogeneity in terms of both levels and the composition of accrued-to-date pension entitlements, where the levels refer to total pension entitlements relative to a country's GDP and the composition refers to the share of private pensions in total pension entitlements.

Figure 4: Composition of pension entitlements, 2015
(% of total)



Note: EU-27, excluding Greece and Luxembourg. EFTA: excluding Liechtenstein. Greece and Luxembourg: not available.

Source: Eurostat (online data code: [nasa_10_pens1](#))

There are 25 EU Member States plus the United Kingdom, Iceland, Norway and Switzerland that have published data on national pension entitlements according to the ESA 2010 transmission programme. Data for Table 29 below cannot be used to make inferences in relation to any structural trends concerning pension entitlements in these European countries. That said, there are a number of reflections that might be made when analysing the data shown.

Data are available from Table 29 on the composition of pension entitlements for 29 European countries. It is clear that private pension schemes are not so common in most of these European countries. They were not recorded in France, Hungary and Malta and their share of total pension entitlements did not exceed 10 % in a further 19 countries. It is interesting to observe that countries with significant private occupational pension schemes tended to be located in western European or Nordic countries, where a broad welfare system has also traditionally been present.

Moreover, it can be observed that funded general government pension schemes are relevant in roughly the same countries as those where private pension schemes represent a relatively high share of total pension entitlements.

On the contrary, general government social security schemes that are pay-as-you-go schemes and unfunded schemes for general government employees represent (almost) the totality of households' pension entitlements in most of the southern and eastern European countries.

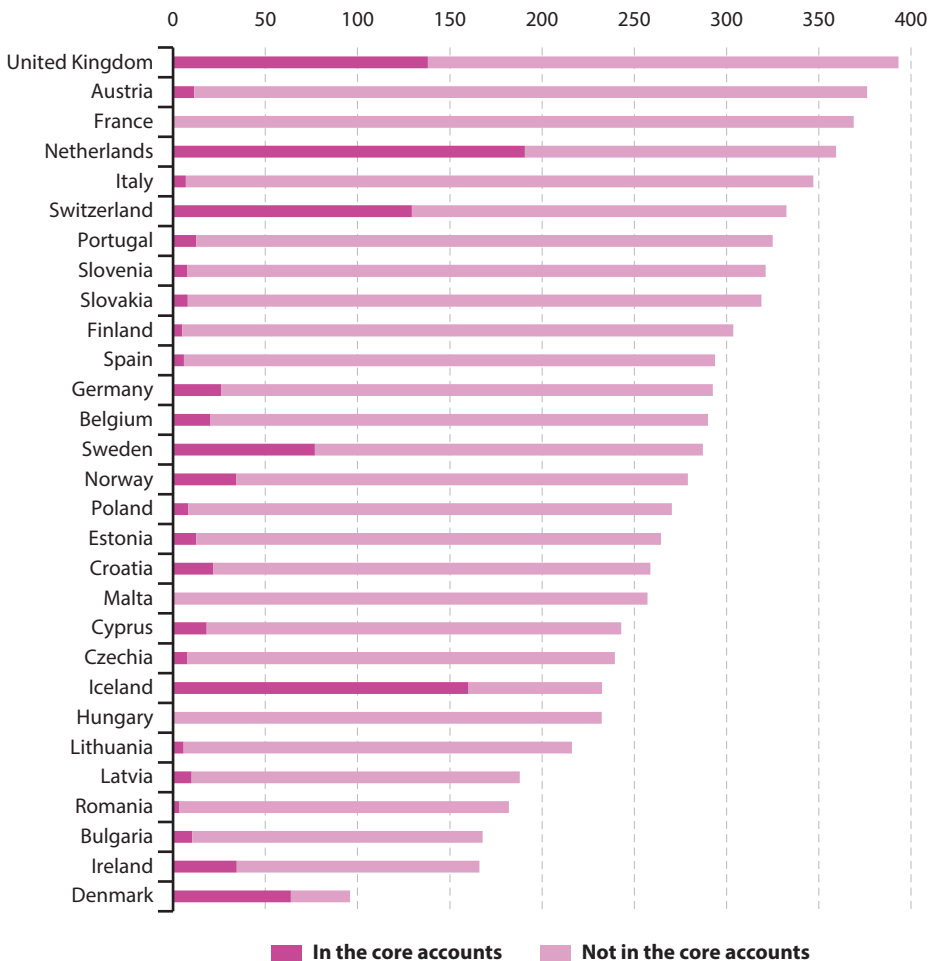
For the sake of completeness, it should be also noted that in many of the countries that joined the EU in 2004 or more recently, occupational pension insurance schemes were established fairly recently and these do not yet cover full career entitlements, contrary to the situation in the other European countries studied.

Pension entitlements relative to GDP also show heterogeneous results across European countries. There were four countries where this ratio was above 350 %, with considerable heterogeneity even among this restricted group. In the United Kingdom and the Netherlands, a significant share of total pension entitlements was formed by private pension schemes and funded government schemes. By contrast, in Austria and France schemes not recorded in the core accounts amount to almost 100 % of total pension entitlements (100 % in France). Overall, 10 countries reported pension entitlements that were equivalent to more than 300 % of GDP, 14 had ratios between 200 % and 300 %, and five recorded ratios that were below 200 %.

Moreover, a specific consideration holds for the 13 Member States that joined the EU in 2004 or more recently, as compared with the other 16 European countries for which Table 29 information are available. These 'more recent' EU Member States had lower pension entitlements relative to GDP (247 %) than the average (323 %) for all 29 countries. Furthermore, these 13 Member States also had a different structure to the composition of pension entitlements, as columns G and H (see Table 2 above) represented 97.0 % of their total pension entitlements, compared with an average of 84.7 % for all 29 countries.

Figure 5: Pension entitlements relative to GDP, 2015

(%)



Note: Greece and Luxembourg, not available.

Source: Eurostat (online data codes: [nasa_10_pens1](#) and [nama_10_gdp](#))

Finally, it is important to give some background to explain the figures shown for Denmark. The very low share of pension entitlements expressed relative to GDP in Denmark (below 100 %) may be explained by the fact that, according to the ESA 2010 rules, most pension entitlements are not included in social insurance but in social assistance and, according to ESA 2010, should be excluded from Table 29. This concerns in particular, the so-called 'Danish universal flat-rate benefit' ('Folkepension' in Danish), which is financed by general taxation rather than social contributions; it is therefore independent of the employment status of beneficiaries and any employment-related social contributions.

3.1.1 SENSITIVITY ANALYSIS

Table 29 includes a sensitivity analysis to assess the impact of the discount rate on 2015 pension entitlements of general government employees and social security pension schemes. Published data confirm the importance of a common and realistic discount rate to allow for international comparability of statistics on pensions.

Table 4: Sensitivity analysis of Table 29 pension entitlements, 2015
(million EUR)

	Base case -1 percentage point	Base case	Base case +1 percentage point
Belgium	1 345 507	1 123 394	955 829
Bulgaria	81 692	71 861	63 853
Czechia	469 711	390 371	330 385
Denmark	:	:	:
Germany	9 745 970	8 079 140	6 818 550
Estonia	65 999	52 384	42 654
Ireland	424 900	345 500	284 600
Greece	:	:	:
Spain	3 678 476	3 102 318	2 665 228
France	9 804 000	8 108 000	6 837 000
Croatia	123 763	105 688	91 495
Italy	6 603 446	5 631 628	4 875 826
Cyprus	47 911	40 044	34 004
Latvia	51 504	43 403	37 196
Lithuania	96 717	78 559	65 153
Luxembourg	:	:	:
Hungary	316 554	260 615	219 100
Malta	30 549	24 841	20 625
Netherlands	1 385 508	1 164 296	993 897
Austria	1 499 284	1 255 532	1 069 407
Poland	1 352 364	1 127 612	962 232
Portugal	667 480	561 751	482 877
Romania	347 470	286 358	240 827
Slovenia	148 490	121 709	101 738
Slovakia	312 275	248 052	201 679
Finland	747 019	631 547	542 795
Sweden	:	:	:
United Kingdom	8 631 482	6 736 087	5 375 045
Iceland	13 590	11 364	9 668
Norway	1 029 533	850 838	716 662
Switzerland	1 509 349	1 244 000	1 044 883

Note: the base case is a real rate of 3% (5% nominal); the discount rates used for the first Table 29 data transmission (December 2017 for 2015 data) were based on the recommendations of the 2018 Ageing Report (European Commission (2017); European Commission (2018)).

Source: Eurostat (online data code: [nasa_10_pens2](#))

The importance of a correct and clear communication strategy concerning data for Table 29 is apparent when looking at the sensitivity analysis results. On the one hand, these figures are necessary to complete the picture on household wealth; on the other hand, they crucially depend on the discount rate. In Section 2.2.3 the focus was on percentage changes as compared with a base case scenario (based on a fixed discount rate for 2015). Here the focus is on figures in euro terms (EUR), whereby a change of +/-1 percentage point in the discount rate can result in households' pension entitlements fluctuating by +/- billions of euro bearing in mind the inverse relationship between the discount rate and accrued-to-date pension entitlements.

3.2 Methodological issues

In contrast to social insurance benefits, social assistance benefits are payable without qualifying contributions having been made to a social insurance scheme. Usually all resident households are entitled to apply for social assistance but the conditions under which it is granted are often restrictive. Generally, benefits are means-tested, including an assessment of available income and property.

Sometimes it may not be feasible (or not sufficiently important) to separate elements of social assistance within pension schemes organised as social insurance. In these exceptional cases, social assistance benefits might be included in the data recorded by countries in the supplementary table, accompanied by suitable metadata for users.

The distinction between social insurance and social assistance: an example

Under social insurance, participants are obliged, or encouraged, by their employers or general government, to take out insurance against certain eventualities or circumstances (Eurostat (2013) § 4.88). By contrast, social assistance benefits in cash are current transfers payable to households by government units or non-profit institutions serving households to meet the same needs as social insurance benefits but which are not made under a social insurance scheme requiring participation (Eurostat (2013) § 4.105).

In Country A the basic pension granted independently of contributions history is excluded from Table 29 — being classified as social assistance, whereas topping-up to the minimum pension has been retained, being based on specific conditions.

In Country B the social security pension consists of both a flat-rate part and a contributory part. The flat-rate part (the basic pension) is partially contributory in the sense that a certain amount is granted only if a contribution record of at least X years can be proved (independently of the amount of the contributions paid) and additional conditions (citizenship, for example) also need to be satisfied. In this case, the whole flat-rate part might be included in Table 29 since, as mentioned also in ESA 2010 § 17.122 in practice, it may not be feasible, or sufficiently important, to completely separate the non-pension social insurance elements. Elements of social assistance within pension schemes generally organised as social insurance may not be separable, and so occur in the supplementary table.

Individual insurance policies related to pensions are policies that beneficiaries take out in their own names without being members of a scheme organised collectively for groups of employees, as in the case of social insurance. They are based on contracts which are (generally) made with individuals and which are not organised collectively. These individual insurance policies are not part of social insurance, are not employment-related and therefore are not recorded in Table 29.

The boundaries of Table 29: an example

ESA 2010 clearly says that individual pension schemes are not part of social insurance and therefore should not be included in Table 29. It explains the background for their exclusion as follows: *For a life insurance policy the benefits from the policy are treated as changes in wealth, recorded in the financial account. For a policy qualifying as social insurance, the benefits in the form of pensions are recorded as income in the secondary distribution of income account. The reason for the different treatment is that a policy other than social insurance is entered into entirely on the initiative of the policyholder. Policies that qualify as social insurance reflect the intervention of a third party, usually the government or the employer, to encourage or oblige the policyholder to make reserve for income in retirement (ESA 2010 § 16.68).*

However, the practical classification of single schemes into one category or another may be difficult in some cases; the following example illustrates this.

Characteristics of an AAA pension plan: *AAA plans offer more flexibility. They are known as ‘contract-based DC plans’ and operate on a different basis to occupational DC plans (OECD (2008)); In an AAA, the scheme is run by a pension provider that your employer chooses, but your pension is an individual contract between you and the provider (national source).*

Characteristics of a BBB pension plan: *Contributions are made by individuals, employers, or both. Employees who participate in a company pension plan may only make contributions to a BBB if company pension plan rules prohibit them from making additional voluntary contributions (OECD (2008)); employers that do not provide an occupational pension scheme for their employees are obliged to provide access to at least one BBB (national source).*

AAA and BBB pension plans are similar for several reasons:

- in both cases, pensions are contracts between an individual and a provider;
- in both cases, the role of the employer is of a ‘facilitator’, setting a contact between the individual and the provider;
- both schemes seem to be ‘portable’ — in other words from one job to another.

Still, they present some minor but crucial differences. Concerning portability, if a person changes jobs under an AAA scheme, his or her group personal pension is normally automatically converted into a personal pension and the worker continues paying into it independently. However, it is necessary to check if the new employer offers a pension scheme. A worker may be better off joining the new employer’s scheme. Under a BBB scheme, if a worker’s new job allows him or her to become a member of an occupational pension scheme, the worker may transfer their BBB into that scheme. Alternatively, if the new job is not pensionable or if the worker becomes self-employed, he/she can continue to contribute to his/her BBB scheme. Another difference is that AAA schemes are personal schemes but related to employment, while BBB schemes are more flexible and are available to everyone regardless of job or employment status. However, BBB schemes can also be seen as a supplement to occupational schemes, since an employer who offers an occupational pension

scheme that does not allow employees to make additional voluntary contributions must make a BBB scheme available, either as part of the existing occupational pension scheme (this requires an amendment to the rules of the scheme) or as a separate additional voluntary contributions scheme.

It is apparent that the two schemes presented above are very similar. However, due to their slight differences in terms of their relation to employment status, they are treated differently in Table 29: AAA is included and BBB is excluded.

Another interesting topic is that of ‘fully portable’ schemes where a worker who changes job can choose to bring his or her ‘pot’ into the next employer’s scheme or put the money to another use. There are currently a few schemes designed in this way across Europe, and it is questionable whether or not they should be identified as pension schemes. If a worker moves his or her resources each time into a new employer’s scheme, then at retirement there is a substantial resource to be used for retirement (thus the scheme could be considered a pension scheme). However, this may not be the case, in which case the scheme should rather be considered as a type of saving scheme. Only observation of the operation of the scheme in practice can determine if members actually use it as a pension scheme (or not).

3.3 The way forward

In 2011, Eurostat and the European Central Bank produced a first version of a *Technical Compilation Guide for Pension Data in National Accounts* (Eurostat and the European Central Bank (2011)), and this formed the background for the first compulsory transmission of data to Eurostat by EU Member States’ statistical authorities for the years 2014 and 2015 and their subsequent publication. Throughout the work, a clear distinction has been made for users between statistical data and sustainability analyses.

One of the improvements introduced in ESA 2010 was enhanced statistical reporting on pensions, including accrued entitlements of households and Table 29 of the ESA 2010 transmission programme reflects this improvement.

Cooperation is established between Eurostat, the EU and EFTA Member States, and relevant bodies including the Economic Policy Committee’s Working Group on Ageing Populations and Sustainability (AWG), the European Central Bank and the Actuarial Association of Europe. Annual meetings of the Pensions Expert Group are organised to discuss existing methodological and practical issues and provide the basis for Table 29 data transmissions.

An updated version of the technical compilation guide was released in September 2020, as the transmission of 2018 data for Table 29 was expected by the end of the year. This updated version incorporates a targeted revision of the 2011 guide, including an expanded section on the actuarial approach, updated economic and demographic assumptions for the actuarial calculations and new/augmented data sources.

Moreover, there is constant cooperation between Eurostat and the AWG, which plays an important role in the setting of common assumptions with statistical compilers. Given that the statistical timetable has been established to match the same frequency as the AWG's three yearly cycle ⁽¹⁾ there are several areas where mutually beneficial cooperation can take place, including an assurance that common assumptions are used. There are important differences between statistical data on pensions and the sustainability analyses carried out by the AWG. It is therefore essential that users are fully aware of these differences when the respective information is published.

4. Conclusions

Table 29 provides a comprehensive overview of households' pension entitlements, an important part of households' wealth, and reflects the impact over time of social insurance systems to build entitlements to income during retirement.

Traditionally, official statistics use indicators such as GDP to describe economic developments. However, GDP on its own says nothing about how people are faring. In 2011, the European Statistical System Committee (ESSC) adopted a report on *Measuring Progress, Well-being and Sustainable Development*, identifying three key areas to 'change the paradigm', one of these being better and more complete information on households' income, consumption and wealth. Table 29 is therefore a fundamental tool to broaden the picture on households in the EU, and this paper guides the reader as to how Table 29 figures should be presented and interpreted.

It should be borne in mind that accrued-to-date pension entitlements in social insurance are not suitable as a measure for analysing the sustainability of pension schemes and should not be considered as part of government debt. Sustainability analysis of pension schemes requires different, more forward-looking calculation approaches, notably considering future flows of social contributions. This analysis is provided along with the Ageing Report published every three years by the European Commission — Directorate-General for Economic and Financial Affairs.

⁽¹⁾ The Ageing Report, including economic and budgetary projections for the European Union Member States is published every three years.

Acknowledgements

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