



Supply-Use tables for the digital economy

Experimental research

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1. Introduction and background

The effects of digitalization on the economy are largely hidden in the supply and use tables of the national accounts framework. In order to improve the visibility of digital products and digital industries, the Organisation for Economic Co-operation and Development (OECD) has developed guidelines and templates for supply and use tables for the digital economy (digital SUTs). In this report, Statistics Netherlands (CBS) completes the templates designed by the OECD to the fullest extent possible for the Dutch economy, and discusses the main findings. The reference period for this research is the year 2018, and all results are noted in terms of nominal prices.

The experimental ‘beyond SNA 2008’ products which are part of the digital SUTs according to the OECD guidelines¹, such as free services and investments in data, are not included in this study. As a result, the macro figures (such as GDP) are identical in both the digital SUTs and the standard SUTs.

The report is structured as follows. First, chapter 2 provides a brief description of the digital SUTs framework and its operational approach. Chapter 3 and 4 follow with a discussion of the relevant data sources and methods used to identify digital industries and digital products respectively. The fifth chapter presents data sources, methods, results and feasibility of transaction type specifications. The resulting digital supply and use tables are discussed in detail in chapter 6. Finally, chapter 7 ends with a discussion of the estimation process and recommendations for future iterations.

This research is experimental and all results may be subject to change when new data sources or methods are available. Funding for this research project has been made available by Eurostat through the ESTAT-2020-PA2-PA4-C-NA European statistics grant program. The objective of this grant scheme is: “experimental statistics on digital economy satellite accounts (supply and use tables)”.

¹ [Guidelines for Supply-Use tables for the Digital Economy](#) (OECD, 2019)

2. Supply-Use tables for the digital economy

2.1 Introduction to the conceptual framework

To facilitate the measurement of the digital economy, the OECD has developed digital supply- and use tables (SUTs) as a conceptual framework. The digital SUTs are a restructuring of the standard SUTs by introducing the following seven new digital industries:

1. Digitally enabling industries
2. Digital intermediary platforms charging a fee
3. Data and advertising driven digital platforms
4. Firms dependent on intermediary platforms
5. E-Tailers
6. Digital only firms providing financial and insurance services
7. Other producers only operating digitally

Some of these digital industries are defined by inclusion of NACE activities, while others are defined by their main means of sales to customers (e.g. 'E-Tailers' and 'Firms dependent on intermediary platforms'). This results in classes that are not mutually exclusive. For enterprises that match the criteria of multiple digital industries, the OECD guidelines provide a 'digital industry decision tree' for prioritization (Appendix 1).

Besides the aforementioned digital industries, the digital SUTs also introduce four new digital products to the current scope of the National Accounts (SNA 2008):

1. ICT goods
2. Priced digital services – except cloud computing services and digital intermediary services
3. Priced cloud computing
4. Priced digital intermediary services

Any products that do not fall under these four categories are also further classified as either 'significantly affected by digitalization' or 'other'. The OECD framework also includes data, free digital services provided by enterprises and free digital services provided by communities as digital products that are beyond the SNA 2008 scope. This study does not include data nor free services as digital products. The aforementioned topics are already subjects of separate research projects² in the National Accounts department of Statistics Netherlands. Including the results and findings of these studies into the digital SUTs seems desirable and is recommended for future research.

Aside from the new columns specifying digital industries and the new rows specifying digital products, the row dimension is also used to differentiate the manner in which products are ordered (transaction types). We distinguish between four different transaction types:

- Digitally ordered
 - Digitally ordered directly from a counterparty
 - Digitally ordered via a resident digital intermediary platform
 - Digitally ordered via a non-resident digital intermediary platform
- Not digitally ordered

Finally, the supply table in the DSUTs includes two additional columns differentiating digitally delivered services from non-digitally delivered services. This delivery specification is presented at the product level, and is included for the total output of digital industries, the total output of other industries, and total imports.

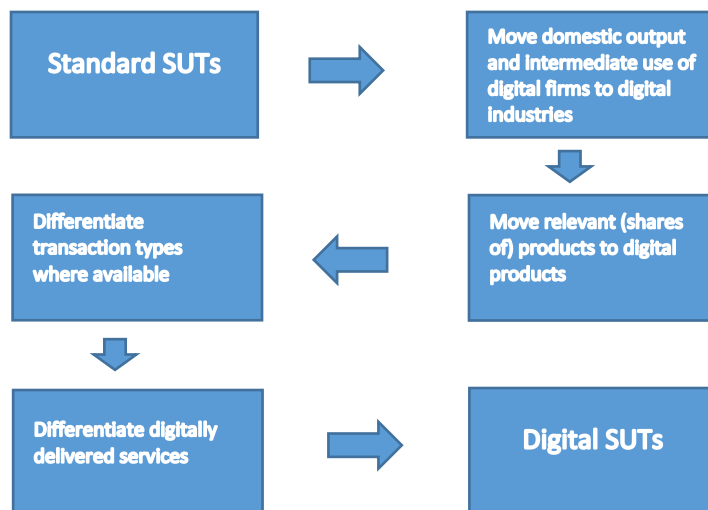
² Free services (CBS, 2019c) and De Waarde van Data (Value of Data) 2001-2017 (CBS, 2021)

2.2 Operational approach for the framework

The standard SUTs are used as the starting point for the digital SUTs, on the most detailed level available for internal use at Statistics Netherlands (CBS). As the scope of the project is limited to the products in the 2008 SNA, the rows (digital products) and columns (digital industries) added to the tables are filled with economic activities that are already included in the regular SUTs. Filling the new rows and columns for digital products and industries therefore means reallocating the exact same values from rows and columns already present in the standard SUTs. This process starts with the estimation of the amounts to be shifted from a respective cell in the standard SUT to a digital product and/or industry. To process this re-allocation of values from the standard supply and use tables into an expanded supply and use table containing digital industries and products, an automation system was programmed in R. R is an open source programming language and software environment mainly used for statistical computing, but also contains many capabilities for data processing and data transformation.

The automated data processing system takes as input a data file containing several columns indicating for each row: whether the row pertains to supply or use, the origin industry, the origin product group, the target industry, the target product group, the value to be re-allocated, and an indicator of the quality of the observation. The system applies each of these re-allocation rows to the standard supply and use tables and returns an expanded supply and use table which contains digital industries, digital products, and a quality indicator. Following, separate input files are used to expand these tables with four rows specifying the value for each transaction type. These input files contain: an indication of whether the row pertains to supply or use, the industry, the product, the fraction digitally ordered, the fraction non digitally ordered, the fraction ordered through digital intermediary platforms, the fraction ordered digitally directly from a counterparty, and a quality indicator. Finally, the columns regarding digitally delivered services are filled using an input file containing a digital delivery fraction for each service.

Figure 2.1: Sequence of re-allocations from standard SUTs to digital SUTs



Matching results for digital industries or products based on data sources with the figures of the standard SUTs has proven to be a difficult task. The balancing of accounts, corrections on data sources, redistribution schemes, as well as the fact that national accounts prioritize the precision of year-on-year growth rates over the precision of absolute figures, all contribute to a disconnection between the values in the original data sources and the values in the standard SUTs presented in the national accounts. These issues were resolved by calculating the proportions of digital firms or products to be shifted from the standard industries or products from the data source, rather than calculating the value to be shifted from the data source. This implies that any discrepancies between the data source and the standard SUTs are re-allocated proportionally. These proportions are applied to the values in the standard SUTs in order to calculate the values to be re-allocated to the new columns and rows.

In the standard SUTs, the product structure of output or intermediate consumption for each industry is based on the most detailed information available from e.g. SBS data when the national accounts are revised. This may be once every five years. The most recent revision was for the reference year 2015. In between revisions the data used to compile SUTs is somewhat aggregated for the purpose of stability. So, the re-allocation of output and intermediate consumption by product in 2018 is based on the aggregated SBS data.

3. Digital industries

The identification of relevant business units differs for each of the 7 digital industries. The methods and data sources for each digital industry are discussed in the following sections, 3.1-3.6.

3.1 Digitally enabling industries

Objective

Businesses included in the digitally enabling industries can be identified by their NACE class in the business registry. The full list of relevant ICT industries, as defined in the ISIC classification, are retrieved from the OECD guidelines. These ISIC classes can be matched to NACE classes³, which is the classification used in the business registry of Statistics Netherlands. Output, intermediate consumption and value added of each of the identified businesses will be re-allocated from manufacturing, wholesale and services industries to the digitally enabling industries. For compilation purposes, a further distinction is made between “enablers” in manufacturing, trade and services.

Data source

The Structural Business Statistics survey (SBS) provides the relevant data for a large sample of businesses in the enabling industries.

Methodology

Identifying which business should be part of the digitally enabling industries is done through their NACE class. Some business units in the scope of the NACE classes of the enabling industries are included in other digital industries (e.g. intermediary platforms). According to the ‘Digital industry decision tree’, these are not included in the enabling industries.

Some ICT industries are direct one to one matches with an industry/column in the detailed SUTs compiled by Statistics Netherlands, which means that the entire column can be shifted to the digitally enabling industries. This is the case for ‘*Wholesale of computers, peripheral equipment and software*’ (NACE Rev. 2, 46.5.1), ‘*Wholesale of electronic- and telecommunication equipment and parts*’ (NACE Rev. 2, 46.5.2), ‘*Telecommunication industries*’ (NACE Rev. 2, 61), and ‘*Computer service industries*’ (NACE Rev. 2, 62).

In all other cases, the ICT industries make up only part of an industry as available in the standard SUTs compiled by Statistics Netherlands. For these industries, the SBS sample is used to identify individual business units that are in relevant NACE classes, and their share in the industry for which the SUTs are compiled. For example, the industry ‘*Publishing activities*’ (NACE Rev. 2, 58) is readily available from the compilation process of the standard SUTs, but the relevant subclass ‘*Software publishing*’ (NACE Rev. 2, 58.2) is not. The SBS data is used to calculate the shares of supply, use and value added to be re-allocated from each standard industry to the digitally enabling industry. Since the SBS is a sample survey, the sampled businesses need to be incremented/weighted.

The standard weights available in the SBS data are based on groups of NACE classes (SBS NACE groups). If the NACE classes relevant for the enabling industries match a SBS NACE group in full, it is self-evident that the standard SBS weights are appropriate. For example, ‘*Software publishing*’ (NACE Rev. 2, 58.2) is a SBS NACE group, and therefore the available weights can be used directly. In other cases, the NACE class relevant for the digitally enabling industries is a subsection of a SBS NACE group. For example, the SBS NACE group ‘*Manufacture of computers, electronic and optical products*’ (NACE Rev. 2, 26) consists only partly of NACE classes relevant for the enabling industry. For example, ‘*Manufacture of computers and peripheral equipment*’ (NACE Rev. 2, 26.2) is

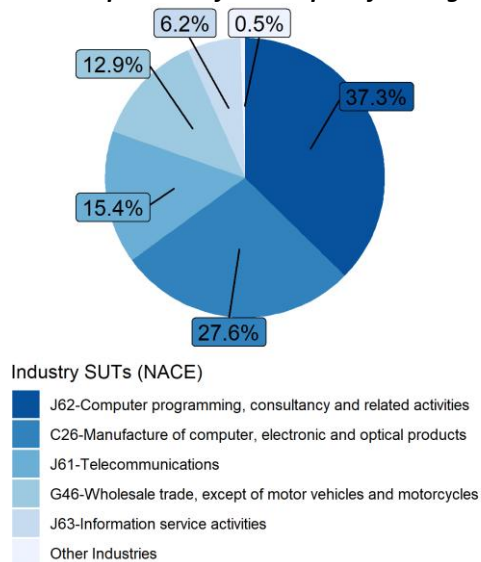
³ [Standard Industrial Classifications \(Dutch SBI 2008, NACE and ISIC\) \(cbs.nl\)](https://cbs.nl/en-gb/indicators/indicators-overview/standard-industrial-classifications)

relevant, while ‘*Manufacture of irradiation, electromedical and electrotherapeutic equipment*’ (NACE Rev. 2, 26.6) is not relevant. Since the SBS weights aim to estimate appropriate values for the SBS NACE group, these weights may not be appropriate for estimations of subgroups. The standard weights, readily available in the SBS data, were therefore compared to weights based on the VAT (turnover) data compiled specifically for our purpose. As the results for the two weights are nearly identical, it was decided to apply the standard SBS weights in all cases.

From the SBS data the fractions of the NACE classes relevant for the digitally enabling industries in each industry in the standard SUTs are compiled. These fractions are then applied to the corresponding values for each product-industry combination in the standard SUTs, so that the aggregate values (digital industry and non-digital industry) in the DSUTs match up to the standard SUTs.

The digitally enabling industries are compiled from several NACE industries. Figure 3.1 presents the composition of the output of this digital industry.

Figure 3.1: Composition of the output of the digitally enabling industries



3.2 Digital intermediary platforms charging a fee, or advertising driven

Objective

Since the most recent NACE classification does not specify classes for digital intermediary platforms, individual platforms are currently registered across many different NACE classes in the business registry. In the digital SUTs, all sorts of platforms (e.g. retail, accommodation, transport or employment) are placed into one of two platform industries based on their business model, being either fee driven or advertisement driven. Only enterprises for which operating a platform is their main activity are included in the digital intermediary platform industries.

Data sources

To determine for which business units the main source of revenue is the operation of a platform, we employ a survey by Statistics Netherlands on resident digital intermediary platforms (CBS, 2021b). From this survey, we retrieve the subsection of businesses for which the survey answers indicate they operate an online platform, and have fifty percent or more of their employees working specifically for the platform. As the population of businesses participating in the survey is incomplete and misses some platforms that play a key role in the economy, we further extend the resulting subsection with large platforms based on expert knowledge. The

resulting population consists of 430 businesses with intermediary platforms as their main activity, of which 18 are included based on expert knowledge.

In order to make the distinction between platforms charging a fee and advertising driven platforms, we employ answers on survey questions based on the sources of revenue for the business in question. If these questions were left unanswered, we employ survey questions regarding the (non)requirement of payment for both users and providers on the platform. In case neither the users nor providers pay a fee, we assume the platform to be advertising driven. In any other case, the platform is specified as a platform charging a fee. Lastly, for any business for which both sets of survey questions are unanswered, we employ expert opinion to determine the payment model of the platform.

Of the derived platform population of 430 businesses, 356 are indicated as platforms charging a fee. Of this subsample of fee-driven platforms, 34 businesses are present in the SBS data. While this is only a small subsection of the population, it makes up the vast majority of the total revenue (based on VAT turnover data) of fee-driven platforms, roughly 99%. We can therefore use the data on this subsample to make estimates for the rows and columns of the SUTs for the entire industry “Digital intermediary platforms charging a fee”. The industry and product values are scaled up based on the total revenue of the population present in the SBS compared to the total revenue of all 356 fee-driven platforms in order to correct for the small difference in populations.

The other 74 of the 430 intermediary platforms are indicated as data and advertising driven digital platforms. Of these 74, we only observe 13 in the SBS data. However, these 13 businesses make up roughly 96% of the total revenue of data and advertising driven platforms. Equivalent to the method for platforms charging a fee, the industry and product values are scaled up based on the total revenue of the survey population compared to the complete population of 74 data and advertising driven platforms.

Methodology

As stated in the previous paragraphs, the values for the platforms included in the SBS survey are incremented to the total platform population. These increments are calculated based on the total revenue in the VAT registry. Like the digitally enabling industries, the proportion of the SBS platform subsample in the full SBS sample is determined for each product-industry combination. These shares are subsequently applied to each product-industry combination in the standard SUTs.

The origin industries from which the most value gets reallocated to fee driven digital intermediary platforms are ‘Travel agency activities’ (NACE Rev. 2, 79.1.1), ‘Computer programming, consultancy and related activities’ (NACE Rev. 2, 62), and ‘Information service activities’ (NACE Rev. 2, 63). For advertisement driven platforms, most of the value gets allocated from the ‘Retail trade, except of motor vehicles and motorcycles’ (NACE Rev. 2, 47), ‘Information service activities’ (NACE Rev. 2, 63), and ‘Advertising and market research’ (NACE Rev. 2, 73) industries.

3.3 Firms dependent on intermediary platforms

Objective

Regardless of the economic activity, any business unit that sells the majority of its products through digital intermediary platforms should be re-allocated from its NACE class in the business registry to the digital industry ‘firms dependent on intermediary platforms’. For our methodology, we differentiate between several types of businesses.

Data sources

The ICT usage survey includes a follow-up question on the sales made through digital intermediary platforms for any businesses that make part of their sales online (website or app). However, the ICT usage sample for 2018 exclusively covers businesses with two or more employees. This could be troublesome if a large proportion of firms dependent on intermediary platforms are self-employed without any employees. In order to deal with this limitation, additional data sources are used for: drivers for Uber and similar platforms, hosts of holiday rentals on Airbnb and similar platforms, and home cleaners on Helpling or similar platforms.

Research by SEO Amsterdam Research (2018) provides estimates of the number of drivers on Uber and similar platforms (4,750) and their average gross monthly earnings (approximately €1,000) in 2017. Follow-up research performed by SEO Amsterdam Research (2020) for 2019 shows a slight decrease in both gross monthly earnings as well as number of drivers, although the authors stress that a one-on-one comparison with the prior research cannot be made. A spokesperson for Uber stated in April 2019 that there are over 3,500 drivers on a monthly basis (FD, 2019). Statistics Netherlands (CBS, 2019a) has published estimates on the turnover of platform drivers based on a combination of sources within National Accounts, proxy variables and news sources. In the years 2014-2016 this total turnover is estimated to be 4, 13 and 29 million euro respectively.

The estimates on holiday rentals are based on research by Statistics Netherlands (CBS, 2017/ 2019a). The figures are estimated based on the number of nights spent in rented accommodations, and the average price of rental. The assumption is that these accommodations are rented by private households not included in the business registry, contrary to business units in the industry '*Real estate activities*' (NACE Rev. 2, 68).

For home cleaners on Helpling and similar platforms, the research by SEO Amsterdam Research (2018) provides an estimate of the number of house cleaners as well as their average gross monthly earnings (400 Euro).

Methodology

For drivers on Uber or similar platforms, the output is based on the aforementioned data sources. We choose to stick to the figures estimated for 2017 by SEO Amsterdam Research, with 4,750 drivers earning on average €1,000 per month. This leads to a total production of 57 million euros. We expect the ratio of intermediate consumption to output for this group of drivers to be slightly different from the average taxi company. This ratio was obtained from the businesses of one person employed in the SBS survey for the industry '*Taxi operation*' (NACE Rev. 2, 49.3.2).

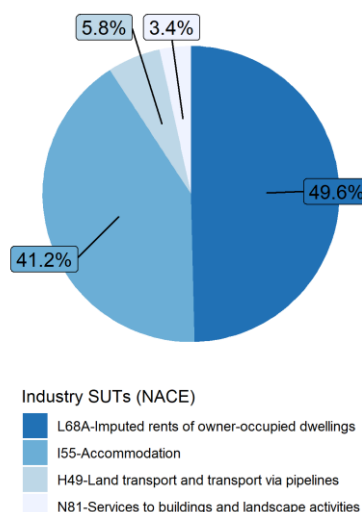
The results of the ICT-usage survey show that platform dependency for businesses with two or more employed persons is only found in '*Accommodation*' (NACE Rev. 2, 55). There are some other industries where isolated cases reported a share of over 50% in sales via a digital intermediary platform. However, a check on these businesses units proved the data for these cases to be implausible. It could be the case that survey respondents have a different perspective on the definition of 'platforms'. As the definition of an intermediary platforms requires multiple suppliers to be present, it is very unlikely to find an industry with only one or a handful of platform dependent businesses.

The businesses in '*Accommodation*' (NACE Rev. 2, 55) are registered in the business registry. From the ICT usage data, we do not observe a difference in share of turnover for platform dependent businesses (e.g. hotels generating over 50% of their revenue through platforms) of different size classes. We therefore calculate a weighted percentage of platform-dependent revenue at 4.9% and apply this to the whole sector for production, intermediate consumption and value added.

Finally, for home cleaners the estimates are obtained by using the amount of workers and the gross monthly earnings. Since we expect the users of this service to take care of most if not all of the necessary cleaning supplies themselves, and transport costs are minimal, we assume that intermediate consumption is equal to zero.

The methods applied to identify firms dependent on platforms result in shifts from four NACE classes to this digital industry. The composition (output) of this digital industry is summarized in figure 3.2.

Figure 3.2: Composition of the output of firms dependent on intermediary platforms



3.4 E-Tailers

In the OECD guidelines, trade companies that generate more than 50% of their revenue online are allocated to the E-Tailer digital industry. This digital industry is made up of both wholesale (business-to-business) and retail (business-to-consumer) businesses. In our approach for constructing the DSUTs, wholesale E-Tailers and retail E-Tailers are compiled separately, as they require different data sources.

3.4.1 Retail

Objective

In the standard SUTs, all retailers are included in a single industry column. The objective is to split this industry into enterprises that make most of their sales online, and enterprises that sell mostly in ‘brick and mortar’ stores. Digital intermediary platforms that are classified as retailers in the business registry are allocated to platform digital industries, as determined by the OECD prioritization decision tree.

Data sources

The SBS survey for the retail industry provides information on the sales made through different sales channels. One of these sales channels is online sales, which can be used to determine whether a business unit is an E-Tailer or not. A differentiation between online sales made directly through web shops owned by the retailer and sales made through digital intermediary platforms is not available in the SBS. The ICT usage survey however does allow for this differentiation. The ICT usage survey shows no platform dependency among retailers in 2018. However, this may be due to the survey including only enterprises with more than one employee. This limitation may therefore contribute to the misallocation of “Firms dependent on intermediary platforms” to the E-Tailers industry.

Methodology

To obtain the row and column estimates for the supply and use tables from the sample, the values for the E-Tailers present in the SBS must be scaled to national population totals. To do this, multiple incrementing methods were tested:

- The scaling weights based on the tax register and the probability of selection used in the standard SBS incrementing.
- A scaling weight based on the total business revenue of the E-Tail population in the SBS survey compared to the total business revenue of the online retail industry NACE class, using VAT registry data. This scaling weight has also been corrected for the proportion of businesses in the SBS that are allocated to the online retail industry but do not make more than 50% of their sales online.
- Weights based on the trade margins from the subsection of the survey population that is E-Tail, relative to the trade margins of the entire retail industry.

Comparing the three scaling weights, we find that the standard scaling weight present in the SBS closely resembles the estimate based on the total revenue of the sub-population of online retail. The scaling weight based on trade margins is significantly larger. For this reason, we apply the SBS scaling weights to the values for the various products and industries retrieved from the SBS.

Similar to the digitally enabling industries and the digital intermediary platforms, the values of the SBS subset of E-Tailers are compared to values of the full SBS sample to obtain fractions for each product-industry combination. Applying these fractions to the standard SUTs results in to-be reallocated values that match up to the SUTs aggregates.

In total, E-Tailers in the retail industry make up about 8.1% of the production of the retail industry, 11.4% of use, and 6.5% of value added.

3.4.2 Wholesale

Objective

In the standard SUTs the wholesale Industry is divided in ten subclasses, similar to the three or four digit classes in the NACE classification for economic industries. In compiling the DSUTs, the objective is to re-allocate businesses within the wholesale industries that sell the majority of their goods online from their origin industry to the E-Tailing digital industry.

Two specific classes in the Wholesale section are included in the Digitally enabling industry, namely '*Wholesale of computers, computer peripheral equipment and software*' (NACE Rev. 2, 46.5.1) and '*Wholesale of electronic and telecommunications equipment and parts*' (NACE Rev. 2, 46.5.2). According to the decision tree in the OECD guidelines, E-Tailing has priority over Enabling. Therefore, any business unit that is allocated to NACE class 46.5.1 or 46.5.2 but generates more than 50% of their revenue online is re-allocated to the E-Tailer industry rather than the digitally enabling industries.

Data sources

Contrary to the SBS survey for the retail industry, the SBS for the wholesale industry does not include any information about online sales. The survey of ICT usage does include relevant information on the digital sales for the wholesale industry, but this survey does not include a direct measure for output or value added. Digital sales include both the web shop sales and the EDI (Electronic Data Interchange) sales. Additionally, the number of employees and turnover is available from administrative data sources for all businesses in the Wholesale industry.

Methodology

The starting point is to identify the units in the ICT usage survey sample that make the majority of their sales digitally. The ICT usage survey is executed as a stratified random sampling. The largest businesses (based on number of employees) are all included in the sample, and the probability of selection reduces as businesses have fewer persons employed. Sampled businesses are weighted to account for differences in probability of inclusion,

and to increment the sample to the total industry population. A basic approach is to use the share of E-Tailer businesses based on the number of persons employed, or the turnover after applying weights to the businesses in the sample, and simply applying this share to SUTs data in wholesale industries. This assumes that E-Tailers have the same structure of production, intermediate consumption and value added as non-Etailers in the same industry.

In the ICT usage sample survey, the larger size classes include more E-Tailers. The weights reduce the share of E-tailers in wholesale. For example, the share of E-Tailers is 38% based on revenue and 32% based on employees. After applying weights to these shares, to correct for the probability of inclusion in the sample, they are reduced to 23% and 18% respectively.

The weights for revenue do not result in a correct estimate of the industry total revenue. Applying the weights to VAT register revenue of the businesses in the sample results in 82% of the total turnover for wholesale businesses (of two or more persons employed). The ICT usage survey weights for employees do offer a match (98%) of the total employed persons in the wholesale industry. The share in the number of employed persons is therefore preferred over the revenue share. The weights correct for the probability of selection per size class, so the weighted shares of E-Tailers for each of the ten subclasses for Wholesalers are applied to all output, intermediate consumption and value added figures.

A more refined approach would be to merge the ICT usage and the SBS surveys and to use the detailed, financial information of individual business units provided in the SBS survey. The main challenge here is that the two samples (SBS and ICT usage) will include different businesses, and only the business that are present in both samples can be used.

Both the SBS and ICT usage samples include all of the largest businesses. Of the 1207 Wholesale businesses in the ICT usage survey, 791 are also available in SBS survey. These matches account for 81% for the employees. As there are more E-Tailers among the larger businesses, the number of matches in the SBS is 155 of 178. These represent 91% of the employees in the full E-Tailers subsample. This implies that merging the ICT usage and SBS surveys results in an overrepresentation of E-Tailers.

The compilation level of the standard SUTs differentiates 10 subclasses of the wholesale industry, which leads to a low number of respondents for each subclass. This issue is exacerbated when merging the SBS and ICT usage samples, which could be a reason to employ the basic method.

For the wholesale industry as a whole, the difference in the share of E-Tailers in value added estimated between the refined approach including a correction for overrepresentation of E-Tailers (16,2%) and the basic method (18%) is small. The "Wholesale of solid, liquid and gaseous fuels and related products" and "Wholesale of waste and scrap" subclasses contain no business units that are classified as E-Tailers. The share of E-Tailers is largest for the trade in household goods.

The digital intermediary platforms include 14 wholesalers. None of these are included in the ICT usage survey sample. The possible overlap between these two digital industries therefore remains unknown, as the relevant business units are not included in the sample.

The basic method, based on the share of E-Tailers in persons employed of the Wholesale businesses in the ICT usage survey, is used in our final DSUTs. Combining the ICT usage sample and the SBS sample (in the refined approach) reduces the robustness as the number of available business units are reduced and does so in a disproportionate manner, which results in an overrepresentation of E-Tailers.

3.5 Digital only firms providing financial and insurance services

Objective

According to the OECD guidelines this industry “*would only contain those units that are operating exclusively digitally, with no interaction with consumers physically*”.

Data sources and methodology

Data sources on the interaction with the consumers are limited to the questions regarding online sales in the ICT usage survey. Most subclasses of NACE section ‘*K - Financial and insurance activities*’ are included in this survey, but ‘*Trusts, funds and similar financial entities*’ (NACE Rev. 2, 64.3) is not included. In total, six business units respond that all sales are made online. The weighted share of these units in all units in the financial industry is 0.8 percent. For practical reasons, this entire share of section K was assigned to the industry ‘*Insurance, reinsurance and pension funding, except compulsory social security*’ (NACE Rev. 2, 65), which has a majority in the small share.

Many insurance and banking brands are promoted as online businesses, but the brands or labels are owned and operated by a small number of very large business units that run both online and mixed models (online, phone and office) brands. The many publically known examples of online insurance companies do not meet the “no interaction with consumers physically” criterion on business unit level.

Alternatively, one may consider to include specialized producers of digital financial services (Fintech) to digital industries. Relevant services may be digital payment services, services for crypto services and online brokers. Delineating the relevant units is challenging, as these digital services may be provided by units that offer other (non) digital services as well.

In the Netherlands, financial statistics of businesses in the financial industry are collected by the national bank of the Netherlands (DNB) as a supervisory authority. CBS organized an expert meeting with DNB to discuss the OECD guidelines in regard to the digital only firms in banking and insurance. In regard to “no interaction with consumers physically”, this meeting did not result in additional information on relevant units. During this session it was mentioned that many financial firms are required by law to have a contact phone number available at all times. A list of the payment services providers located in the Netherlands is most likely available at DNB.

For now, this digital industry is limited to a small share (0.8%) of NACE section ‘*K - Financial and insurance activities*’, based on the ICT usage survey.

3.6 Other producers only operating digitally

Objective

This category must include producers that sell and deliver services exclusively digitally. Examples provided in the guidelines are streaming and gaming services. Several approaches were tested in order to identify relevant businesses.

Data sources and methodology

Keywords on websites

The project ‘*Measuring the internet economy in the Netherlands*’ (CBS, 2020) has classified businesses based on the content of their website (See Appendix 2 data sources, web scraper data). Especially the internet economy classes ‘Online services’ and ‘Internet-related ICT’ were expected to include relevant businesses for the digital industry ‘other producers operating only digitally’. All businesses in these classes, excluding businesses that are

present in other digital industries (based on either NACE class or the ID of individual units in the business registry), were analyzed. Many of the businesses are not relevant for 'Other producers only operating digitally'⁴, because a website does not provide the weights of a product in a company's portfolio, and one company may operate multiple domain names. For example, a furniture factory that sells its furniture on its own website may still be a manufacturer rather than an E-Tailer.

Specific NACE classes

The SBS questionnaire for '*Publishing of books, periodicals and other publishing activities*' (NACE Rev. 2, 58.1) provides a distinction between print and electronic publications. In '*Publishing of directories and mailing lists*' (NACE Rev. 2, 58.1.2), a vast majority of sales are specified as electronic publications. This NACE class has a low total revenue and is dominated by one large enterprise. In '*Book publishing*' (NACE Rev. 2, 58.1.1) only a handful of small businesses are specialized in electronic publishing according to the SBS questionnaire (about 2% of turnover in 5811). The total impact of digital only publishers in NACE 58.1 is small and dominated by a single enterprise (subject to confidentiality issues). We therefore do not re-allocate any value in the DSUTs from NACE 58.1 to 'Other producers only operating digitally'.

In the SBS questionnaire for the industry '*Other information service activities*' (NACE Rev. 2, 63.9) businesses are asked about the 'share of services for websites' in their sales. The respondents specialized in these website services are very small businesses with a total revenue of less than a million Euros. Again, the conclusion is that moving any output from NACE class 63 to the 'Other producers only operating digitally' digital industry is not worthwhile.

Publically known examples

The guidelines suggest to "target the large publically known examples as a proxy for the entire digital industry". This approach was applied to streaming services, gaming and other popular websites in the Netherlands.

The streaming industry for motion pictures has a few sizable players. Five of the most popular streaming services have been researched. Of these five, four streaming services have locally registered businesses, while the fifth supplies services to Dutch consumers from abroad. Of those that do have national representation, only one is a specialized streaming service. The others are streaming services operated by businesses (in a single statistical unit) that run television channels or cinema's as well. These may therefore not fit the definition of digital only producers. Another issue regarding the streaming services is the production of in-house content. Is the production of content a digital only activity or is this limited to digital distribution?

The review of four gaming businesses reveals that the distribution of games is integrated with the development of the computer games. Two out of four business of interest are registered in the wholesale (of toys) industry, although in one case the website shows that the games are developed in-house. One smaller company that sells merchandise, develops games and runs a Youtube channel is part of '*Business support service activities n.e.c*' (NACE Rev. 2, 82.9). The fourth gaming company is already included in the digitally enabling industries ('*Computer programming activities*', NACE 62.0.1). In at least two cases, the games are not only ordered and delivered digitally, but physically as well.

The most popular websites in the Netherlands include search engines, other online intermediary platforms, E-Tailers and online media. Some online media are online only brand names, while many others are the digital twin of print media or television channels. Even if the brand is online only, the most popular ones are all operated by large media enterprises and the online brands do not have a distinctive statistical business unit.

The micro approach is very time consuming and did not provide robust results for any of the activities considered. Overall, this 'publically known examples' approach shows that most providers of online content are not

⁴ The main 2-digit NACE classes in which we find internet economy business (outside any of the six digital industries) are: '19 Manufacture of coke and refined petroleum products', '70 Activities of head offices; management consultancy activities', '45 Wholesale and retail trade and repair of motor vehicles and motorcycles'.

necessarily digital only, and that (online) distribution and production of content are in most cases integrated in a single statistical business unit.

After testing three alternative approaches to identify businesses that meet the criteria of '*Other producers only operating digitally*', we were unable to identify any substantial amount of relevant business units for this digital industry.

4. Digital products

The four digital products that are within the SNA 2008 scope are included in our DSUTs. The “beyond SNA” digital products, data and free services, are not part of our research. Two digital products, ‘ICT goods’ and ‘Priced digital services except cloud computing services and digital intermediary services’ are based on codes from the CPC 2.1 product classification that are listed in the OECD guidelines for the digital SUTs.

The ‘Priced cloud computing services’ are defined as Software as a Services (SaaS), Platform as a Service (PaaS) and Infrastructure as a Service (IaaS) in the OECD guidelines. A reference (Eurostat, 2018) to classes in the CPA 2.1 product classification is provided and contains the following product codes: CPA 58.2 (*‘Software publishing services’*) for SaaS; CPA 62.01 (*‘Computer programming services’*) for PaaS and CPA 63.11.1 (*‘Data processing, hosting, application services and other IT infrastructure provisioning services’*) for IaaS.

The fourth digital products concerns the fees produced by digital intermediary platforms: ‘Priced digital intermediary services’. These are not specified in any existing product classifications (CPA/CPC/BPM6). We therefore made use of the population of platform businesses used to fill the digital industry, and the share of platform activities in their total employment or turnover.

The supply and use of digital products are compiled using multiple data sources and methods that differ both for each digital product and for different supply and use columns.

4.1 Domestic Output

4.1.1 ICT goods

Any ICT goods in the OECD list of ICT products that coincide one-to-one with a product in the working level of the Dutch national accounts are shifted in their entirety to ICT goods. This means that every supply and use column for that good is transferred, including domestic output. Products are identified by coupling the CPA 2.1 codes that correspond to the CPC 2.1 codes in the OECD guidelines for the DSUTs. Examples of products that shift in their entirety are Computers, Integrated switches and Magnetic and optical media.

Several product codes in the standard Dutch SUTs consist of both ICT goods and other goods. For these cases, the relevant product codes and their ‘ICT goods shares’ are based on PRODCOM data where possible. PRODCOM provides statistics on the production of manufactured goods by enterprises in sections B and C of the NACE classification. The products in CPC classification (from the OECD guidelines) are linked to CPA codes, which in turn are linked to 6 digit PRODCOM codes. As PRODCOM data directly concerns domestic output, its use is preferred. However, its classification is often not detailed enough to distinguish between ICT goods and non-ICT goods at the highest level of detail. For products where the PRODCOM specification lacks detail, the alternative method is therefore to employ data on the international trade in goods statistics (ITGS). The ITGS data is collected in the detailed products classification of the Combined Nomenclature (CN). A CPC 2.1 – HS 2017 (Harmonized Commodity Description and Coding System). A correspondence table was used to identify the relevant CN codes of ICT goods (HS 2017 equals CN at the 6 digit level). A correspondence table for the CN codes and the products in the standard SUTs is available for internal use for compiling the standard SUTs. Photo/Film devices and Office machines are examples of products in the standard SUTs that are re-allocated in part to ICT goods in the DSUTs. The shares for domestic output are based on the exports of domestic production (excluding re-exports) from the ITGS data. While this is not a perfect match conceptually, the ITGS data is the only source detailed enough to accurately distinguish between ICT goods and non- ICT goods within all product codes at this high level of detail.

4.1.2 Priced digital services except cloud computing services and digital intermediary services, priced cloud computing services

In order to specify priced digital services, we again make use of the CPC list from the OECD guidelines (2019). The approach for the domestic output is largely similar to the approach for ICT goods. The guidelines are denoted in the CPC 2.1 classification. From here, the CPC 2.1 classification can be converted into CPC 2.0. In turn, this can be converted into CPA, which can then be converted into the required classification used in the Dutch SUTs. Again, some cases were individually judged.

First, any services in the OECD guidelines that coincide one-to-one with a product class in the Dutch SUTs are transferred in their entirety to priced digital services, hence domestic output is also transferred. For services that make up only part of a product code in the Dutch SUTs, the methods employed to determine the fraction to be transferred differs depending on data availability. For some cases, the structural business survey contained additional information about the services provided, allowing us to determine which proportion of a product code consists of digital services except cloud computing services and digital intermediary services. Installation services to be considered digital services could be distinguished from other repair/maintenance/installation services through PRODCOM data. Finally, for industrial services, the digital service fractions of the underlying product codes at the 2 digit level are taken and weighed to retrieve a single weighted fraction.

For the product software publishing services, the Structural Business Survey is used. In this survey there are several questions about (online) software and database or data processing activities. The relevant items in the SBS specification of turnover are:

- Application software packages
- Software downloads
- Online software
- System software packages
- Data processing, webhosting and related activities

The questionnaire with these questions is sent to the industries '*Computer programming, consultancy and related activities*' (NACE Rev. 2, 62), '*Information service activities*' (NACE Rev. 2, 63) and a subset of '*Publishing activities*' (NACE Rev. 2, 58). From these we take the income through sale of online software as a fraction of all sales regarding software. This fraction is put on the total production. This amounts to a total value of 2.6 billion.

For the product data processing, hosting and related services we include 100% of production as a cloud service. The total amount produced amounts to 4.3 billion euros. In using this, we also implicitly include colocations⁵ as delivering priced cloud computing services, while this is not an agreed upon standard.

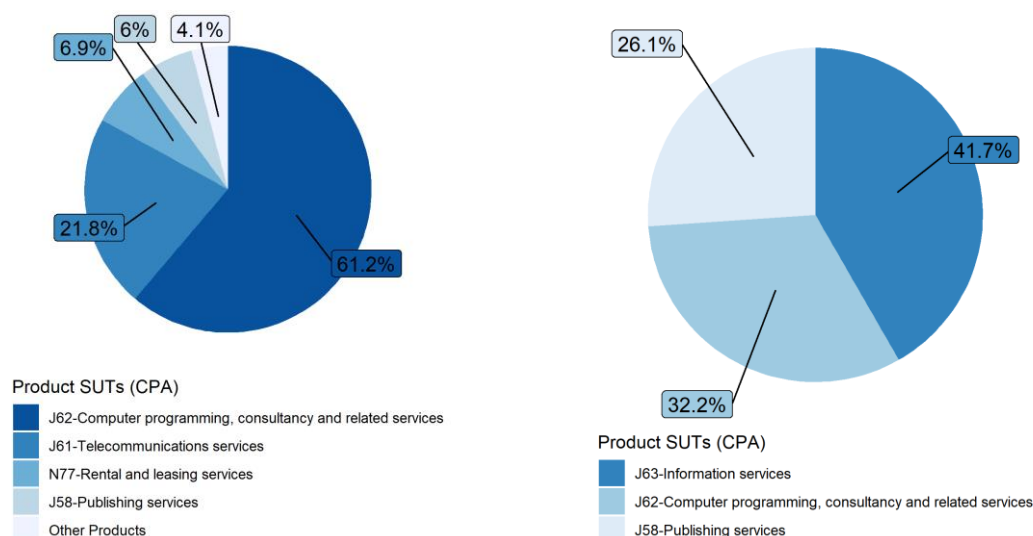
'*Computer programming, consultancy and related services*' (CPA 2.1, 62) that are produced by businesses in '*Data processing, hosting and related activities; web portals*' (NACE Rev. 2, 63.1) in the business registry are included as cloud computing services as well. The value for this amounts to 2.4 billion euros.

Summing all three categories together results in a total of 9.3 billion euros for priced cloud computing services.

The results of the re-allocations of products (CPA) to these digital products are presented in figure 4.1.

⁵ Colocations are businesses that rent out buildings, equipment and maintenance for datacenters but are not (or scarcely) involved in cloud activities.

Figure 4.1: Composition of the output of ‘Priced digital services except cloud computing services and digital intermediary services’ (left) and ‘Priced cloud computing services’ (right)



4.1.3 Priced digital intermediary services

From the subset of businesses identified to be resident digital intermediary platforms in the digital industry section, we first take the subsection that are fee platforms. We then retrieve the percentage of employees working specifically for each platform as an indicator for the share of the production that is to be seen as a priced digital intermediary service. These shares are applied to the SBS data on the output of any business units that are at least partially a fee driven platform. The assumption is that the shares in employment may be applied to the output. The uncertainty of this assumption is small, as the largest businesses are fully specialized digital intermediary platforms. Finally, using a correspondence table between product classifications in the SBS survey and product classifications in the final SUTs, we can calculate the fraction of (fee-driven) platform services in the total production of each industry and product combination. These fractions are re-allocated from their origin product to priced digital intermediary services. The industry classifications used in the SBS data are already expanded to include digital industries, so that values only have to be shifted across products, and not across industries.

4.2 International Trade

4.2.1 ICT goods

In the OECD framework for the DSUTs, the ICT goods are defined at the 5-digit CPC 2.1 classification. The international trade in goods statistics is classified in more detail, but in a slightly different way, by the 8-digit Combined Nomenclature (CN). To identify the ICT goods in the international trade in goods statistics, a correspondence table between HS 2017 and CPC 2.1 from Eurostat was used. HS 2017 is the Harmonized Commodity Description and Coding System, which corresponds to the CN-classification at the 6-digit level. Some HS codes consist of ICT goods as well as non ICT goods. We manually evaluated these cases and found that generally the ICT goods made up a significant portion of the HS code. We have therefore decided to classify the entire HS code as an IT good in these cases. Nonetheless, this means that any estimates of the size of digital products where this situation occurs is likely to be a slight overestimation.

The next step is to calculate the share of ICT goods for each good in the standard SUTs. This share will be re-allocated from the standard product code to ICT goods product in the digital SUTs. For this a correspondence table between CN codes and SUTs products is available for internal use at CBS.

The international trade in goods statistics is then matched with the SUTs product classification by a correspondence table. For every code, the share of ICT goods in the total category was computed. This share is multiplied with the value of the goods category in the existing Supply and Use tables and moved to the ICT goods in the Digital Supply and Use Tables.

4.2.2 Priced digital services – except cloud computing services and digital intermediary services

In order to specify international trade in priced digital services, we again make use of the recommended services code list from the guidelines, also denoted in the CPC 2.1 classification. These are matched to the relevant classification for international trade in services statistics (ITSS), after which the relevant services are taken. Once again, services that coincide one-to-one with a digital product are shifted in their entirety.

When a service falls only partly under a digital product, responding companies in the ITSS data were judged in two ways:

- First, some are distinguished by (NACE Rev. 2) activity. An example of this is the product category licenses and royalties: only companies in '*Computer programming, consultancy and related activities*' (NACE Rev. 2, 62) are considered relevant in order to include trade in software licenses and exclude trade in licenses for music.
- Second, for some services the relevant businesses were identified through the services they sell according to the SBS data.

In both cases, these businesses were then identified in the ITSS data, after which a fraction of their trade compared to total trade was calculated for each service (BPM6 classification) as classified in the ITSS data. This results in a 'ICT services – other than cloud/ intermediary services' share for each BPM6 class.

A correspondence table (BPM6 – SUTs product codes) for internal use facilitates calculating the share of 'ICT services – other than cloud/ intermediary services' in each standard SUTs product. These shares are applied to the standard SUTs in order to relocate the import/export values to this digital product.

Finally, for some product classes that are partly digital products, such as industrial services for computer products and engineering services, the ITSS data did not contain sufficient observations. In these cases, the share of a product relevant for digital products determined for domestic output is applied to import or export in the standard SUTs.

4.2.3 Priced cloud computing services

The methodology for cloud computing services is similar to the approach employed for cloud services in the domestic output. The international trade in cloud services consist of three parts:

1. The services '*Data processing, hosting and related services; web portals*' (CPA 2.1, 63.1) are included in full. These figures are available from the detailed standard SUTs.
2. Services in '*Computer programming, consultancy and related services*' (CPA 2.1, 62) are available in the standard SUTs as well. From this, we include only the trade by the share of businesses in '*Data processing, hosting and related activities; web portals*' (NACE Rev. 2, 63.1).

3. A share of '*Software publishing services*' (CPA 2.1, 58.2) was re-allocated to cloud services as well. We only include the share of business units in the NACE classes 63.1, 62 and 58.2.9⁶ in the BPM6 services that correspond to CPA code 58.2. A correspondence table (BPM6 – SUTs product codes) for internal use facilitates calculating the '*Software publishing services*' value for the relevant companies in the international trade in services statistic (ITSS). The average share of these units are applied to the value of '*Software publishing services*' (CPA 2.1, 58.2) in the standard SUTs.

4.2.4 Priced digital intermediary services

To determine international trade in priced digital intermediary services, the population of resident platforms is relevant for the export figure. For exports, the ITSS only contains detailed information on the types of services traded for a select few companies. However, this small subset of businesses contains the vast majority of turnover of all platforms. For this subset the exact share of the intermediary fees in total trade (in the SUTs product classification) can be computed using this detailed classification level. For the small businesses in the population, only the total amount of exports are available. In these cases, the entirety of their exports are assumed to be digital intermediary services. Based on this subset of businesses a digital intermediary services share is calculated for each product in the SUTs product classification.

Imports of priced digital intermediary services are not present in available data sources. For Airbnb type of intermediation for holiday rentals an estimate is available (CBS, 2017), but this obviously does not cover all import of digital intermediary services from non-resident platforms.

⁶ '*Other software publishing*' (NACE 58.2.9)

4.3 Gross fixed capital formation

For the gross fixed capital formation (GFCF) of ICT goods and ICT services (non-cloud and non-intermediary), we re-allocate the exact same shares used for domestic output from the standard SUTs products to their respective digital products. However, after internal discussion with experts on the topic, three exceptions to this rule were applied. For these exemptions, we use data from the Gross fixed capital formation survey. This survey specifies values for each industry by product. The aforementioned exceptions are as follows:

1. *'Architectural and engineering services; technical testing and analysis services'* (CPA 2.1, 71). For this the value is taken from the industry Telecommunications for the product machines and installations.
2. *'Licensing services for the right to use intellectual property and similar products, except copyrighted works'* (CPA 2.1, 77.4). All investments made under this header are software, as such it is classified as GFCF in its entirety.
3. *'Other software publishing services'* (CPA 2.1, 58.29). In our production approach this good is split between ICT services and paid cloud services. After looking into the top investors for this group we decide to put all investments on ICT services.

4.4 Intermediate consumption and household final consumption

As mentioned in the previous sections, all goods and services in the OECD guidelines that coincide directly with a product in the Dutch national accounts product classification are shifted in their entirety, hence intermediate consumption and household final consumption of these goods are also shifted. For products that are partially shifted to digital products however, no data is available on the intermediate consumption, nor the household consumption, of the proportion that is digital. For these products, intermediate consumption and household final consumption is estimated based on the 'Commodity flow method'. We will explain this approach by presenting an simplified example.

Starting point

Some standard products, like computers, are moved entirely to one digital product (ICT goods). These shifts are applied to all columns in both the supply and use tables cases. The supply and use will remain balanced for all products after these shifts. In other cases, such as photo and film equipment, shares are re-allocated from the standard product to the digital product. These shares are estimated for output, import, exports and GFCF based on data sources available for these columns. After applying these shares, we have DSUTs where supply and use for the digital products and the standard product partly affected by the shifts are unbalanced. This difference in supply and use has two causes:

- The shares of the standard products shifted to a digital product are determined independently for the supply and use columns, where data sources are available. The digital product shares applied differs for each of the available columns. For instance, the share of ICT goods in office machines is 13% for domestic output, but 16% for export.
- Shares are unavailable for several use columns. For example, the intermediate consumption of cloud computing services is not present in any data source.

Objective

In order to balance supply and use for both the digital products and the standard products that were shifted in part to the digital products, we calculate additional shifts from the standard to digital products for columns on the use side that are not covered by available data sources. The additional shifts are calculated for each combination of standard and digital products in shifts on the supply side. Table 4.1 present an example of digital product, which is composed partly of standard products B and C. These shifts results in unbalanced DSUTs for

the individual products. The aim is to calculate shifts in the use columns that results in equal shifts on the supply and use side for each pair of standard and digital products (B to A and C to A are the pairs in our example).

Assumptions

The shifts calculated for output, import, exports and GFCF are assumed to be correct. This means that total supply for the digital products is determined from the available data sources. All additional shifts calculated are made only for the use columns that are not covered by the shifts based on data sources, e.g. intermediate consumption. For digital intermediary services, data on imports are missing. In this case, we assume total supply is equal to domestic output for this digital product.

Table 4.1 Example of the shifts from standard product to digital product for the columns where data sources facilitate estimates (x 1 million Euro's).

Standard SUT	Supply			Use					Supply -/- Use
	Output	Imports	Total	GFCF	Exports	House- hold Cons.	Inter- mediate Cons.	Total	
Standard Product B	800	200	1000	200	300	300	200	1000	0
Standard Product C	700	100	800	100	100	400	200	800	0
Shifts									
From B to A	400	80	480	100	150	?	?	250	230
From C to A	100	20	120	50	50	?	?	100	20
Unbalanced DSUT									
Digital Product A	500	100	600	150	200	?	?	350	250
Standard Product B	400	120	520	100	150	300	200	750	-230
Standard Product C	600	80	680	50	50	400	200	700	-20

Calculations

Calculating the additional shifts required in order to balance supply and use for each product is done in three steps:

1. The total use to be shifted for a balance in supply and use shifts is calculated for each combination of standard and digital product. Table 4.2 shows that a balance between supply and use is achieved by an additional shift in use from standard product B to digital product A of 230 million euro's.

Table 4.2 The total use to be shifted in order to balance supply and use for each pair of standard and digital product (x 1 million Euro's).

	product B to digital product A	product C to digital product A
Supply shifted	480	120
Use shifted	250	100
Use to be shifted	230	20

2. In order to calculate the amounts to shift to digital products for each vacant use column, the share of each of these column in the total of all vacant use columns for the standard product was calculated (see Table 4.3).

Table 4.3 The values of the individual use column not covered by data sources in the total and the shares of each column in all the total of the relevant columns for each standard product (x 1 million Euro's).

	Values			Share		
	Household Cons.	Intermediaite Cons.	Total	Household Cons.	Intermediaite Cons.	Total
Product B	300	200	500	60%	40%	100%
Product C	400	200	1000	67%	33%	100%

- The total use to be shifted for each standard product-digital product pair (step 1) is combined with the column shares calculated in step 2. This results in a shift for each column. Applying these shifts to the relevant use columns in the standard SUTs results in balanced DSUTs, like the example in Table 4.4. The household final consumption shifted from B to A is $60\% \times 230$ million euro's = 138 million Euro's. The shift from C to A is 13,4 million Euro's. So the estimated total for the household final consumption of digital product A is 151,4 million Euro's.

Table 4.4 Use columns completed for balanced DSUTs (x 1 million Euro's).

Balanced SUT	Supply			Use					Supply -/- Use
	Output	Imports	Total	GFCF	Exports	House- hold Cons.	Inter- mediaite Cons.	Total	
Digital Product A	500	100	600	150	200	151,4	98,6	600	0
Standard Product B	400	120	520	100	150	162	108	520	0
Standard Product C	600	80	680	50	50	386,6	193,4	680	0

5. Transaction types

5.1 Digitally ordered

Objective

Five additional rows under each product (and aggregate) in both the supply and use tables, separating transactions by whether they were: digitally versus non-digitally ordered, with digitally ordered transactions further broken down into ordered directly from the counterparty, ordered via a resident digital intermediary platform, and ordered via a non-resident platform

Data sources

The ICT usage survey is the main data source for the transaction types. It offers information on the digital sales and purchases in most industries for businesses that employ two or more persons. We assume that 'ordered digitally' includes both website/app sales and purchases and the Electronic Data Interchange (EDI) sales and purchases. The share of digital sales to and purchases from non-residents is available, albeit for the larger businesses that employ 10 or more persons. For website/app sales the share of sales via online platforms is available as well as a differentiation of customer types: businesses (B2B), resident households, non-resident households and government. As a differentiation between resident and non-resident platforms in website/app sales is not included in the survey, we will not be able to provide reasonable estimates for this dichotomy.

Additional information is available from the SBS survey (online sales in retail industry) and the household budget survey (online purchases by households). Details on whether a transaction is made directly or through an online platform are not included in these data sources however.

5.1.1 Output/Intermediate consumption

To estimate the proportion of output and intermediate consumption that was digitally ordered, data from the ICT usage survey is employed. While the transaction types of businesses' purchases and sales are not available at the product level, we do have information on the (NACE) industry in which each business is active. This allows us to derive fractions for the proportion of digitally ordered sales and purchases for each industry that is present in the ICT usage survey.

In order to fill out the transaction type specification on the product level, we can further weigh the resulting average industry-wide fractions by determining products that are always digitally ordered, as well as products that are never digitally ordered, through expert opinion. Products that are determined to never be digitally ordered are in-house investments on software and research and development. Products that are determined to always be digitally ordered are e-books, online newspapers, online magazines, online content, music downloads, cloud services (digital product) and digital intermediary services (digital product). Setting these products to 100% and 0% respectively allows us to calculate a corrected industry-wide fraction for any goods that do not fall into these categories. Finally, the corrected industry transaction type fractions can be applied to each product-industry combination, leading to a weighted fraction at the product level. The information on transaction types is available at the industry level for supply and use, contrary to the industry-product level required by the DSUTs template. This lack of detail is resolved by assuming that all products within an industry have the same share in transaction types for either output or intermediate consumption, with the exception of products that are either always or never digitally ordered by nature.

5.1.2 Household final consumption

In order to estimate the household consumption through online channels in 2018 two possible methods were explored:

Method 1

The first method is to use the SBS retail questionnaire's revenue. For each business in the sample of the retail industry we have information on the proportion of revenue of each product type in their total revenue, as well information on how much of total revenue from trade was made from online sales. Assuming that each product has the same share of its sales online for one business unit, we can then take the total sales revenue of a certain product multiplied by the online fraction of sales, and divide this by the total sales revenue of that product to obtain an online fraction of sales.

The product classification in the SBS is less detailed than the product classification in the compilation of the DSUTs. To resolve this the detailed products in household budget survey are used to redistribute SBS products to more detailed product classes. The redistribution keys differ for subclasses of retail industry, e.g. Supermarkets, DIY stores. The fraction of online sales for a product in the DSUTs is a weighted mean (based on revenue levels) of the fraction of that product in the various retail classes.

Using the SBS turnover in online retail as an estimate for household final consumption does not take into account the exports of retailers to consumers abroad (exports). In addition, we do not know how much Dutch consumers order online from retailers abroad. Furthermore, some goods are sold (online) directly to consumers by industries, such as the financial sector, agriculture or wholesale.

Method 2

An alternative method to estimate the online consumption per product group is to use the online purchases by product from household budget survey from 2015 as the foundation. The main issue is that online sales grow more rapidly than overall sales, thus the 2015 shares of online purchases are too low for 2018. In order to update the 2015 fractions by product to 2018 levels, we could apply 2015-2018 growth rates of the relative online sales per product (based on the SBS data for 2015 to 2018) to the fractions from the budget survey.

Having carried out an estimation for both methods, we have decided to employ the results of the first method in our final digital SUTs. While the budget survey method's starting point contains more detailed products, the second method proved less robust. Unfrequently purchased products (e.g. pet foods) had unreasonable online fractions due to their low sample size and/or outliers. Because these extreme values would consequently be scaled up to 2018 levels, this problem would only be exacerbated further. The overall share of online purchases from the budget survey in method 2 were also much lower than in method 1.

For products consumers buy directly from the producers, so without any reselling by retail traders, alternative data sources were used for estimating the proportion of sales digitally ordered. This was done for insurance services (ACM, 2020), accommodation and travel (CBS, 2019d) and gambling (CBS, 2019e).

5.1.3 International trade

For digitally ordered exports the share of online exports in total turnover for the business units of ten or more persons employed in the ICT usage survey sample were obtained by combining the share of digital sales and the share of non-resident customers in the digital sales. The share of digitally ordered exports in total turnover and the turnover from the SBS data (for small units not included in SBS the turnover from the ICT usage survey was used) result in a value of digitally ordered export for the units in the sample of the ICT survey. These units were merged with the international trade data (ITSS and ITGS).

For units available in both the international trade data and the ICT usage survey, the share of digitally ordered exports in total exports is estimated and this share is used for all product exported by the business unit. For each product an average share of relevant units is used as the digitally ordered share in export.

The method is very similar for imports to the method for exports. The method uses the share of digital purchases and the share of non-resident suppliers from the ICT usage survey.

The quality of the results will differ by product. For products that are internationally traded mostly by large business units the results will be of higher quality as the larger units have a higher probability of inclusion in the ICT usage sample. The assumption that all traded products of a firm get the same average share of digital ordering seems inevitable. Specification of the digitally ordered share in export or import for each individual product most likely is a disproportionate, administrative burden on firms.

5.2 Digitally delivered

Objective

In the DSUTs, additional rows were added to present the differentiation between digitally ordered and non-digitally ordered transactions for each product in each industry. The mode of delivery is presented by additional columns in the supply and use tables. These additional columns break down supply for each service into whether it was digitally delivered or not. This means the digital delivery of products is not required for individual industries.

In the Use table digital delivery is specified only for the exports. On the supply side digital delivery is specified for:

- Domestic output of digital industries
- Domestic output of other industries
- Imports

Data source & Methodology

Goods are by nature of their product never digitally delivered, hence only the proportion of services that is digitally delivered remains to be estimated. For this, only one relevant data source was identified, which is previous research by Statistics Netherlands (CBS, 2019b) on modes of supply (MoS) in the international trade of services. For each service in the BPM6 classification in Dutch trade, the MoS was estimated. While this was initially an exploratory research project, the MoS will become a regular statistic in a few years as part of the new regulation for European Business Statistics (EBS).

On the basis of OECD (2019), we assume that, unless there is reason to believe otherwise, services delivered by mode 1 following this research, are digitally delivered. Mode 1 is defined as cross-border supply, which takes place when a service is produced in one country but consumed in another one. The service is delivered across a border while both the supplier and the consumer remain in their respective countries.

The correspondence table between services in the international trade and the services in the standard SUTs was used to move from the data source to SUTs. Digital services, like priced cloud computing services and digital intermediary services, are expected to be fully digitally delivered by their nature. Furthermore, some cases were manually adapted. For instance, transport services are defined to be exclusively delivered by mode 1. Since we do not consider these services to be digitally delivered, their fraction of digital delivery is set to zero.

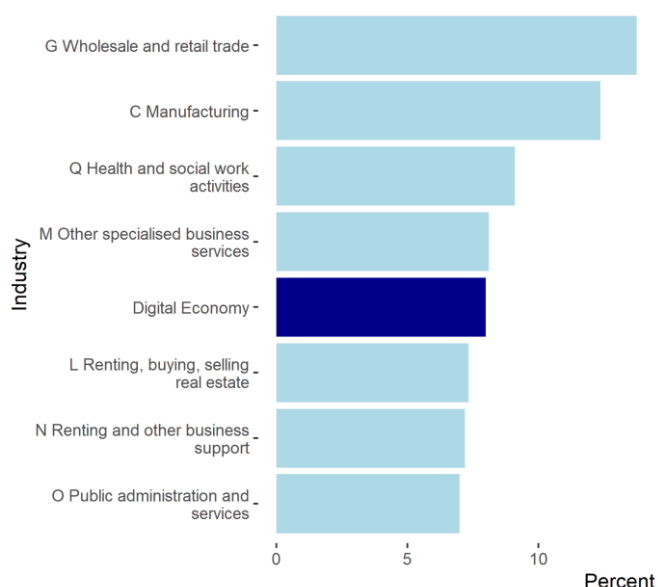
In our estimation, we assume that the modes of delivery are the same for domestic sales and exports. In other words, we apply the proportion of exports that were digitally delivered on the product level to the domestic output columns, for both digital and other industries, as well.

6. Results

In this section we will evaluate key indicators based on the (digital) supply and use tables. All values presented here are expressed in nominal basic prices.

First, it is valuable to provide an idea of the relative importance of the digital economy relative to all other industries. Figure 6.1 displays the contribution of each industry (NACE section) to GDP, including the Digital Economy, an aggregation of all digital industries. This measure of the digital economy contributes 8% to the gross value added of the Dutch economy in 2018 and is the fifth largest industry. It should be noted that the digital industries in figure 6.1 are retrieved from the DSUTs, while the NACE sections are retrieved from the standard SUTs. This means that the Digital industries are also included in the standard NACE sections, and the total of all industries does not add up to 100%. The purpose of the figure however is to compare the size of industries, not to make aggregations.

Figure 6.1: Share of the digital industries and other industries in the total Gross Value Added in the Netherlands, 2018



Diving deeper into the digital economy we can assess the economic impact of each of the specified digital industries separately. Output, gross value added, and their respective shares in the total of all industries combined are displayed for all digital industries in table 6.1. The largest contributors to the Dutch digital economy are the digitally enabling industries. The digitally enabling industries contribute 36 billion euros to GDP, of which 29 billion originates from services industries. Online wholesalers also play a significant role in the digital economy, contributing 11 billion to GDP. Finally, digital only financial firms contribute very little to the Dutch economy, due to the very strict classification of this industry in the DSUTs guidelines.

Table 6.1: Output and gross value added per Digital Industry, 2018, billion euros

	Output	GVA	Share	
			Output	GVA
All industries	1.514,5	692,6	100%	100%
Total digital industries	137,4	55,3	9%	8%
Digitally enabling industries	95,4	36,4	69%	66%
Digital intermediary platforms	16,3	5,4	12%	10%
Firms dependent on platforms	1,0	0,7	1%	1%
E-Tailers (Retail)	3,4	1,7	2%	3%
E-Tailers (Wholesale)	20,7	10,8	15%	20%
Digital only firms providing finance and insurance services	0,7	0,4	0%	1%
Other producers only operating digitally	NA	NA		

Similar to the industries, we can also evaluate each digital product group in detail. Table 6.2 displays each supply and use category, as well as totals, for each specified digital product. In terms of domestic output, priced digital services other than cloud computing services make up a substantial amount of the digital products, with a production of 67 billion by Dutch businesses. In terms of total supply and use however, ICT goods are larger than the aforementioned digital services. This is driven by high numbers of imports and exports, 52 and 60 billion respectively. For digital intermediary services neither total supply nor total use are currently present in the available data sources.

Table 6.2: Digital Product totals, billion euros

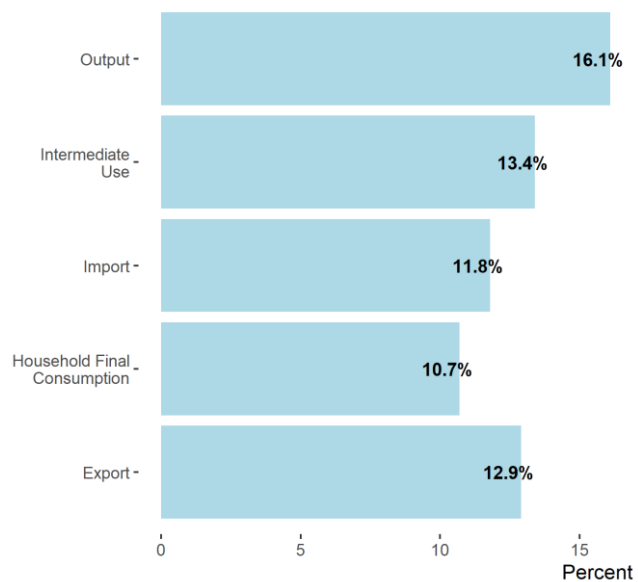
	Output	Supply			Total
		Imports	Other*		
ICT Goods	36,0	52,1	0,3		88,4
Priced digital services except cloud computing services and digital intermediary services	67,3	10,5	0,0		77,8
Priced cloud computing services	8,5	1,8	0,0		10,3
Priced digital intermediary services	15,5	-	-		-
Total Digital Products	127,3	-	-		-

	Use					Total Use
	Gr. fixed capital form.	Inter-mediate cons.	Exports	Household final cons.	Other*	
ICT Goods	5,6	17,8	60,4	4,4	0,2	88,4
Priced digital services except cloud computing services and digital intermediary services	21,9	34,3	15,2	6,6	-0,2	77,8
Priced cloud computing services	0,0	6,5	3,1	0,7	0,0	10,3
Priced digital intermediary services	0,0	-	13,6	-	-	-
Total Digital Products	27,5	-	92,3	-	-	-

* Other supply e.g. import tariffs , other use e.g. accumulation of stock

To further establish the extent of digitalization for the Dutch economy we can split domestic output, household final consumption, exports, and imports into a proportion digitally ordered and a proportion non-digitally ordered. Figure 6.2 presents the percentage of digitally ordered products in each of the aforementioned categories, only taking into account products for which we have information on the method of ordering. Digital sales are largest for domestic output (16.1%) followed by exports (12.9%). Household consumption and imports are less affected by digitalization, being ordered digitally 10.7 and 11.8% respectively.

Figure 6.2: Percentage of digitally ordered products, 2018



In the total supply, 22.6 % of the value of all products is delivered digitally. Only a limited number of services, like cloud computing or television broadcasting, can be delivered digitally by nature. Two thirds of all products, including all goods, at the 2 digit CPA 2.1 classification are never digitally delivered.

7. Conclusions and Recommendations

The results presented in this report are the first step towards measuring the digital economy in The Netherlands based on international guidelines in a manner consistent with the national accounts. As stated in chapter 1, the OECD guidelines for digital supply- and use tables were followed to derive the estimates presented. During this process, several issues and/or points of discussion have arisen. In this section, conclusions will first be drawn from the results presented in the previous chapter. Next, some commentary will be provided on the methods employed to fill the digital supply and use tables. Finally, recommendations for future iterations of this process are made.

Summarizing the results, we find that all digital industries combined contribute 8 percent to gross value added in the Netherlands for 2018. It should be noted that this is an experimental estimate. Of the aforementioned 8 percent, the largest part is contributed by digitally enabling industries, followed by E-Tailers. In terms of digital products, ICT goods are largest in total supply and use (88 billion), due to high prevalence of international trade. In terms of domestic output however, priced digital services excluding cloud computing services and digital intermediary services are larger. Regarding transaction types, the share of digitally ordered products within household final consumption is estimated to be 11.9 percent. The share of digitally ordered products for exports and imports are 12.9 and 11.8 percent respectively.

There are some remarks and recommendations to be made regarding the identification of digital industries. First, the E-Tailers industry currently includes both retail and wholesale industries. From a spatial economics policy perspective, the online retail industry may be more relevant, as digitalization may have more spatial and employment impact in the business to consumer sphere. Furthermore, we found that conceptually the Industries of ‘Digital only firms providing financial and insurance services’ and ‘Other producers operating only digitally’ are problematic to assign businesses to. Many of the relevant publically known brand names in streaming or insurance services do not meet the criterion for ‘digital only’ on the level of the (statistical) business unit. Most Financial Technology (FinTech) firms, like online payment providers, are currently not in scope of digital industries according to the guidelines.

When it comes to estimating supply and use of digital products, several notes are made. The guidelines contains a suggestion on how to approach the estimation of priced cloud computing services. Cloud services are split into three categories: ‘Software as a service’, ‘Platform as a service’, and ‘Infrastructure as a service’. The recommendations include a corresponding CPA category for each of these services. There are however several definition issues regarding cloud computing services. While the activities of datacenters are (very likely) cloud services, there are also so-called colocations, which offer physical space as well as non-cloud services where data centers can be seated. It is also possible that colocations offer the complete package necessary for operating a datacenter. As a result, it is unclear to which extent they should be included. More generally, software can be split into on-premises and cloud, which is a distinction that is difficult to make based on data currently available. Possibly, adding relevant questions regarding both output and costs to existing SBS surveys may resolve this difficulty. However, it could also be that this distinction may fade over time, in which case it should be questioned how trustworthy responses to the survey still are. All in all, the definition of cloud services is difficult to operationalize and therefore not yet set in stone. Efforts to make a standard definition should be undertaken to help international debates and foster comparisons.

In the DSUTs framework there is a strong focus on digital intermediary platforms for all three dimensions (industry, product and transaction type). For both the transaction type ‘digitally ordered via an online platform’, which provides the value of the transactions on platforms, and the product digital intermediary services, which measures the revenues for fee driven platform businesses the available, data is limited. In fact, for both the transaction value and the fees neither total supply nor total use are known. On the supply side, the available

data is limited to the domestic supply. On the use side, the purchases (transaction value) by households and businesses via platforms and the fees paid for intermediation are not present in data sources currently available.

Furthermore, no relevant data sources were found to distinguish transactions via resident platforms from transactions via non-resident platforms. The value of transactions on resident platforms is included in the platform survey, but several larger platforms are non-respondents and a split between resident and non-resident users is not available. The international trade data provides useful information on the exports of intermediary services, but import of intermediary services specifically cannot be specified. Many global online platforms do have resident business units in the Netherlands, but not all of these cases are considered resident online platforms under current definitions. In some cases, the resident business units serve only as hubs in logistics (retail platforms) or tax constructions. When the terms and conditions confirm that platform users have an agreement with a non-resident unit when making a transaction, the resident business units of global platforms are not included in the population of resident platforms.

The domestic production of digital intermediary services is highly concentrated in a few large businesses in the Netherlands. This results in confidentiality issues with regard to the publication of figures for both the product 'Digital intermediary services' and the industry 'Digital intermediary platforms charging a fee'. For now, the latter issue is avoided in the presentation of key results by combining the two platform digital industries.

Finally, some relevant digital activities are not identifiable in the standard SUTs, such as streaming services that households purchase from non-resident streaming services (which are not included in international trade data), and food delivery services provided by self-employed cyclists using online platforms (which are not available from data sources used for transport services). For these activities, it is unsure whether the macro totals in the current SUTs are exhaustive. As the scope of the DSUTs in this report is equal to the scope of standard SUTs, these activities are not re-allocated in the DSUTs either.

A caveat of the transaction type specification is that currently available data sources do not contain this type of information at the product level, but only at the business level. When a single unit sells multiple products, the assumption that the share of digital sales is the same for all of the products sold or bought by a business is therefore inevitable. This assumption affects the differentiation of transaction types by product for all columns of the DSUTs.

For both the transaction types and the digital industries we did include sales via EDI (Electronic Data Interchange) in the digital sales. However, this is not specified in the current guidelines (OECD, 2019) for the DSUTs.

For future iterations of DSUTs compilation, we recommend the following:

The most (cost-) effective method to improve the quality of some key figures is likely to update existing questionnaires. Several examples are:

- Differentiating the fees paid (costs) to online platforms for retail, accommodation and travel industries (SBS survey)
- Differentiating sales via online platforms in the 'sales by channel' for the retail industry (SBS survey)
- Differentiating between turnover from intermediation and trade (change of ownership) for the retail industry (SBS survey)
- Differentiating between cloud and non-cloud services in the specification of services sold by ICT businesses (SBS survey)
- Differentiating between cloud and non-cloud services and specifying digital intermediary services in the international trade in services statistics (ITSS)
- Expanding the scope to include the smallest businesses which have only one person employed (ICT survey)

The user's needs may not require the exact level of detail required for the template designed by the OECD to collect DSUTs data. Prioritization is crucial in order to have comparable time series for key indicators which are internationally comparable. For example, the transaction types by product for each column in the DSUTs will probably always require a lot of assumptions to compile. Such details may therefore get lower priority.

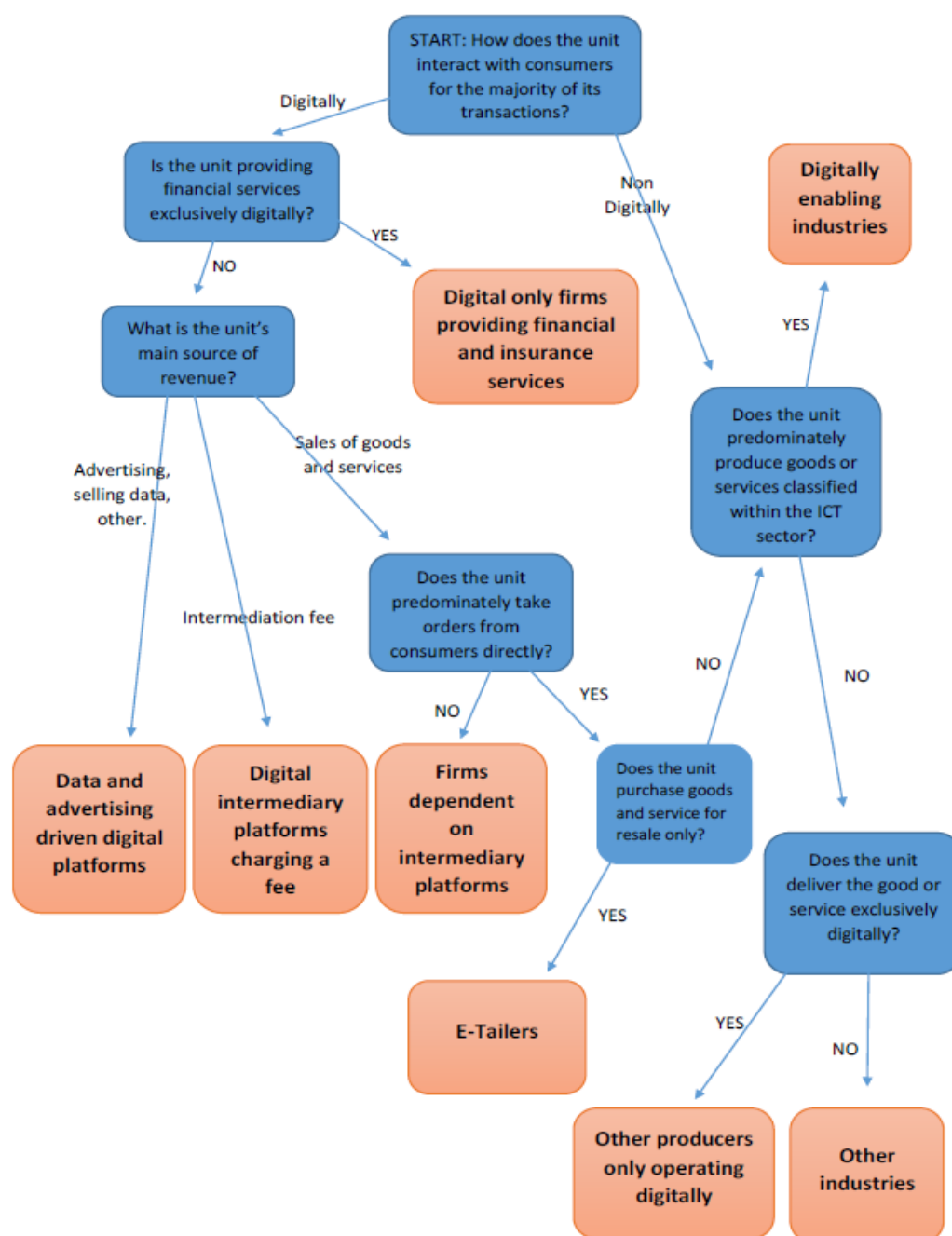
Future guidelines for the DSUTs would preferably include more guidance on 'Digital only firms providing financial and insurance services' and 'Other producers operating only digitally', as well as 'priced cloud computing services'. In general, the DSUTs concepts should be developed in close coordination with expected updates in the classifications for industries (NACE/ISIC) and products. The development of time series for the DSUTs will increase the means to assess the quality of the results and draw more attention from users.

Lastly, figures on employment within the digital industries are currently not available in the framework, but may be derived from the work undertaken. It could be valuable to explore the possibilities in this direction.

This project was limited to the scope of the current National Accounts framework (SNA 2008), but the DSUTs guidelines further expand this scope by including three entirely novel digital products, namely data, free digital services (beyond 2008 SNA) provided by enterprises, and free digital services (beyond 2008 SNA) provided by communities. Statistics Netherlands has done work (and is currently working) on the value of data and free services provided by enterprises in other projects. Moving towards integration of these projects in the DSUTs framework is recommended. This involves for example resolving double counting between data and software (own account), breaking down macro-economic totals by industry, and possibly estimating imports and exports.

For this experimental research the standard SUTs at the most detailed level of products and industries, available only for internal use at Statistics Netherlands, are used as a starting point. However, the compilation process of DSUTs is not integrated in the compilation of process of the standard SUT's. If the aim is to provide the DSUTs as an annual statistical product, alignment of the compilation processes of the DSUTs and the standard SUTs will be beneficial in terms of efficiency and quality. An example is the method applied in standard SUTs to use the detailed data sources when the National Accounts are revised, while using more aggregated data to calculate developments in between revisions.

Appendix 1 Digital Industry decision tree



Source: OECD (2019)

Appendix 2 Description of data Sources

ICT usage for businesses

Coverage: Businesses in NACE Rev. 2 sections C, D, E, F, G, H, I, J, L and N, divisions 69-74 and 95.1. with 2 or more persons employed. Before 2017 the threshold was 10 persons employed.

Number of respondents: 13644 in 2018

The model questionnaire on ICT usage and e-commerce in enterprises provides a large variety of variables covering among others the following areas:

- General information about ICT systems
- Access to and use of the Internet
- E-commerce and e-business
- Other topics foreseen in the benchmarking frameworks: e-skills, the mobile use of the Internet, cloud computing, social media, software as a service, etc. The survey used is the one of 2019, all questions revolving around (online) revenue however pertain to 2018.

Questions on E-commerce are of particular interest for DSUTs :

- Revenue earned through a website/app, split into own website/app and a platform owned by others
- Revenue earned through EDI (Electronic Data Interchange, a way of automated ordering)

The results for the E-commerce section of the survey are subject to quality concerns that may be the result of a lack of financial information in the ICT department of the enterprise that is likely to respond to the other sections of the questionnaire. These concerns are mostly related to the comparability over time. The percentage of enterprises in retail trade with one percent or more of the sales online⁷ shows some large year-on-year increases and declines over the past 10 years.

Structural Business Statistics survey (SBS)

Coverage: businesses in all size classes and the NACE Rev. 2 sections B through N, excluding Financial and insurance activities (K). Contrary to the all other digital industries, the digital industry 'Digital only firms providing financial and insurance' is not included in the SBS.

The SBS survey is a yearly survey on the structure (e.g. revenue, costs) of enterprises, which intends to accurately represent the economic structure of the relevant industry in the Netherlands. The SBS is one of the main building blocks of the annual figures for the industries in the standard SUTs.

The SBS survey population consists of small (<10 employees), medium (10-50 employees) and large businesses (>50 employees). The data of small and medium sized businesses is retrieved solely through survey sampling, whereas for the large category every single business in the country receives the survey.

The 2018 survey population of 57.158 business represents roughly 5% of all businesses in the Business Economy in the Netherlands. However, the total revenue of this 5% of business is roughly 90% of the total revenue of all businesses in the Business Economy, indicating that the coverage of large business is very high. Each of the survey units are also uniquely identified, which allows the data to be linked directly to various kinds of registry data if desired.

The survey indicators that are relevant in producing the digital SUTs are:

- The specification of the products sold.

⁷ <https://ec.europa.eu/eurostat/databrowser/bookmark/f4c557af-1960-4520-a8e2-58d6b7856123?lang=en>

- The costs of e.g. inputs purchased, employment and rent. (intermediate consumption)
- The questionnaire for the retail industry includes the value of retail trade by sales channel. Internet sales is one of these sales channels, which is a variable of interest.

Webscraper data Dataprovider

Coverage: URL's that are considered Dutch by Dataprovider.com

Dataprovider.com is a Dutch business that runs a spider in order to index over 450 million web domains in 50 countries all over the world, collecting over 200 valuable data variables for all of them. This results in a database of structured data about everything on the world wide web. Statistics Netherlands has merged its business registry and the Dataprovider.com data in order to obtain an insight in the online presence, activity and the keywords on the website of statistical business units.

Resident digital intermediary platform

In 2020 Statistics Netherlands sent a digital questionnaire to businesses that are expected to operate one or multiple online platforms. The businesses were identified on the basis of past research or the findings of scraping their website. The questions that are relevant for the digital SUTs are:

- Does your website operate as an intermediary for the exchange of goods, services or information between individuals, businesses or other organizations? (No, ends questionnaire for participants)
- Is your business the only supplier/provider on this website? (Yes, ends questionnaire for participants)
- Number of employees involved in platform activities.
- The share of intermediation services in the turnover of the business.
- The revenue model of the platform (e.g. advertising, transaction fees)

Since this population in the survey is incomplete, partly due to non-response, we further extend it with large platforms based on expert opinion. As a result details from the survey are not available for all units in the population of platforms.

Household budget survey

The household budget survey, held once every five years, provides detailed information on the products bought, the type of store it was bought in, as well as the online purchases of a rotating sample of households. For the reference year 2018, the latest available budget survey is from 2015. This survey sample contained a total of 15.000 households.

Appendix 3 Literature

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