13th Meeting of the Advisory Expert Group on National Accounts,
1-3 October 2019, Washington D.C., USA

Agenda item: 2.3.4

VALUATION OF FREE ASSETS AND FREE SERVICES

Introduction

This paper presents a draft guidance note on the valuation of free assets and free services. The paper considers valuation methods for software, databases and free services, and then explores options for conceptualising the value created by the production and consumption of free digital services.

Documentation

Please refer to the references at the end of the paper.

Main issues to be discussed:

The AEG is invited:

- to comment on the draft guidance note;
- to discuss the options in chapter 3, suggesting which one may be developed into recommended approach;
- in general, indicate directions for future work.

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Valuation of free assets and free services

1. Introduction to the issue

Digital technologies are dramatically changing work, consumption and leisure, yet the debate regarding the benefits of the Digital Economy regularly features the suggestion that mismeasurement by national statistical offices is playing a major role in obscuring productivity and economic growth, price declines and welfare gains.

New, sometimes very specialized, digital products appear with increasing rapidity, and free products (such as information and entertainment services) are increasingly available at zero price, reflecting the very low marginal costs of digital replication and distribution. Even when free products have an implicit price, this price is not usually observed so a price of zero is applied. Thus, the positive quantities of these products that are consumed have a measured price of zero and measured value of zero in the conventional national accounts. To the extent that their production falls outside the current SNA production boundary, they are not reflected in standard statistical agency reports for GDP or related metrics like productivity, which are typically defined in terms of GDP or GVA. Furthermore, despite GDP's widespread use as a proxy for welfare, the omission of new free digital products highlight that it is not the correct metric for this purpose, at least as conventionally measured.

There appears to be a consensus that measurement needs to improve to better understand the role of free assets, products in the modern economy.

> *"Statistics have failed to keep pace with the impact of digital technology."* Professor Sir Charles Bean (2016, p. 7), Independent Review of UK Economic Statistics, interim report.

> *"Indicators of welfare from free digital products can, and should, be developed…"* IMF (2018)

This consensus has contributed to inspire work to examine either developing new alternatives to GDP ("Beyond GDP") or the potential expansion of GDP ("GDP and Beyond"). Either approach has significant implications for measurement and our understanding of economic activity. For example, Brynjolfsson, Collis, Diewert, Eggers and Fox (BCDEF) (2019), using their "Total Income Approach" which builds on GDP (and which does not include consumer surplus), estimate that Facebook alone could have added 0.05 percent to GDP on average every year since its launch in 2004 to 2017. Schreyer (2019) similarly considers an extended measure of economic activity which estimates the impact of Facebook as adding as much as 0.2 percent per year to that of GDP growth.

While the expansion of free digital products calls for a re-examination of their treatment in the national accounts, including satellite accounts for freely-shared digitized consumption products, the existing framework may be sufficiently broad to allow many free digital products to be incorporated into the existing framework as capital services. Many open source software products and other reusable content shared digitally, such as audio, video, and graphic content fit within the existing framework as capital assets, though the current implementation of intangible assets in national accounts is incomplete. However, it if is user created (e.g. created by households) it would not fit into the existing framework.

Some key issues in the treatment and measurement of free assets and services can be summarised as follows:

- The production boundary
- Free data and other assets as intangible capital
- Valuation methods, including consideration of quality change

Some key considerations in addressing the above include the following:

- Production – what is produced, how is it produced, and does it fall within the current SNA production boundary?
- Who produces it – which sector (households, non-profit organizations serving households, corporations, governments)?
- How is it consumed and what is the nature of the product (is it an asset, intermediate consumption, or final consumption expenditure)?

2. Existing material

2.1 The Production Boundary

Free products currently fall outside of the GDP production boundary. Consider following from the IMF (2018):

> ***Free digital services that are self-produced, volunteer-produced, or produced by platforms that sell advertising and collect users' data, have been proposed for direct inclusion in the definition of GDP, but a change in the conceptual framework of GDP to directly include "free digital services" in consumption would not be warranted.*** *GDP is a measure of market- and near-market production valued at market prices, and, as such, is well-suited to address key policy questions. However, some free services enabled by digital products represent quality improvements that could be captured in real consumption by quality-adjusting the deflator. Also, research on expanding the measure of investment to include collection of data may imply a modification of the GDP production boundary.*

However, they also note the following:

> ***Indicators of welfare from free digital products can, and should, be developed in the context of measurement of nonmarket production outside the boundary of***

> ***GDP.*** *Productivity gains in households' time use for nonmarket production may be increasing welfare in ways not measured by consumption or GDP. Therefore, the old debate about measuring household non-market production is now even more pertinent. International and national institutions need to accelerate efforts to develop indicators of welfare growth from non-market production beyond the boundary of GDP.*

While this is a very clear and common view, Ahmad and Schreyer (2016, p. 13) note that the 2008 SNA Research Agenda (#A4.16) recognised that the provision of free products by corporations required further consideration:

> *In the SNA, no final consumption is recorded for corporations because corporations are not considered to be final users of products, except for capital products which, with the exception of valuables, are acquired for the purpose of production. However, large corporations often undertake sponsorship of cultural and sporting events. To date, the SNA regards the payments involved as a form of advertising but it could be argued that they are a form of individual consumption and could be treated as final consumption expenditure of corporations and social transfers in kind to households……*

More broadly, this can be interpreted as recognition of the potential to consider free products, including digital products, in GDP.

In addition, Coyle (2017, p. 770) responds to the view that free digital products should be in a satellite account rather than incorporated into GDP as follows:

> *Although national accountants often describe GDP as simply monetized production, and not an economic welfare measure, this becomes a fiction as soon as it is deflated. The use of any price index is an attempt to create a measure that holds utility constant over time (with well-known challenges about how to achieve this).* ***Real GDP is therefore inherently a welfare concept.*** (Emphasis added.)

Even if it is accepted that free digital service should be treated in a satellite account, there remain conceptual issues around the production and consumption of these products. Schreyer (2019) and Heys, Martin & Mkandwire (forthcoming) examine these issues by proposing a framework to account for free digital capital services in household production. This is considered further in Section 3.

2.2. Free Data and Other Assets as Intangible Capital

The 2008 SNA defines an asset as: A store of value representing a benefit of series of benefits accruing to the economic owner by holding or using the entity over a period of time. It is a means of transferring value from one period to another (SNA 2008, Paragraph 3.3).

Here, two types of potentially free assets are considered: software and data.

2.2.1. Software

Conceptually, software investment in the national accounts includes software purchased or created inhouse *but excludes software acquired for free from others*. Software created inhouse that is used internally over a long period of time is accounted for as own account software, without respect to whether or not the creator has shared it with others as open source. Similarly, custom software includes software the is custom-made in the market, regardless of whether that software is shared with others as open source.

The OECD's Handbook on Deriving Capital Measures for Intellectual Property Products (IPPs) defines these products as typically one-off (unique) but reproducible; often produced on own-account; not subject to wear and tear like conventional assets; and can be reproduced with minimal physical production costs (OECD 2010).

The handbook addresses freely-available IPPs, pointing out that making the asset available freely does not diminish its identity as an asset (OECD 2010 p. 20). An important aspect is that the owner has effective management of the asset, which can take many forms, including publication.

2.2.2 Data

Current practice is reflected in Heys, Martin and Mkandawire (forthcoming, p. 15, footnote 30):

> *The definition of a 'database' in ESA 2010 (authors highlights) is: "**Files of data organised to permit resource-effective access and use of the data.** For databases created exclusively for own use the valuation is estimated by costs, which should **exclude those for the database management system [which is software] and the acquisition of the data**."*
>
> *SNA 2008 says similarly: "Databases consist of **files of data organized in such a way as to permit resource-effective access and use of the data**. Databases may be developed exclusively for own use or for sale as an entity or for sale by means of a licence to access the information contained. The standard conditions apply for when an own-use database, a purchased database or the licence to access a database constitutes an asset."*
>
> *Thus, the value of a database is the 'value added' by structuring the data, not the value of the data itself. If you use 'personal data' as payment for a digital service, then international guidance says do not capitalise the value of your data. It would instead say capitalise any work that the company receiving your personal data does to amalgamate and structure your data with other data (e.g. through linking, matching, sorting), such that they can make resource-effective use of it – e.g. to sell tailored advertising space at a premium. As such, [National Accounts] currently only captures purchases of (in practice, more likely licences to use) databases or*

externally developed bespoke databases. In-house (own-account) development of databases are not captured in the same way as software, although [National Accounts can] address the capitalisation of the time of 'data scientists' or 'data architects' (see Martin, 2019).

Data can be considered as a knowledge-based asset. Corrado, Hulten and Sichel (2005) classified intangible assets into three groups: digitised information, innovative property, and economic competences/organisational capital. Digitalised information is typically considered to include investments in software and databases. The OECD (2014) recommended measuring the value of digitised data as an intangible asset. Eliciting valuations of databases from firms can be complicated, as it is common for databases and software to be capitalised together (OECD 2010, p. 120); see Nguyen and Paczos (2019, p. 29) for more on measurement difficulties.

Regarding the nature of free data, Nguyen and Paczos (2019, p. 20) note the following:

…data points are provided by and collected from the users of an online social network free of charge and, hence, they do not generate any financial transactions in the country where the user is based. However, once those data points are transferred and aggregated with millions of other data from across the globe, they become the basis for data analytics and thus the basis for value creation. Eventually, they are monetised by the provision of data-based services or by database licensing.

Hence, with digitalisation, data are collected by firms via various online means, such as aggregating individual data points, to create databases with commercial value. No explicit transaction takes place between the provider of the data and the business, but clearly value is created; e.g. LinkedIn was purchased by Microsoft in 2016 for US$26 billion. That is, personal data of individuals is collected into databases and monetised by firms. This can be thought of as a barter transaction between individuals and firms that provide a free online service in exchange for the users' information; see e.g. Nakamura, Samuels and Soloveichik (2018).

Through this exchange, a data asset is created and how to value this is unclear, especially as they are rarely transacted and hence market prices are rarely observed. In addition, the usual problems with asset measurement exist, such as how to measure depreciation.

2.3 Valuation Methods

Current SNA valuation methods are:

- *Market-based:* transactions should be valued at market prices if no market price is available then value is determined based on the market price of comparable products on the market. (preferred SNA concept)
- *Cost-based:* value is determined by how much it costs to produce.
- *Income-based:* value is determined by estimating the discounted present value of expected future returns.

Ahmad and Ribarsky (2018, p. 19), in proposing a framework for a satellite account for measuring the Digital Economy, note that "there remain a number of issues and challenges to consider and resolve, (in particular how to meaningfully value data and free services, where research continues)." That is, while frameworks can be constructed, a key barrier to understanding the role that free digital assets and services play in the economy is the fundamental issue of their valuation.

However, a body of work is emerging which can be of assistance in assessing alternative valuation methods. For example:

- Greenstein and Nagle (2014) and Robbins et al. (2018) have considered different approaches to valuing software.
- In their work for the OECD Working Party on Measurement and Analysis of the Digital Economy, Nguyen and Paczos (2019) have made a quite comprehensive review of methods and possibilities for measuring the economic value of data and data flows.
- Brynjolfsson, Collis, Diewert, Eggers and Fox (2019) use massive online experiments to elicit consumer valuations of Facebook. In addition, they use experiments in laboratory conditions for valuations of a range of other free digital services, including maps, Skype, WhatsApp, Instagram and Twitter.

These methods will be elaborated on in Section 3.

3. Options considered

We begin by considering valuation methods for software, databases and free services, and then explore options for conceptualising the value created by the production and consumption of free digital services, with particular reference to the production boundary.

3.1 Software

For valuation, proposed approaches include considering close substitutes which have a market price and using production costs. Examples of the use of these methods include the following:

- Based on the cost of the nearest available substitute, Greenstein and Nagle (2013) estimated the value of capital stock of Apache Open Source software in use in 2013 at between $2 and $12 billion.
- Based on production costs (own-account investment method in national accounts) Robbins et al (2018) estimate that open source R and Python packages have a value of at least $3 billion dollars in 2017.

3.2 Databases

Nguyen and Paczos (2019, p. 20) considered a range of data valuation methods, including the following:

1. *Data brokers:* Provide itemised price lists for compiled databases. SNA08: "databases for sale should be valued at their market price, which includes the value of the information content". Identification of brokers may be difficult, due to their not having a single standardised business industry classification.

2. *Mergers and acquisitions:* An acquired company is required to report the value of its assets, including intangibles such as databases. Sometimes the purpose of the merger or acquisition is to obtain database access, such as Microsoft's purchase of LinkedIn.
3. *Insurance:* Insurance companies assess the value of data held in-house or in data centres, and data centre companies may insure themselves against service disruption.

3.3 Free Services

Heys, Martin and Mkandawire (forthcoming):

'Free goods/services' could actually be being paid for in at least one of four ways:

- ***Advertising*** *– if the digital manufacturer creates an app and sells advertising space before giving the app away to consumers for free, the 'free app' will just be treated as a marketing expense in the National Accounts. Free television has traditionally been paid for via this means. This can either be direct (the free good is the advert), or indirect (the free good is paid for via advertising fees, normally in return for advertising space on the digital 'page'). Such payments are already included within the National Accounts.*
- ***Payment in kind (barter payments)*** *– sometimes consumers do not pay in cash, but instead through a different means of exchange. In many cases, this is through a barter process whereby the consumer pays for the free good through granting access to their personal data. For example, users of online maps pay in kind to use the service with their personal data, which the provider then either sells on, or sells access to, or sells services from. This data has a market value, either again for advertising or product innovation purposes.*
- ***Patient investors*** *– This model argues that a patient investor will fund a 'loss-leader' product on the basis of an expected return in the future. This model might best be explained through services like Spotify, where a basic version of the product is given away free, but the premium version is dependent on subscription purchases, creating a flow of revenue to cover the cost of the fixed capital investment and deliver a rate of return. The key question in this area is how the capital asset which creates the market (the free version), which allows future revenue streams (from the premium version) is valued. In this case the 'free good' is simply a 'loss-leader'. They may also be accruing payments in kind (e.g. personal data) they can later sell-on.*
- ***State intervention*** *– we should not forget that the majority of free goods in the economy are provided free at the point of use by the state, paid for via taxes.*

The value of these revenue streams should be in the National Accounts, accepting that, as with many components of the Accounts they can sometimes be challenging to measure.

So, whilst the productive sector should be fully capturing the value firms receive from free products made by firms, there is one production activity where there may remain gaps, which relate to what can be described as 'pure home production'.

Brynjolfsson, Collis, Diewert, Eggers and Fox (2019) (BCDEF) used massive online experiments to elicit *consumer valuations* of Facebook. In their Total Income Approach, they estimated the additional amount of income needed by consumers to maintain their standard of satisfaction (utility) if they were deprived of access to Facebook. That is, if Facebook (or some other free digital service) did not exist, consumers would need additional income to buy market products to be as well off as they are with access to Facebook. This method indicates that considerable value is provided by Facebook (and other digital services).

Taking this as the starting point, Schreyer (2019) considers how to incorporate this created value into an accounting framework (emphasis added):

> *Results from choice experiments have revealed that individuals attribute significant value to digitally-enabled services such as those derived from the use of social media. We integrate this consumer value into an accounting framework* ***by treating it as the value of own-account production by households of a particular type of leisure service. Time spent by households, along with social media services and IT hardware capital constitute the relevant inputs****. We derive a quality-adjusted unit cost index for such household-produced leisure services whereby* ***the number of network users acts as the main vehicle to capture quality change****. These quality adjustment effects turn out to be key when assessing the quantitative importance of own-account leisure services. To illustrate, we consider an Extended Measure of Activity (EMA) that encompasses GDP and own-account household production of digitally-enabled leisure services. A simulation for the U.S. shows that the effects due to Facebook use alone would cause the EMA to grow anywhere between -0.04 percentage points per year less to about +0.2 percentage points per year more than U.S. GDP between 2004 and 2017, depending on the size of network effects. These are magnitudes that deserve systematic monitoring in designated satellite accounts.*

Hence, in contrast to the view of e.g. Coyle (2017), this treatment squarely puts the production and consumption of free services outside the GDP production boundary. It suggests the importance of "systematic and periodic development of measures of household production and consumption outside the current SNA boundaries but inside a **framework of satellite accounts** so that accounting concepts are adhered to, results can be compared with established national accounts aggregates and experimental aggregates à la EMA can be constructed." (Schreyer 2019, p. 15).

It may be possible to expand this framework to consider other scenarios. For example, the treatment of voluntary production and distribution of instructional materials, such as YouTube videos; it might not be appropriate to treat these as entertainment services. The production of an instructional YouTube video may be considered as an own-account leisure service, but there is also the consumption by a potentially large number of viewers, who are combining time and ICT capital to produce own-account educational services.

Some examples of "unpaid digital provision" are given in Table 5 in Coyle (2017, p. 763), with each deserving consideration of how they could be accounted for in a similar accounting framework to that proposed by Schreyer (2019):

- Open source software
- Online software/tech advice
- Writing/editing online material
- Uploading videos, other entertainment
- Other advice, discussion forums
- Educational material
- Crowdsourced information, user-generated content
- User/open innovation and design

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