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DIGITALISATION AND GDP – HOW DIGITALISATION IS VISIBLE IN ECONOMIC STATISTICS

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Contents

1 Foreword

Digitalisation has changed the economy significantly in the past couple of decades. How is it reflected in the key figures of the national accounts? Is GDP still a useful indicator of economic development?

This report discusses the effects of digitalisation in national accounts and price statistics. The report has been compiled by the experts of the statistics in question at Statistics Finland.

Section 2 discusses the definition of digitalisation and how digitalisation affects the economy. Section 3 explains the indicators, production boundaries and investments of national accounts in general, as well as classifications and their relation to digitalisation. Section 4 examines how the digitalisation of the economy is visible or how it should be visible in the GDP and other main aggregates of national accounts. Section 5 describes the effects of the phenomenon on prices and the production of price indices. Section 6 contains the main conclusions.

2 Digitalisation – concepts and definitions

Digitalisation does not have an unambiguous and established definition. Digitalisation refers to saving, transferring and processing of data in computer-readable form but the term also refers more broadly to the economic and social change process as the result of development in information and communication technologies (ICT). (Itkonen 2015)

A better term could be the digital or Internet economy, as the Internet is what enables the economic revolution that can be compared to the industrial revolution. It is, for example, characterised by the following features: clearly more efficient use of resources (Airbnb, Uber), shorter value chains (printed media turning digital, which means decreased printing and distribution of newspapers and magazines), exponential growth of services (Facebook, Twitter), increased importance of data in business (Google), and servicisation of all types of things (autonomous car). (Kostiainen 2016)

The term sharing economy (collaborative economy) is also often used and it refers, for example, to sharing your home or holiday home that is under-utilised. The sharing economy is not a new phenomenon as such, as households have always, for example, rented out their apartments in the short term and this is, at least in principle, also included in GDP. The sharing economy is also part of the platform economy. All business that takes place through a digital platform is not sharing economy, however. Digital platforms can also be utilised in conventional business.

The term peer-to-peer (P2P, consumer to consumer) is used for digital services provided by one consumer to another. In a study by the Federation of Finnish Commerce, the apt term peer trading is used to refer to trading between private individuals not subject to value added tax. Peer online trading, in turn, is trading online where private individuals sell goods and services to each other with the help of an online platform. According to the study, peer electronic trade is growing rapidly in Finland and it exceeded, for example, Finnish consumption in Estonia in 2015. Internet trading sites, like Tori.fi and Huuto.net are used

most but various Facebook groups are also popular (Vertaiskauppa verkossa (Peer trading online) 2015).

The Internet of things refers to digital solutions through which machines and equipment can be connected to the web. Through the web, equipment can be remotely controlled or data produced by the equipment can be analysed in real time. Based on the data, new services can be produced for consumers, enterprises and more widely for the entire society, for example, estimate traffic flows or the timing of electricity consumption peaks. This is called the Internet of things or M2M (machine to machine) (communication). The Internet of things is often linked to consumer business like wearable technology.

The Industrial Internet often refers to the utilisation of digital solutions linked to industrial machines and equipment in business activities. For example, sensors that produce real-time data on the operation of a machine can be installed on machines. These data can be analysed and utilised either mechanically or manually in many ways.

Digitalisation affects the economy in three ways:

1) Physical products turn into digital services lowering usage, duplication, distribution and transportation costs. Marginal production costs decline. Examples are CDs, newspapers and printed books that are replaced with electronic versions. In manufacturing, 3D printers can replace physical transportation of products as digital data can be sent to where the product is consumed and printed.

2) Digital platforms increase efficiency and turn previously local services into international services, for example, buying of airline tickets online. They also create international marketplaces for employers and employees without the workforce having to move between countries.

3) Digitalisation improves the efficiency of conventional production. For example, energy production can be better adjusted to demand, logistics can be

simplified with digital trackers or by developing industrial robots towards artificial intelligence. (McKinsey Global Institute 2014)

The OECD's work group report on the Internet economy (OECD 2013) uses a classification that is also suitable for examining digitalisation even though there may be differences in the concepts. According to the OECD's recommendation, the Internet economy refers to various measurable effects of the Internet whose extent can be measured from three viewpoints: direct effect, dynamic effect and indirect effect.

The direct approach is the most conservative and mainly based on official data. For example, the GDP share of the Internet economy can be measured by examining which industries are closely linked to the Internet and summing up their value added. Another approach tries to describe the dynamic effect the Internet has on all industries, which is reflected in the productivity and GDP growth figures of official statistics.

The third approach is to take into account the indirect effects of the Internet. It tries to analyse the effects of the Internet on such economic phenomena as consumer's benefit or social wellbeing. Studies analyse the value added (utility) that the Internet produces for economic wellbeing and that conventional statistics do not necessarily measure.

3 National accounts

3.1 Production boundary of the national accounts – what GDP includes and excludes

The production boundary of national accounts is defined in the international recommendation on the System of National Accounts, SNA 2008 and the European System of Accounts, ESA 2010 (sub-sections 3.07 to 3.09) stipulated by

the European Union. A summary of the ESA's sub-section in question is presented in Appendix 1.

Boundaries are important because along with digitalisation, the boundary between the work performed in enterprises and at home become blurred.

The ESA's definition shows that production in national accounts only includes agricultural products and own-account construction of households' own-account goods production, and for services only imputed services of owner-occupied dwellings and services produced by employed household staff.

When production moves across the production boundary from households to the market GDP grows and when production moves from the market to households GDP declines. There is constant movement in both directions. For example, meal preparation and childcare have moved from households to the markets in the long term as women's working has increased; GDP has grown. Correspondingly, for example, a drop in the use of shop and travel agency services decreases GDP as people have moved to direct online purchases. Similarly, banking services moving from bank offices to home computers has decreased production and GDP if it has lowered banks' interest income and service charges.

Information and communication technology becoming more common has blurred the boundaries between work, domestic production and free-time. Through the Internet, households can produce services for one another and themselves, which previously have been produced by enterprises that supplied services on the market, in which case the activity was included in GDP. In addition to airline tickets and hotel reservations, other examples are self-service at airports, in shops, when withdrawing cash or paying bills. As stated above, this type of household participation in service production is not included in the production concept of national accounts. In terms of the compilation and interpretation of GDP expanding the production boundary would include complicated pricing and delimitation problems.

The effect of these digital services produced by households themselves, for example, on the growth figures of an individual year is probably insignificant but it is hard to assess. Other transitions across the production boundary may have a bigger effect, for example, as unemployment grows or contracts.

The same approach also applies to households' consumption. For consumers, free advertiser-funded services are by implication included in the price of the final product and also in the output of advertising services if the enterprise offering them is domestic. So national accounts do not assess separate (imputed) consumption of media services. Consumption shares of free Internet services and the benefit they produce for consumers could, in principle, be described outside the conventional national accounts framework in the so-called satellite accounts by utilising, for example, time use surveys or data transfer volumes but such an exercise has not been carried out at Statistics Finland.

By contrast, the Consumer Society Research Centre has, together with Statistics Finland, researched the value of household production. The publications include Kotitaloustuotannon satelliittitilinpito Suomessa 2001 (Satellite accounts of household production in Finland in 2001) by Johanna Varjonen and Kristiina Aalto, Kotitalouksien palkaton tuotanto ja sen muutokset 2001-2009 (Unpaid production of households and its changes 2001 to 2009) by Johanna Varjonen and Kristiina Aalto.

Household production outside GDP includes, for example, cleaning and maintenance of a dwelling, meal preparation, clothing care, caring for children or relatives, vehicle maintenance, voluntary work and related shopping including travel. It also includes running bank and shopping errands.

According to research, the annual change in the value added of household production outside the national accounts has not deviated much from the annual change in GDP. The difference was at its highest in 2007, when GDP grew by eight per cent in nominal terms but household production outside the national accounts by 3.5 per cent. In 2009, the difference was reversed, GDP decreased by 6.5 per cent in nominal terms and household production by three per cent.

In other words, the development in household production has been more stable than in GDP.

National accounts manuals change slowly and changes to, for example, the current production boundary of national accounts is not likely, at least in the short term. A description of the Internet economy (digital economy) is, however, under consideration. The international Advisory Expert Group that is preparing the next SNA (UN's System of National Accounts) renewal rejected in April 2016 the suggestion to add an imputed consumption component corresponding to free services into national accounts but will, however, analyse what additional data could be produced on the digital economy. This could mean adding various satellite examinations that describe the digital economy to national accounts. The work plan of the OECD's working group mentions the following complementing entities as examples: e-commerce, value of free services for households and value of data warehouses.

3.2 Investments and intangible capital

When defining investments (gross fixed capital formation) it is important to make a division into intermediate consumption and consumption. In practice, the division into intermediate consumption is defined based on enterprises' book-keeping conventions; expenses that the enterprise has recorded as investments are investments. Division into consumption is also clear in principle: purchases households use for production activities are investments. Thus, for example, buying a car is an investment if the household buys it for business activities but consumption expenditure if the car is bought for personal use.

An asset classification that in principle covers all intangible and tangible assets is applied to capital formation and consumption of fixed capital in Finnish national accounts. In an economy that is becoming increasingly digitalised and global, the importance of Intellectual Property Products, IPP increases and international mobility grows. In national accounts, the item includes R&D activities, mineral exploration, software, and entertainment, literary and art originals

and other intellectual property products. Intellectual property products are currently included in investments in national accounts as listed below (the figures describe the gross fixed capital formation of the entire national accounts in Finland in 2015 at current prices):

N117 Intellectual property products EUR 9.0 billion
of which:
N1171 Research and development activities EUR 5.8 billion

R&D investments are naturally used in production. Their lifetime is generally assumed to be ten years in national accounts. The lifetime of software investments is assumed to be five years.

Statistics on other intellectual property products than R&D investments are currently partly deficient and their investments or stock data are not published separately. This is also true for intangible assets that do not belong to investments but to the item "Net acquisitions of other non-produced assets". These include, for example, radio spectrum, contracts and licences, as well as goodwill. In the sector account, this item currently includes data only on sale of emissions rights.

Most problematic for users is probably that no separate data are published on software investments and that R&D investments are published at a rougher industry distribution than other investments. ICT equipment investments are not published separately either. This is due to uncertainty of data.

Examples of investment division

Acquisition of a dwelling is always considered an investment and never consumption expenditure in national accounts. In practice, a dwelling used in Airbnb activities should to that extent be a building construction investment in accommodation activities instead of a residential investment in owning or letting of dwellings. The industrial classification TOL 2008 does not recognise Airbnb activities but it would seem natural that it would be seen as accommodation activities and not as letting of dwellings. In practice, the division is not necessary as the occurrence has low importance but the situation should be monitored.

Acquiring of a car used as an Uber taxi should be considered an investment and not consumption expenditure to the extent it is used as a taxi. In practice, the car acquisitions of entrepreneurs in various fields are recorded as investments in full even if they are also used outside the entrepreneurial activities. The problem may be reversed, car investments are over estimated in national accounts.

Development of open source code software is, in practice, an investment for own (and other's) use. The investment is freely available to everyone. No value can, however, be calculated for it because the work has been carried out for free.

Big data collected in business information systems could, at least in theory, belong to databases included in intellectual property products. Enterprises use the collected big data in their activities, for example, to target marketing. The SNA recommends that only physical database maintenance and construction are included in produced capital but the profit potential of the accumulated data is excluded. So in practice, costs related to the digitalisation of data materials are recorded as investments in national accounts but not the value of the accumulated data as such. One reason for this is that it might inadvertently lead to capitalisation of knowledge (and human capital) in national accounts (Ahmad, N. and P. Schreyer 2016).

In practice, big data will only be included if enterprises record it in their balance sheet. According to article by OECD (Ahmad & Schreyer 2016), the market value of databases is probably much higher than the capital stock valued by the Perpetual Inventory Method. It is likely that the total value of databases is only taken into consideration when they are sold in their entirety. In such a case, it should probably be visible in the enterprise's goodwill value, which does not affect GDP. Goodwill is recorded in intangible assets in the enterprise's balance sheet usually in connection with an acquisition.

Selling of intellectual property products abroad is visible in Finland as a negative investment in the sector or industry in question with exporting of the service as the counter entry. In case of non-produced intangible assets like emission rights being sold abroad, the sale is recorded as net acquisition of the non-produced

asset in question both domestically and internationally. In both cases, Finland's current account improves.

If the IPP itself is not sold but its usage rights are sold abroad, the exports of the service are recorded under the item "Patents and royalties". Received royalties and similar payments are recorded in the output of the country that owns the IPP.

An international group can for tax reasons or as part of enterprise reorganisation transfer intangible capital found in an affiliates balance sheet from one country to another without compensation. In national accounts and balance of payments, the transfer of IPP from one country to another is recoded as so-called other change in volume, which does not affect the current account.

3.3 National Accounts' indicators

Gross domestic product tries to measure the value and volume of production. It is not an indicator of wellbeing even though it is often used as such. Currently it describes economic wellbeing ("material wellbeing", "standard of living") relatively well but not perfectly, however. For example, the above-mentioned production boundary leaves unpaid household work nearly fully outside the production boundary even though it improves economic wellbeing considerably.

Gross domestic product (GDP) is usually given as nominal or at current prices at the price level of each year. In terms of GDP development, it is more relevant to know the real change in GDP or the change in the constant price time series. It describes the volume of GDP, which includes both the change in production volume and quality. Nowadays, the constant price series is calculated by using the previous year as the base year, which means that structural changes in the economy are better considered than before when the base year was changed every five years.

In practice, the volume of GDP is calculated by adding up gross value added by industry and adding taxes on products and subtracting subsidies on products.

Gross values added by industry are obtained by deflating the output and intermediate consumption separately with suitable price indices (double-deflation) and subtracting the deflated intermediate consumption from the deflated output. The value added volume thus obtained can, within individual industries, fluctuate considerably from one year to another but for the entire economy the fluctuations level off.

Another central indicator of the national accounts is the net domestic product (NDP). It is obtained when consumption of fixed capital that describes the decrease in the value of the capital stock due to normal wear and tear is subtracted from GDP. This part of production must be used to create new capital stock in order for the economic capacity to be maintained. Thus, net domestic product describes better the value of production available to the economy than gross domestic product.

The third key indicator is (net) national income (NNI). It is obtained when primary income (interest, dividends, undistributed profits, salaries, etc.) received from abroad are added to net domestic product and primary income paid to abroad is subtracted from it. It describes the income of national economy better than the domestic product.

The national income is also calculated in real prices. That means that in addition to primary income, the effects of terms of trade or changes in export and import prices are considered. As the terms of trade improve, the national economy has more export revenues to buy relatively cheaper imported products. If the terms of trade improve, the national income usually develops more positively in real terms than GDP or NDP. The difference between the real annual changes in GDP and national income can be considerable, in 1995 it was as much as 4.5 percentage points. In recent years, when the oil price has fluctuated, the difference has been over one percentage point.

The fourth indicator is disposable income in the national economy. It is obtained when current transfers paid to abroad (EU payments, development cooperation, pensions, etc.) are subtracted from the national income and current

transfers received from abroad are added. The disposable income in the national economy describes, as the name indicates, disposable income.

In practice, GDP, net domestic product, gross national income, net national income, and disposable income have developed quite similarly in Finland in nominal terms. Real development has, however, differed considerably due to the terms of trade effect.

Crucial in terms of the income of households is how the households' share of disposable income develops. An even better indicator for this is the so-called households' adjusted disposable income that also includes private services that general government and non-profit institutions serving households produce for households, such as educational, health and social services. It is usable especially in international comparisons because these services are arranged differently in different countries.

The corresponding consumption concept to households' adjusted disposable income is households' actual consumption where the above-mentioned individual services have been added to consumption expenditure. Savings are obtained as the difference between income and consumption.

Households' disposable income and adjusted income are also calculated in real prices through deflating them with the price index of household consumption expenditure and the price index of households' actual consumption. In Finland, households' disposable income and adjusted income have developed relatively equally.

3.4 Digital economy transcends statistical classifications

Digitalisation concerns all industries in one way or another but most fundamentally it affects the industries where both produced commodities and related distribution and other services can be fully or partially moved to the web. It

accelerates the structural change that has taken place in Finnish manufacturing, where activities with higher value added have increased. At the same time, manufacturing has become more service oriented, i.e. the importance of services as an intermediate and final product in manufacturing has grown. Digitalisation of services enables global markets and affects international trade.

However, simply based on the sector accounts of the national accounts or even based on supply and use tables it is difficult to separate the ongoing structural change because products and services are ever more complexly intertwined in production. The share of services and digital commodities (e.g. software and applications) in the production costs of the product and the value of the final product can be considerable. This is not necessarily shown in statistics because the classifications used in them and their source data are not detailed enough. For example, in statistics on international trade, a product can still be fully recorded in goods exports based on the final product. In supply and use tables, output and intermediate consumption are divided by product but the product classification of the national accounts does not separate digital commodities extensively. IT designing and programming services can, however, be separated from output and intermediate consumption.

In principle, similar problems as in household consumption are connected to the measuring of industries' digital commodities used as intermediate products. In national accounts, intermediate consumption for each industry is calculated, for example, based on the value data available in Statistics Finland's structural business and financial statement statistics, which are deflated with suitable price indices in accordance with the product structure of intermediate consumption to calculate volume. For intermediate consumption – just like for turnover – the effect of, for example, intra-group pricing cannot be separated. It is also not known to what extent enterprises utilise free digital commodities available on the markets like free software as components of their intermediate products. Both phenomena affect the changes in the value and price of intermediate consumption.

It is very difficult, if not impossible, to calculate even a rough estimate of the size class of digitalisation from statistics. One reason for this is the classifications

used in statistics. The classifications define the framework in which the statistical data are presented. For example, consumption and industrial classifications do not extensively classify digital products or industries.

4 Measuring challenges of digitalisation

Possible measurement biases in GDP and more generally in economic statistics have become a hot topic in academic research and public discussion. Especially GDP's ability to measure growth and productivity development is questioned. In a recent report ordered by the Economic Council and compiled by ETLA's researchers (Kotiranta etc. 2017), the measuring challenges of GDP and wellbeing are divided into five topics: decrease of digital prices and improved quality, reduced importance of specialised intermediaries, free services, tax optimisation of multinational enterprises, and the platform, sharing and gig economy.

The following sections examine these phenomena brought on by the digital economy especially from the viewpoint of how they affect national accounts and price indices.

4.1 New digital intermediation services

Automation and increased self-service removes enterprises that used to provide such services from the markets. Examples include travel agent services, crowdfunding services and e-commerce. They have been replaced with new digital services directed at consumers which are provided by enterprises offering online services. In national accounts, these types of digital intermediation services produced by enterprises are in principle recorded like other services, that is the enterprise's service margin and the service charges it collects are recoded in its output. So in national accounts, a simple changeover from conventional business services (like travel agencies) to web-based services (like Booking.com)

takes place. If the service provider is a domestic economic unit it is probably included in the source data used by national accounts. For multinational service providers, it is unsure how their invoicing is carried out in Finland: do they have a branch/affiliate/billing location in Finland and in which industry.

4.1.1 Travel intermediation services

The business model used for intermediation services related to trips and hotel reservations may vary. An article in Helsingin Sanomat describes the intermediation of hotel reservations (http://www.hs.fi/talous/art-2000002857604.html):

"There are two different operating models for services that provide hotel reservations. The first is the so-called merchant model, where the reservation service buys accommodation capacity from hotels and acts as the retailer. They basically use the hotels as wholesalers and sell the products to consumers with a margin. The other model is to collect a commission from the hotel for room reservations. This is cheaper for the intermediation service because it does not have to pay for the room in advance but, on the other hand, it is bound to the prices set by the hotel. Suppliers that use the wholesale model can price the room more freely — and collect bigger profits.

In addition, there are also so-called meta search engines that do not supply actual reservations but search for a suitable room from several search services at one time. Their income is collected from the ads shown with the search results. In addition, some get commission on customers that they send forward to the actual booking services. The booking services prefer, however, to sell combined flight and hotel packages. It is actually a case of conventional volume discount where the seller increases sales and the customer saves a bit."

In Finland, the recording practices of the national accounts vary depending on the enterprise's activities.

4.1.2 Financial intermediation

Digitalisation has also brought new forms of financial intermediation to the markets which at least yet do not compete with conventional financial intermediation. One new form is peer-to-peer (P2P) loans. Peer-to-peer loans are one of the many forms of crowdfunding where lending of money between private individuals is enabled through the Internet. A P2P loan is always an agreement between two private individuals. Both the borrower and lender or investor decide under which term they are ready to enter into the loan. The biggest Nordic crowdfunding service Fellow Finance describes P2P loans like this on their webpages (http://www.fellowfinance.fi/en/peer-to-peer-loan):

"...P2P lending is made through the online service which provides a modern, flexible and transparent way to agree on the loan terms. Lending for a private person does not, however, in practice differ from other loan alternatives. A loan application is filled in in the same way and if the loan is approved the borrower receives the whole sum to be withdrawn at once even though it has many financers. P2P lending is always based on an auction, which means that only financers that are offering the loan at the most favourable rate are approved and thus the borrower is always offered the cheapest possible funding option available. This also works in reverse in that the more solvent the loan applicant, the better loan offer he/she can get from the lenders. Therefore, you should fill in all the data that improve your solvency carefully. "

Other financial instruments can also be utilised in crowdfunding, in which case it is similar to the activities of venture capitalists. Crowdfunding platforms include Kickstarter that focuses on funding of creative projects for consideration and Finland's first consideration-based crowdfunding platform mesenaatti.me. Venture Bonsai, in turn, is Finland's first service focusing on share-based crowdfunding.

The activities of units specialised in crowdfunding can be considered operations serving financing, which, at least in theory, are included in GDP through the service fees, etc. that are collected from service users. Acquiring of financing

between households is not, at least yet, considered when calculating the FISIM output of national accounts (imputed financial services) because households are not considered to produce financial intermediation services or carry the risk it generates. In financial accounts, loan and share-based crowdfunding should be recorded under the instrument in question but so far it has not been considered necessary. The development of crowdfunding is monitored, however.

4.1.3 E-commerce

E-commerce refers to purchases made on domestic and international web pages and corresponding sales. The purchases can be goods or services. The services can be delivered to the buyer either over the Internet or otherwise. Product purchases are usually delivered directly to the buyer's house. If the manufacturer sells their products directly, no trade intermediation service is needed and it is obvious that the value added in trade is slightly lower. On the other hand, the need for transport services may increase.

Purchases can be made by private persons, enterprises, organisations and general government. It can be assumed that purchases made by other than private persons are recorded in normal business accounts and thus included in the basic data of national accounts.

If the e-commerce seller is a Finnish enterprise, the turnover from e-commerce is included in other turnover and separate data are not available. If the buyer is a foreign economic unit, it is a case of goods or service exports. Finnish Customs' statistics on international trade and statistics on international trade in services cover, as a rule, exports in Finnish e-commerce.

If the buyer is a Finnish private person and the seller a foreign economic unit, import data must be supplemented. Of private person's online shopping, Finnish Customs' goods trade statistics cover goods deliveries from outside the EU. E-commerce of products within the EU must be estimated and added to goods

imports. Online purchases related to travel (e.g. accommodation and trips) are included in tourism expenditure and transport services in service imports. Online purchases directed at other services must be estimated and added to service imports.

Trade becoming digitalised into e-commerce affects tangible goods and investments, as well as services. Investments in buildings may decrease as buildings are not needed for trade in the same extent as before. On the other hand, logistics and distribution centres, as well as warehouses are still needed. Both conventional trade and e-commerce are investing in IT systems. Investments in transport equipment are also still needed because purchases made online are transported from the production facilities and ports to warehouses, pickup points and directly to consumers' homes. Transport services can be used more than before to deliver the product to the consumer.

4.2 Free and ad-funded services

This category can include both ad-funded digital services that are free for users (like Facebook, subscription services, search engines) and free commodities produced through voluntary work (like Linux and Wikipedia). Subscription services can also be acquired online (e.g. music, movies, XaaS), some of which are chargeable (like Netflix) and some are ad-funded. In terms of pricing, freemium services can be separated from premium services: typically the basic version of the service is free and the premium version costs.

Typical for all free online services is that when they become more common it decreases the consumption of corresponding products. How are the free digital services or consumption shifting from goods to subscription services visible in national accounts?

In every case, only chargeable services are visible in the output in national accounts, which is recorded according to advertising revenue, subscription fees or similar. If the enterprise that produces the advertising is a foreign economic unit

the advertising services purchased by a Finnish advertiser are visible in balance of payments as services imports. In household consumption, subscription services are recorded to the extent that consumers pay for them.

On the other hand, if, for example, the consumption of printed products and postal services decreases because households consume corresponding services through the Internet it will visible as reduced productivity in these industries. The use of the Internet can increase production elsewhere, for example, electricity production, manufacturing and trade of equipment.

Free "public service goods" produced by households for one another like blogs and Wikipedia articles could, in principle, be compared to production. No value is, however, recorded for commodities or their production because the work is carried out for free. If the writing of a blog is financed on a market basis, for example, with advertising revenue, it should be recorded in output.

Free video services (Youtube): Ads and ad space are sold in connection with the videos and the videos may include product placement or marketing. The videos contain, for example, educational and professional content, information or entertainment. Video-sharing services are included in production to the value of the advertising revenue received by enterprise maintaining the platform and the own-account workers and enterprises that produce content. The advertising costs of the enterprises that advertise are included in their intermediate consumption. Free video-sharing services are not recorded in private consumption. Their recording in national accounts does not differ from the free channels of traditional commercial television.

Linux is a significant and widely used open source code software on the basis of which commercial applications have also been developed. Linux is, at least primarily, developed through unpaid work. In the current framework of national accounts the work used for the development is not included in GDP. This does not, however, mean that it would be outside the production boundary and that it would not have considerable value and use, for example, in enterprises' production process. Because the software is produced for free, i.e. the production

costs are zero, by definition it has no value. In addition, because the development is global, the output cannot be allocated to an individual country.

A search engine (like Google) is a service for advertising and seeking information. With the help of search words and big data it helps advertising enterprises and consumers that are seeking products connect with one another. The use of a search engine is free for consumers as the enterprise that offers the search engine services gets its income from selling advertising services to other enterprises. For the advertising enterprise, the advertising costs are intermediate consumption and for the search engine enterprise that sells the advertising services they are output. Offering of free products is not calculated with statistical methods in the output of enterprises offering search engine services and thus generates no value added. For the consumer, the search engine is a free service, which means its use is not included in private consumption. Enterprises also utilise free search engine services in their activities, for example, when seeking information.

Because search engine advertising is digital and it utilises big data, advertising can easily be directed at individual consumers. In this case, the enterprise can use the resources reserved for advertising efficiently. In terms of the advertising enterprise, an improvement in the quality of the search engine means better targeted advertising than before. In this case, the advertising received by the consumer better fits his/her preferences and the enterprise can target advertising to the desired user group. The consumer sees relevant advertisements and the consumer's information search cost decreases measured over time.

There are probably no established methods, indicators or data for measuring the improvement in the quality of the search engine. It is also not possible to deflate the improvement in the quality of a free service unless its supply and use are imputed with statistical methods. The producer price index for services does not, at the moment, include search engine advertising so there are no data on price development and share, and thus the improvement in the quality of the search engine does not show in the volume.

The euros used by enterprises on search engine advertising are included in their advertising costs in which case the product in the supply and use framework of national accounts is the purchasing of advertising space or time, the price data of which comes from the producer price index for services. The enterprises that respond to Statistics Finland's Financial statements inquiry for enterprises specify advertising, sale and marketing expenses from all expenses and advertising revenue from turnover. The share of search engine advertising is not specified. Data on advertising revenue received by enterprises can be gained from Statistics Finland's Business services inquiry to which service enterprises producing business services respond. It asks for the item "Selling and supply of Internet advertising space or time" and the item "data processing, hosting and related services; web portals (including streaming, Internet advertising)". The inquiry does not, however, necessarily provide data on advertising sales of search engines if the enterprises do not operate in Finland.

Search engine advertising is international trade in services if the search engine enterprise is registered in another country than the enterprise buying the advertising. If a search engine enterprise operating abroad is not registered in Finland, the services bought from them by a Finnish enterprise should be visible in Statistics Finland's inquiry on international trade in services in the item advertising services under import of services. The domestic price of marketing services in the producer price index for services is also used for exports and imports.

4.3 Platform and sharing economy

Services based on various online advertising revenue are included in output in accordance with advertising revenue if the maintainer of the webpage is a domestic economic unit. For example, Tori.fi is a Finnish affiliate of a foreign enterprise that receives its revenue from advertising. Anyone can sell goods and the like through the pages for free. If the maintainer of the page like this is an economic unit located abroad, the advertising space purchased by a Finnish advertiser is service imports.

No production is generated from households selling used goods, like cars, to one another and no value added is generated regardless of the price. Possible fees collected by the supplier (flea market site, web ad, etc.) are part of the value added. In the sales of old apartments, only the commission and the asset transfer tax are included in GDP. The commission is value added in real estate agencies and the asset transfer tax is taxes on products. On the demand side, they are part of building construction investments.

Airbnb is an international site through which you can rent a temporary apartment from another household. Airbnb collects the rent on which it, according to its website, collects a three per cent commission and pays the rest to the lessor. The commission is service imports. The rent income received by a Finnish household is output of accommodation activities in the household sector. It is also service exports (tourism receipt) if the lessor is a foreign economic unit. Rent income must be reported in taxation but it cannot be separated from other rent income so no data on the extent of the activity can be found there. An estimate on the rent income from Airbnb should be included in the output of accommodation activities and be divided into two parts: grey output and other output. When making the estimate it should be noted that the output of owning of dwellings already includes imputed housing services, which, in principle, should decrease over the rental period but in practical calculation it does not make sense to lower it but rather lower the estimate on the output of accommodation activities. These are, however, relatively small figures that have not yet been estimated.

The Uber taxi system in Finland is an affiliate of a foreign enterprise that supplies transport services from households to other households and enterprises. The commission it collects is output of taxi transport in the enterprise sector. The payment the driver receives is output of taxi transport in the household sector. If the income is reported to the tax authority (which one should do) it is unclear into which industry's output it is recorded if the service provider is a part-time entrepreneur or if they are recorded at all. In practice, Uber taxis are likely to be the grey economy. Currently, practising taxi traffic requires a taxi licence in Finland. It is difficult to measure grey output.

If an increasing number of households uses shared goods, for example, a shared lawnmower, it is seen as lower consumption and lower output (in manufacturing, transport and trade) compared with everybody buying their own. This is true also for a shared car. The consumer can get (almost) the same benefits with lower consumption. The fees collected by the enterprise that arranges the service are naturally included in the output.

Time banks and similar households' trading system based on reciprocity are a borderline case. They can be seen as voluntary work, which is not included in output when it involves service production. They can be equated to neighbourly help and voluntary work, i.e. in unpaid household production. These types of activities have been low in Finland.

4.4 Global production

One effect of digitalisation is that it enables the dispersion of production and distribution both nationally and globally because the commodities can in practice be produced anywhere and distributed over the Internet. Globalisation of production in itself challenges national economic statistics and digitalisation does not make measuring any easier.

As a result of digitalisation, some services, the production of which has been tied to a location, becomes detached from their location. This means that international trade in services grows and their movement across borders can become blurred, which may cause a measuring problem. The situation does not as such differ from the current challenges of measuring services between countries. From the viewpoint of national accounts, it might be more a problem of changes in the prices of digital service than a measuring problem and thus a challenge in measuring the volume.

One example of the measuring challenges brought on by digitalisation is the "remote" services produced on the web such as training and maintenance services. In practice, enterprises report the exports and imports of these services

in Statistics Finland's inquiry on international trade in services where they have their own item. But are enterprises always able to separate "remote services"? On the other hand, the service can principally be included in the price of the final product in exports from Finland or imports to Finland when it is carried out as work under guarantee. During the guarantee period, the service is visible as salary or other similar costs of the enterprise producing the service and only once the service is charged will it be recorded in service imports or exports.

Both in terms of statistics on international trade and national accounts the case is somewhat similar to a case where someone buys a computer from abroad: even though the computer includes software and other services, its acquisition is recorded in goods imports in accordance with the final product. If the software is purchased separately, it is booked in service imports.

The scalability of the production of digital products is almost limitless, which is why the growth in enterprises' production can be huge. Online products reach a global market, which means that as an effect of digitalisation, the spreading of products and brands into global ones can be very rapid. Digital products are scalable and easily reproduced because their production and distribution do not face the same types of costs and physical limitations as manufacturing of products. Products shifting from goods to services also changes the industry structure of national accounts, where the importance of industries can be measured, for example, with value added.

Turnover or intermediate consumption of multinational enterprises is recorded in national accounts in accordance with the enterprises' financial statements or the data reported in the statistical inquiries. It is possible that they include the group's internal transfer pricing but its effect on national accounts cannot be estimated.

An international group may, for taxation reasons or as part of enterprise reorganisation, make internal balance sheet transfers that can considerably swing the GDP growth figures at least of small countries, as the example of intellectual property (IP) transfer in Ireland in 2015 proves. To what extent could a similar

transfer of intellectual property from one country to another affect national accounts figures in Finland? In late 2016, Eurostat's GNI committee carried out an inquiry to the member countries that asked to list multinational enterprises whose intellectual property recorded in the balance sheet exceeds EUR one billion. There was only one such enterprise in Finland. The inquiry also asked to assess if large "IP enterprises" have moved to or from the country in recent years. In Finland, such enterprises have not been recognised but, on the other hand, it is possible that some enterprise reorganisations have involved IP of transfers which statistics are unaware. For the same reason, no estimates of the effects can be made. The assumption is, however, that multinational enterprises would not at least have a taxation incentive to transfer a lot of intellectual property to Finland. This does not exclude that, for example, new data centres would be located in Finland, whose balance sheet in Finland would mainly consist of land and real estate property at least for the time being.

5 Challenges presented by digitalisation to price indices

Price indices and their quality play an important role in the calculation of national accounts series at constant prices. The consumer price index is mainly used to deflate consumption. In terms of the volume of GDP, producer price indices are key because output and intermediate consumption deflators formed from the producer price indices are primarily used to deflate the industry-specific value added of national accounts.

Because the price indices aim to measure pure price changes, the structural shift to cheaper digital services may become visible as a drop in the volume in national accounts. In the price index, digital services and physical goods are completely different products, which means that their price changes are measured separately and the index is weighted with the product structure. Let us assume a situation where the number of newspaper subscriptions remains unchanged

but their value is halved as a result of people buying the cheaper digital version instead of the physical newspaper. The prices – that is, of the physical and digital newspapers – remain unchanged in this example, which results in a drop in the volume (halving) just like in the value even though the number of newspaper subscriptions has not changed.

The solution for the problem could be that the value of the output would be divided into two parts in national accounts (digital newspaper and printed newspaper), which would be deflated with their own price indices.

Another addition to the problem is the differences in the quality of products. At least for some products it can be justified to argue that their quality is better than for the corresponding physical product. The change in quality that is caused by new digital services entering the market is not, however, "adjusted" in national accounts when price indices are used in deflation.

This section explains the effects of digitalisation on the production of price indices and international comparability.

5.1 Consumer Price Index

5.1.1 Harmonised methods

In several Member States of the EU, the compilation principles of the index of consumer prices differed from one another in previous decades. Therefore, a Harmonised Index of Consumer Prices (HICP) was created in 1996. The primary use of the harmonised index of consumer prices is to compare inflation in the EU Member States.

The production of the Harmonised Index of Consumer Prices is regulated by 22 regulations that define the minimum requirements for index production. In addition to harmonising the commodity basket, for example, it has been agreed on the handling of quality changes, the calculation formula for the index and

the frequency at which the value weights of the commodities are changed. Commodities that have been considered not to belong to private consumption (owner-occupancy) or whose measuring method was found to be problematic (games of chance) have been excluded from the index. In addition, a number of recommendations that have been compiled in cooperation between the Member States and Eurostat steer the production of the Harmonised Index of Consumer Prices and the CENEX manual on handling quality changes produced by the German statistical authority.

In Finland, the national Consumer Price Index and the Harmonised Index of Consumer Prices are based on the same price and weight data and they are calculated with the same index formula. The indices differ from one another only to the extent that the Harmonised Index of Consumer Prices does not include owner-occupancy, games of chance, interests on consumption and other credits, fire insurance on owner-occupied dwellings, the vehicle tax or fishing and hunting fees.

Even though the data collection methods and handling of quality changes have been harmonised in the EU countries in recent years, there are still differences in the methods. Some countries use more statistical modelling and other unit values and discretionary procedures. Especially the measuring of technical equipment and services differs by country. Examples are computers, mobile phones and telecommunications operators' services.

There are also other commodities where the assessment of quality changes causes problems. Table 1 shows a list of challenging commodity groups in the Harmonised Index of Consumer Prices in terms of measuring price development. Based on a rough estimate, the share of challenging commodities with difficult quality change problems and continuous structural changes is around 30 per cent of the entire value of the Harmonised Index of Consumer Prices.

Table 1.
Challenging commodity groups in the Harmonised Index of Consumer Prices in terms of measuring price development.

ecoicop	Commodity group	Weight, %	Notes
03	Clothing and footwear	5.43	The commodity changes constantly, quality change problem, share of e-commerce
05.3	Household appliances	1.03	Quality change problem, share of e-commerce
06	Health	6.21	Social welfare and health care reform, compensation scheme
07.1	Purchase of vehicles	3.90	Quality change problem
07.3	Transport services	2.71	Structural changes in tariffs, tightening competition, dynamic pricing, e-commerce
08.2	Telephone and telefax equipment	0.41	Quality change problem
08.3	Telephone and telefax services	2.40	Structural changes in tariffs
09.1	Audio-visual, photographic and information processing equipment	1.58	Quality change problem, share of e-commerce
09.2	Other major durables for recreation and culture	0.99	Quality change problem
09.3	Other recreational items and equipment, gardens and pets	2.63	Quality change problem
09.6	Package holidays	1.46	Quality change problem, e-commerce
12.4	Social protection	2.28	New services, pricing model
12.5	Insurance	0.74	Structural changes in tariffs, profiling of consumers
	TOTAL	31.77	

In every commodity group, the collection method and quality change procedures must be known by member country in order to estimate the reasons for differences in price development between member countries. In 2018, all member countries are obliged to send an inventory to Eurostat containing all data sources used in index calculation, collection methods, commodities included in the collection, definitions and quality change methods.

The price level index is not suitable for examining the methodological differences between the EU countries. Price level comparisons examine the prices of similar types of commodities in different countries. Due to national consump-

tion, commodities can vary a lot between countries in the Harmonised Index of Consumer Prices. For example, gas is consumed considerably more in Southern Europe, which is why it is one of the collected commodities there but not in Finland. This difference is reflected in the price development of group 04.5 Electricity, gas and other fuels.

5.1.2 New data sources

In recent years, pilot projects concerning big data and online price collection have been made in price statistics. Big data has been tested with the biggest trade groups' scanner data. In addition, web scraping that collects prices online directly from the pages of the producers of goods and services have been tested.

The first scanner data have been taken into use in the Consumer Price Index from the beginning of 2017 for the commodity group 06.1.1 Pharmaceutical products. The prices of all products for sale are used to calculate the price changes in over-the-counter and non-refundable prescription medicines and oral contraceptives. In addition, an EU funded scanner project is ongoing in the Consumer Price Index that examines the use of scanner data on daily goods in index calculation.

In general, one could assume that implementation of big data improves the quality of price indices because a larger volume of price observations become available. Scanner data are useful to price indices because, in addition to monthly price observations, they also include the purchased amounts and detailed data related to the products.

The use of big data enables a decrease in substitution bias because up-to-date consumption data are available for all purchased products. For example, the price change of rice could be calculated by using various types of rice instead of long-grain rice that is currently used, which would provide a more precise picture of the price development in the group 01.1.1.1 Rice. In addition, big data would enable calculation of indices at a more detailed commodity level.

A change in the data source specifies the index at the commodity level to which it is allocated. This can affect the comparison between the member countries. Currently, fewer than ten member countries use big data in their index production. In addition, several member countries are testing the use of big data as a source for price indices.

5.1.3 E-commerce

The share of e-commerce in price collection is constantly growing. In the price collection, prices are currently collected manually from the Internet. For example, prices of trips, electronics and computers, as well as clothes are collected from online shops.

However, the problem is that we do not know exactly what products and services households buy online because no exact data on online purchases are available. There are also no data on the market shares of e-commerce enterprises by product or service.

The key issue is how the data could be imported directly to Statistics Finland's databases from the service providers' pages or through big data. It should be known what products are bought and from which online stores after which the price data could be collected mechanically from the desired stores and products. This would require more detailed data on the value of sales.

With the help of the Bank of Finland's payments statistics data it could be possible to assess the share of e-commerce and determine the outlet sample. In order to utilise payments data to define the outlet and commodity sample, the data should include the time of the purchase, the online store, where the purchase was made and the purchased product or service on as detailed a level as possible. An alternative source could be the research data of some research institute if these were available. Other member countries also lack data at such a precise level in order to be able to assess reliably the share of e-commerce sales in total sales.

Purchases from international online stores are becoming increasingly common and this is a clear problem in Central Europe. Therefore, Eurostat has issued a recommendation according to which households' online purchases made within the member country (including purchases from foreign online stores) belong to the framework of private consumption in the Consumer Price Index. Thus, international online purchases are to be included in the weights and price collection of the Consumer Price Index. In addition, the Consumer Price Index should monitor the total price paid by the consumer for online purchases including postage, packing and other costs. Costs are classified in the same group as the actual commodity. The objective is to develop this sub-area in coming years.

5.1.4 Digitalisation and new commodities

Digitalisation is visible in the Consumer Price Index, for example, in newspaper subscriptions. Currently the Consumer Price Index monitors the price development of both paper format newspapers and digital newspapers. The share of digital papers in subscriptions is still low.

In future, the popularity of digital papers is expected to grow, which means prices will decline. If the stock of subscriptions did not decrease, the volume would remain unchanged but the total value of the orders would decrease. Part of the value is transferred to equipment, the software of equipment, operator services and electricity. The digital world simplifies consumption but divides the value of old goods and services to several products and consumption groups.

Measuring of new goods and services, as well as managing of quality changes are closely related to digitalisation. If the speed of a web interface increases or the properties of a computer improve, a new product is introduced to the price collection. The new product differs in quality from the old product, which means that the price change due to the quality change should not be visible in the price index but as volume change. The same quality change method is used for all commodities in the Consumer Price Index.

Consumers shifting from physical products to digital services is visible in the Consumer Price Index as a decrease in the weight share of the physical product and, correspondingly, as a rise in the weight share of the digital service. Often the consumer gets more content in the digital service (streaming service) than from the physical product (DVD). The calculation of the Consumer Price Index is based on paired comparison (the same product at successive points in time). The increase in the content is not visible in the index because the physical product and the digital service are interpreted as different commodities.

The most typical methods to manage quality change are direct comparison, bridged overlap and option costs. All in all, there are ten methods and the most suitable method is selected case-specifically whether it is a new or old product.

In order to decrease the substitution bias, the weight structure and the commodity sample of the Consumer Price Index have been updated annually since 2013. New commodities that result from digitalisation are introduced to the Consumer Price Index as their consumption increases and they become part of the national accounts and the Household Budget Survey, for example, the planned MaaS services (Mobility as a Service).

5.2 Producer Price Indices

5.2.1 Producer Price Index for Manufactured Products

In terms of industrial commodities, there are fairly good and comprehensive price indices. There the main problems are increasingly tailored products, one-off products and quality changes in the technical and economical properties of the products.

In the Producer Price Index, prices on very few industrial products can be collected online or from price lists. We could mention electricity and water. In terms of the Producer Price Index, it would be more important to get production value, volume and price data directly from enterprises' scanner data. This

would mean that the prices would be real and, at the same time, data would be provided for the calculation of the volume index of industrial output.

5.2.2 Producer Price Index for Services

In the Producer Price Index for Services, the situation is partially the same as in the Consumer Price Index. It is possible to collect publicly available prices on the Internet. For services, real price, volume and value data available from scanner data would also be a better option for Internet price collection.

The biggest problem is insufficient statistics on services. Good 70 per cent of GDP is services. Statistics Finland's Producer Price Index for Services currently covers around 60 per cent of the total value of market services. The value data for services are deficient at a more detailed classification level, higher than the 2-digit level. Many industries are missing from the Producer Price Index for Services at the 3 and 4-digit level, not to mention the more detailed level. A partial reason is the lack of service product data.

The key to improving the quality of the Producer Price Index for Services is to have service product data at least at the 4-digit level, preferably at the 6-digit level. After this there would be better knowledge of what prices to collect and from which enterprises. Later on, the Producer Price Index for Services should be expanded to new industries and to the export and import price indices of services.

6 Main conclusions

1) As a result of digitalisation, services will shift from market services to services produced by consumers themselves and vice versa, which results in a transition across the production boundary in national accounts. The effect of these digital services produced by households themselves, for example, on the growth figures of an individual year is probably insignificant but it is

hard to assess. Other transitions across the production boundary may have a bigger effect, for example, as unemployment grows or contracts.

Even if desired, national accounts manuals change slowly and changes to, for example, the current production boundary of national accounts is not likely, at least in the short term. "Core national accounts" can, however, be complemented with so-called satellite accounts, which would describe the phenomena of the digital economy in more detail. It would be good to get suggestions from users on what would be important in Finland's case.

2) Digitalisation changes the operating logic of the economy, which is reflected on conventional economic analysis based on national accounts. For example, as the platform economy becomes more common, productivity does not necessarily lead to growth in paid work and investments. The report did not, however, reveal factors that would give reason to assume that GDP at current prices would be "incorrect" in statistics in Finland as a result of digitalisation. So one could say that GDP is still a relatively good indicator for the assessment of the revenue and tax base of national accounts. Due to comprehensive register data and other data, the value of production is well covered in statistics, especially if the production takes place in Finland and the enterprises are registered in Finland. Production that crosses borders is more problematic, especially in terms of international trade in services or intra-group trade. Development of data collections and other information basis concerning global and international trade in services is key.

3) However, digitalisation does change the industry and product structure of production radically. The ability of current economic classifications, like industry and product classifications, to describe changes is quite limited. One can, however, ask whether it makes sense to try to measure the size of the digital economy as such, for example by making classifications more detailed. Digitalisation is comparable with, for example, "electrification". Today, no one considers what is the "size of electrification" or its effect on GDP. Both are so widespread that it is difficult to distinguish their effect.

4) Maybe the biggest challenges are related to the price effects of digitalisation, which are reflected in the growth figures of GDP (volume). In the deflation of the value of GDP, producer price indices are more important than the Consumer Price Index. When the share of services increases, Statistics Finland should be able to focus especially on improving the quality and coverage of the Producer Price Index for Services.

5) Other development targets worth mentioning are R&D and software investments in national accounts for which it is wished that data would be available at the same precision as on other investments.

6) New data sources on purchases made from international online stores are needed to compile statistics on e-commerce. Especially payment card data should be available for wider use than currently.

7 References

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

Annu Kotiranta, Heli Koski, Mika Pajarinen, Petri Rouvinen, Ilkka Ylhäinen (2017), Digitalisaatio muuttaa maailmaa – tarvitaanko politiikan tueksi uusia mittareita? Valtioneuvoston kanslian raporttisarja 2/2017

European System of Accounts – ESA 2010 http://ec.europa.eu/eurostat/documents/3859598/5925693/KS-02-13-269-EN.PDF/44cd9d01-bc64-40e5-bd40-d17df0c69334

Itkonen Juha (2015), Kiihdyttääkö digitalisaatio talouskasvua? Euro ja talous 2-2015

Johanna Varjonen, Kristiina Aalto (2005), Kotitaloustuotannon satelliittitilinpito Suomessa 2001, Tilastokeskus ja Kuluttajatutkimuskeskus, Helsinki

Johanna Varjonen, Kristiina Aalto (2013), Kotitalouksien palkaton tuotanto ja sen muutokset 2001 – 2009, Kuluttajatutkimuskeskus, työselosteita ja esitelmiä 145 • 2013, Helsinki

Kostiainen Juha (2016), Internet-talous tarvitsee mutta hyödyttää kaupunkeja https://nokkelakaupunki.fi/2016/01/07/internet-talous-tarvitsee-mutta-hyodyttaa-kaupunkeja/

McKinsey Global Institute (2014), Global flows in a digital age: How trade, finance, people, and data connect the world economy, 2014. http://www.mckinsey.com/business-functions/strategy-and-corporate-finance/our-insights/global-flows-in-a-digital-age

OECD (2013), “Measuring the Internet Economy: A Contribution to the Research Agenda”, OECD Digital Economy Papers, No. 226, OECD Publishing, Paris. http://dx.doi.org/10.1787/5k43gjg6r8jf-en

System of National Accounts 2008 (SNA 2008) https://unstats.un.org/unsd/nationalaccount/docs/SNA2008.pdf

Valtioneuvoston kanslia 2016, Onko Suomi jäämässä alustatalouden junasta? Valtioneuvoston selvitys- ja tutkimustoiminnan julkaisusarja 19/2016

Vertaiskauppa verkossa 2015, Kaupan liitto 2015

Appendix 1 Production boundary of the national accounts

The production boundary of the national accounts (what GDP includes and excludes) is defined in SNA 2008 and ESA 2010 (3.07 to 3.09). Summary of the relevant section of ESA:

"PRODUCTION AND OUTPUT

3.07 Definition:
Production is an activity... (where) an institutional unit that uses inputs of labour, capital and goods and services to produce outputs of goods and services.

Production does not cover natural processes which have no human involvement or direction, such as the unmanaged growth of fish stocks in international waters, but production does include fish farming.

3.08 Production includes:

a) The production of all... goods and services that are supplied to units other than their producers;

b) The own-account production of all goods that are retained by their producers for their own final consumption or gross fixed capital formation. Examples of own-account production for gross fixed capital formation are the production of fixed assets such as construction, the development of software and mineral exploration...

Own-account production of goods by households pertains in general to:

(1) Own-account construction of dwellings;
(2) The production and storage of agricultural products;
(3) The processing of agricultural products...;
(4) The production of other primary products...;
(5) Other kinds of processing, like... making furniture.

c) The own-account production of dwelling services by owner-occupiers;
d) Domestic and personal services produced by employing paid domestic staff;
(e) Volunteer activities that result in goods. Examples of such activities are the construction of a dwelling, church or other building. Volunteer activities that do not result in goods, e.g. care-taking and cleaning without payment, are excluded.

The activities listed above in points (a) to (e) are included as production irrespective of being illegal or not-registered at... public authorities.
Own-account production of goods by households is recorded when this type of production is significant, i.e. when it is quantitatively important in relation to the total supply of that good in a country.

The only own-account production of goods by households included in ESA is the construction of dwellings, and the production, storage and processing of agricultural products.

3.09 Production excludes the production of domestic and personal services that are produced and consumed within the same household. Exceptions include services produced by paid domestic staff and the services of owner-occupied dwellings. Examples of domestic services that are excluded are:

(a) Cleaning, decoration and maintenance of the dwelling as far as these activities are also common for tenants;
(b) Cleaning, servicing and repair of household durables;
(c) Preparation and serving of meals;
(d) Care, training and instruction of children;
(e) Care of sick, infirm or old people; and
(f) Transportation of members of the household or their goods.

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