The SNA: Facing a Choice Between Measurability and Relevance?

Bram Edens (Statistics Netherlands)
Dirk van den Bergen (Statistics Netherlands)
Maarten van Rossum (Statistics Netherlands)
Rutger Hoekstra (Statistics Netherlands)
Marieke Rensman (Statistics Netherlands)

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Bram Edens, Dirk van den Bergen, Maarten Van Rossum, Rutger Hoekstra, Marieke Rensman[1]

Abstract

In this paper we question whether striking a balance between measurability and relevance will continue to be a successful strategy for the SNA moving forward. First of all, we assess whether we are actually capable of measuring what we have to measure (the supply side), by analysing a number of measurement challenges such as hedging and transfer pricing, volume measurement for services, and the dependency on model assumptions. Secondly, we assess whether the SNA actually measures what we want it to measure (the demand side), illustrated by a number of recent developments such as the increase in C2C transactions, and demands to analyse globalisation and go beyond GDP. We present a potential way forward based on distinguishing between a measurable core system and a periphery with relevant satellites. Rather than providing clear-cut answers, the paper is intended to stimulate further discussions among accountants and economists.

1. Introduction

Few people would deny that the development of the System of National Accounts (SNA) from the first estimates of national income by William Petty in 1664 towards the 2008 SNA / 2010 ESA guidelines, has been a tremendous achievement.[2] Most countries in the world now regularly compile national accounts, although there exist of course large differences between countries regarding their scope, comprehensiveness, and quality. And its flagship indicator GDP (per capita) is considered by the general public as one of the most important indicators to measure societal progress. There appear to be however a number of developments that may erode the current high standing of the SNA and in particular GDP in the foreseeable future.

First of all, notwithstanding several revisions, the core of the SNA was developed in the 1920-40s when there was a clear need for macroeconomic planning in times of war and economic depression and arguably it still carries a "Keynesian skeleton" (Vanoli 2005) with a strong focus on (traditional) production. However, it is clear that the nature of the economic activities that the system intends to describe has fundamentally changed over these years. This is the result of a range of phenomena such as globalisation, the growing importance of ICT, and more recently also the emergence of phenomena such as increasing consumer to consumer transactions (C2C) (e.g. "sharing economy") and the so-called "new industrial revolution" (e.g. 3D printing). These phenomena not only cause various measurement problems for the national accounts, they also fundamentally challenge the system at various levels, ranging from the definition of statistical units and classifications, to its core concepts and call into question whether the current set-up of the system is well equipped to describe the nature and development of economic activities in a way that is useful for its main users in the future (see also Coyle 2014).

Secondly, while prominent economists (e.g. Stone, Meade, Kuznets etc.) played a key role during the design and inception of the SNA, the statistics and economics disciplines seem to have drifted apart over the years. During the last two revisions the SNA has become increasingly clear in articulating its position that measures of economic activity should not be interpreted as measures of welfare, emphasizing they are compiled "in accordance with strict accounting conventions based on economic principles." (2008 SNA para 1.1). The SNA is however increasingly being challenged by a

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[1] The authors all work at the National accounts department of Statistics Netherlands. The text does not correspond with the official point of view of Statistics Netherlands. We would like to thank Piet Verbiest and Gerard Eding for providing comments on an earlier version.

[2] For instance, the BEA called "GDP: One of the Great Inventions of the 20th Century" https://bea.gov/scb/account_articles/general/0100od/maintext.htm

number of developments in the academic literature (e.g. Dasgupta 2009, Arrow et al. 2012), that derive macroeconomic aggregates from a clear foundation in (welfare) economic theory.

This is not to say that the SNA has not changed. By contrary, when we compare the 1968, the 1993 and the 2008 SNA, one can see that tremendous progress has been made in terms of design and coverage of the accounts (e.g. the introduction of balance sheets), the clarification of numerous compilation issues (as evidenced by the large number of compilation guides and handbooks), and a reaction to emerging issues (e.g. the expansion of the asset boundary to include R&D). On the other hand, a range of demands was not met (as witnessed by the long-term research agenda of the SNA). It appears that the SNA as an institution especially in the last revisions has sought to strike a balance between measurability and relevance.

The main objective of this paper is to address the question whether striking a balance between measurability and relevance is a successful strategy, moving forward. In order to narrow down the topic, we have decided to focus on the real economy. Rather than providing clear-cut answers, the paper is intended to stimulate discussion and further debate, between national accountants and within the wider economics community.

The outline of the paper is as follows. In Section 2 we will start by analysing the question whether we are capable of measuring what we have to measure (the supply side), by analysing a number of measurement difficulties we encountered during and after the ESA 2010 revision of the Dutch National Accounts such as hedging and transfer pricing. In Section 3 we analyse whether the SNA actually measures what we want it to measure (the demand side). We will discuss the future relevance of the SNA for informing policy and analysis, by analysing a number of developments such as the advance of C2C, the demand for consumption based accounting and going "beyond GDP". In Section 4 we discuss implications for the future strategy of the SNA. We will present a potential way forward based on distinguishing between a measurable core and a relevant periphery with satellites.

2. Measurement issues with the SNA

There are a number of reasons why measuring GDP is becoming increasingly difficult. We will discuss here challenges with measuring market prices due to phenomena such as transfer pricing and hedging, the increasing share of the economy for which volume based measurement is not possible, and obtaining reliable estimates for the non-observed economy especially growth rates. This is by no means an exhaustive list (e.g. FISIM or cif/fob corrections would be good candidates as well), but these issues were selected because they equally demonstrate that these measurement difficulties are expected to increase due to changes in the nature of economic activities such as globalisation or the increasing importance of intangibles.

2.1 Difficulties in measuring market prices

In the SNA transactions are measured at their market price or sometimes called exchange value. We will discuss two reasons why measuring market prices is becoming increasingly difficult: transfer pricing and hedging.

Transfer pricing occurs when exchange values do not represent market prices, in case of transactions between affiliated enterprises (UN et al 2009, para 3.131). The 2008 SNA is -from a conceptual point of view- quite clear on the treatment of transfer pricing: "Prices may be under- or over-invoiced, in which case an assessment of a market-equivalent price needs to be made (ibid; para 3.131)". The SNA however acknowledges that in practice this is not always easy to achieve and "is an exercise calling for cautious and informed judgment (ibid para 3.132)". The issue of transfer prices is related to the existence of different fiscal policies in countries. Transfer pricing is a phenomena which is quite difficult to assess or 'prove'.

One instance where we did have data to correct for transfer prices shows the size of the problems that are encountered. In this case, a Dutch firm made extra payments to a foreign daughter to compensate for transfer prices that were too low. In the first year, this payment was 150 million

euros. In the next year, the payment was 450 million euros. Moreover, in the second year the volume of purchases was actually lower than in the first year, so that the increase is purely a price effect. In this case a correction could be made, in other cases we may not be aware that this is happening. Under these circumstances, using a price index based on regular transactions, may result in a volume effect. The example illustrates that when transfer pricing is not corrected for, a distorted picture of GDP growth can be obtained.

Table 1: Revenues and costs for selected industries (production survey)

	ISIC 10	ISIC 10	ISIC 10	ISIC 10	ISIC 11	ISIC 11	ISIC 11	ISIC 11	ISIC 19	ISIC 19	ISIC 19	ISIC 19
x mln euro	2009	2010	2011	2012	2009	2010	2011	2012	2009	2010	2011	2012
Revenues	53060	52264	58546	60461	4730	4714	4763	4905	30455	37588	49242	56989
Costs	50846	49334	55839	57767	4224	4179	4082	4227	30223	37444	49287	56981
Purchases	*38270*	*36308*	*42649*	*44032*	*2057*	*1976*	*2027*	*2158*	*27031*	*33936*	*45861*	*53448*
Wages	*5715*	*6072*	*6139*	*6340*	*490*	*501*	*496*	*485*	*606*	*593*	*822*	*606*
Other	*5612*	*5718*	*5860*	*6152*	*1459*	*1494*	*1364*	*1388*	*2201*	*2517*	*2179*	*2413*
Depreciation	*1249*	*1236*	*1191*	*1243*	*219*	*208*	*195*	*196*	*385*	*399*	*425*	*514*
Result	2214	2930	2707	2694	506	535	681	679	232	144	-45	9

Source: Statline (translated)

As a second illustration, consider the Manufacture of coke and refined petroleum products industry as shown in Table 1. Compared to other industries, we find small profit margins in combination with large value changes due to price volatility. A fairly constant result is counterintuitive, as it indicates that this sector was unable to take advantage (or incur losses) of price changes and/or volume changes at all. This is remarkable, because a small wedge in output and input prices most likely will - at least in theory - result in much more profits or losses. The occurrence of transfer pricing may be an explanation for the constant profit levels in this industry. It could be that profits are redirected to other parts of the value chain in which the parent is also active (for example wholesale industry or the retail industry). Another explanation could be the occurrence of hedging, which is the second reason measuring market prices is increasingly difficult.

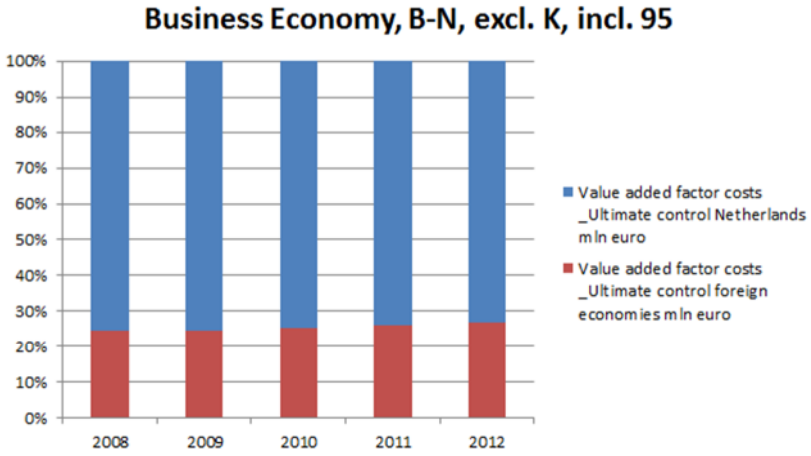
A hedge contract is a special kind of forward contract in which a third party is involved. Hedge opportunities are large when there are substantial price fluctuations. Companies 'hedge' fluctuations in price changes in inputs and outputs. Companies are allowed to register economic relevant prices (in other words the 'hedge' prices) in their annual reports if they meet certain conditions (these conditions should be communicated to stakeholders beforehand). So if they hedged a particular risk they register hedge prices (or economic relevant prices) in their annual reports in order to present stable results over time. But hedge prices are not the same as market prices.

Consider the following example: suppose a refinery purchases for 100 euros a barrel of crude oil through a hedge-term contract, in which a third party is involved (could be a bank or a hedge fund). In the meantime the spot price for a barrel of oil on the spot market decreased to 70 euro per barrel. The risk barrier (here the bank or hedge fund) makes up for the difference of 30 euros. In this case, the hedge funds benefits from the price decrease. The company will report a price of 100 per barrel of oil instead of a price of 70 (market price). In the supply- and use tables we have to record market prices because otherwise we have an imbalance in supply and demand for this product. This correction for hedging has serious consequences for the value added of the refineries in the current accounts. Value added in the national accounts is unequal to the value added as it is recorded in the production survey.

In addition, also the third party offering the hedge (e.g. a bank or insurance company) is not well represented in the national accounts as the hedge lies outside the production boundary. They have costs (intermediate consumption and wages) but no corresponding production.

As a result, in case of hedging, we fail to measure the 'economic reality', where hedging is a part of doing business. The occurrence of hedging is however difficult to prove and difficult to measure.

Figure 1: Value added of business economy by ultimate control



Source: Statline

Phenomena like hedging and transfer pricing (in the absence of accurate volume estimates of these transactions) undermine GDP as an indicator of economic activity and measure of growth. Indeed, despite existing recommendations, it is our conjecture that in reality transfer prices are almost never adjusted because it is both time consuming and difficult to prove. As long as no corrections take, place changes in tax rules across countries may directly lead to changes in transfer prices, and consequently to changes in GDP. Researchers trying to analyse international differences in profit levels on the industry level should be aware of this possibility.

Moreover, due to increasing globalisation the occurrence of these phenomena is likely to increase making the estimation of GDP increasingly problematic. For instance, as shown in Figure 1, based on information from inward foreign affiliate trade statistics (FATS), the percentage of value added of the Dutch economy that is foreign controlled is increasing, which increases the likelihood of occurrence of transfer pricing (a similar picture is likely to emerge when looking at outward FATS).

The issue of hedging appears wide-spread: it is not just large multinationals that engage in these activities, our experience from the ESA 2010 revision is that also small and medium sized companies frequently engage in it.

2.2 Volume measurement

The measurement of economic (volume) growth is one of the key components of the SNA. For all of its importance, it is unfortunately an area subject to large measurement problems. There are three different methods for arriving at volume estimates, each with its own problems.

First, the nominal growth in value can be deflated with an output price index. In the Netherlands, this is the case for most goods and services outside financial services, government, education and health care. For these transactions transaction data in nominal prices is often available. The quality of the measured volume growth is therefore mostly dependent on the quality of the prices indices. Unfortunately, for a lot of services price indices are of limited quality, for example in case of business services. This stems from the fact that a lot of these services are more or less unique. For example, large differences may exist between large-scale IT-projects, and the accountancy services for large companies differ a lot from the accountancy services for small companies. Therefore, it is very difficult to get a representative population sample to estimate the price index. The best example is probably gross fixed capital formation (R&D). R&D projects are

almost by definition unique, so that a price index is virtually impossible to produce. Indeed, in the Dutch national accounts an input price index is used, conform the ESA recommendations.

For as long as these services are produced for intermediate use, this may undermine the quality of economic growth by industry, but it has at least no effect on total GDP. The error in the production in industry A is cancelled by the error in the intermediate use in industry B. This is not the case however for services used for final consumption. Unfortunately, the part of these services that is produced for final consumption will probably increase. First of all, international trade in services is increasing. If import and export of services are a larger part of the flows, a larger part of the error margins in the price indices will be reflected in GDP.

Second, developments in national account are expected to lead to an increasing part in total GDP of services that are produced for final consumption. The 2008 SNA included expenses on R&D as gross fixed capital formation, leading to an increase of the final consumption of these services. It is of course not possible to foretell what the next SNA will look like, but it does not seem unreasonable to expect that there will be attempts to include marketing assets, business structures and / or training and firm specific human capital in GDP (Corrado, Hulten and Sighel, 2004). These are typically services that will have some uniqueness built into them, especially in case of own account gross fixed capital formation. Problems may therefore be expected to increase in the future.

The second approach to arrive at volume growth is to use a direct volume estimate. In the Netherlands, this method is used for large parts of finance, education and health care. Here statisticians face two unsatisfying options: either apply a crude volume estimate with the risk that it does not really measure growth, or use a detailed volume estimate with the risk the others will disagree with the assumed (implicit) definition of output and will therefore use their own definition of output, which will lead to incomparability between countries. For education for example, a crude, but logical way of measuring volume is by simply counting the number of pupils or students that are either following an education or have graduated. The problem however is that this method does not take into account the quality of education. A country could halve the number of teachers per pupil without any effect on the volume growth of output so defined. It can also decide to put in a huge effort to increase the quality of education without it ever showing up in the output figures.[3]

The alternative is to make an effort for a more detailed volume measure. A possible method would be to measure pupils' knowledge at the beginning of school (or a school year) and at the end of the year. The problem however is to determine what skills and knowledge are important and how to weight them. Are skills more important than knowledge? Is 5 per cent more pupils getting a specific type of education equivalent to increasing the knowledge of the pupils following this education by 5 per cent? Opinions will differ widely on these kinds of questions, so any chosen method will probably lead to results that are deemed questionable by part of the users.

In reality, the friction between crude and sophisticated volume measures of output seems to have resulted in mostly crude methods. This is not surprising, since comparing different countries is an important goal of making national accounts statistics in the first place. This is easier achieved with crude methods. It should be realised that this comparability is only realised at the cost of the accuracy of the actual volume measures.

The third most problematic method for estimating volume growth for input based parts of the economy is to deflate the input based nominal value with an input based price index. This is the last resort to obtain volume measures of output. The most important parts where this method is used are collective government consumption and own account gross fixed capital formation in R&D. For collective government consumption, the same problems exist in defining the output as with education and health care and other parts of individual government consumption. Unlike individual government consumption however, there are no number of "users" of the service to count as a

[3] Except as a decrease in productivity, since the effort is usually accompanied by higher spending. Since real output is unchanged and real inputs increase, productivity declines.

crude method. The number of people arrested does not seem a good measure of police output, since collective government consumption in mostly uniquely non-market, there is also no market price to measure, and an input price index often is the only possibility.

The problem with deflating an input based nominal value with an input based price index is not only that there is no way to tell what the volume growth is. It also tends to give unexpected results. If productivity increases in government output, the corresponding volume decreases. Take for instance a statistical office making national accounts. Suppose increasing IT-use leads to a productivity increase, so that the same national accounts can be made with fewer people. Less people means less inputs, which results in a decrease of the measured output? This is obviously not a desired result. It is however unavoidable when using input levels and input prices.

In short, for the largest parts of the services there are serious problems in measuring volume growth. For a system that is partly built around measuring volume growth, this can hardly be seen as a recommendation.

2.3 Non observed economy

A third difficult area concerns the non-observed economy (NOE) which covers a range of activities (underground, illegal, white spots) (OECD 2005). Although obtaining accurate measures for each of these areas is problematic, we fill focus here on the issue of measuring illegal activities. While the SNA is clear that that the only criteria of whether or not to include an activity in GDP is the production boundary, until the 2008 SNA revision illegal activities were usually not included in GDP in most EU member states. With the 2010 ESA revision this situation has changed and all member states now include for the first time illegal activities in GDP which has resulted on average in a 0.2 percent increase of GDP (OECD 2015) in OECD countries in 2010 on average (0.4 percent for the Netherlands). There are good theoretical reasons for including illegal activities in GDP: international comparability will increase as the problem is resolved that the (il)legality of some activities (e.g. prostitution) differs across member states, which has become more important in the EU context where the GNI is used for assessing EU contributions; and imbalances in the system caused by missing inputs and outputs of illegal activities are resolved.

In reality, obtaining estimates of the NOE is by definition notoriously difficult. In case of the Netherlands, the main illegal activity is the production and sale of cannabis whose production value was estimated during the 2010 ESA revision at 1.2 billion euro. The production estimate depends on a number of assumptions, most importantly: the capacity of rolled cannabis plantations (based on confiscations), the detection rate, the average yield per plant, and number of harvests per year. (Statistics Netherlands 2012) based on figures from the National Police Agency. In 2006 the reported detection rate was 30-50 percent, the assumption that underlies our estimates is 40 percent, and an average of 3 harvests. More recent figures from the National Police Agency suggest however a much lower detection rate, and a higher number of harvests, estimating production to lie in the range of 1 till 6 billion euros, with average of 2.4 billion euro in 2011. While our estimates lie within the range indicated by more recent figures, in the light of new data they appear to be conservative.

In addition to the difficulty of estimating the correct level of illegal activities (and doing this in such a way that comparable estimates are obtained across countries), obtaining plausible estimates about their growth rates is even more difficult. Indeed, should the different detection rates as reported by the police be considered as a deterioration of the detection rate between 2006 and 2011 (which would have a large effect on level and growth of GDP), or as a revised estimate of the average detection rate (effect on level)? This is illustrative of the general problem that exists with using a model-based approach: there will always be reasons to revise the model or change the parameters of the model, but it is often unclear to what extent such changes should be interpreted as real (i.e. have a volume effect). These problems add to the difficulty of obtaining reliable growth estimates of GDP.

3. Relevance of the SNA

In Section 2 we have discussed a number of areas of measurement that complicate the compilation of national accounts. Although some of the measurement problems described in Section 2 are not new (e.g. valuation at cost), they are being exacerbated due to changes in the nature of economic activities due to economic developments such as globalisation and the increasing importance of R&D.

In this section we will address the question whether the SNA is expected to remain relevant in the near future in the absence of changes to the way it is measured. Does the SNA still measure what we want it to measure? Hereto, we will describe three developments: the advance of the "new economy" which challenges the depiction of households as 'passive' final consumers; the increase of globalisation which undermines the usefulness of the national perspective in describing economic activity, and the demand to go "Beyond GDP". Each of these developments question the relevance of GDP as it is currently measured.

3.1 The advance of the "new economy"

Developments in information technology (IT) are changing the way households interact with the rest of the economy. Until recently, households were straightforward consumers of goods and services. They wanted some goods and services, paid for them and enjoyed the benefit of these goods and services. The main exception was owning your own house, which is considered a productive activity in the national accounts. In recent years this interaction is becoming less straightforward. Two examples will be discussed. First, there is an increase of Consumer to Consumer (C2C) transactions through the arrival of "sharing-sites" like Uber, LendingClub, Wework, Lyft etc. As a result households increasingly use their durable consumer goods for production purposes, turning them into investments goods as well. This calls into question the representation of households as "final consumers". Secondly, consumption of IT-related services (like apps) is not directly paid for by consumers, but – through advertisements – by other companies. The absence of the link between paying for the service and using it may seriously hamper analysis.

3.1.1.Households as producers

In the national accounts, households can be both producer and final consumer. Since every household undertakes final consumption, this means that some households are producer and consumer at the same time. For these households, goods and services can be either purchased in the role of consumer (i.e. as final consumption) or in the role of producer (i.e. as intermediate consumption or as gross fixed capital formation). For analyses of the economy, it is important that this distinction is accurately measured. Fortunately, most governments have for tax purposes strict rules about what can be recorded as purchased for business purposes, so that data on the purchases of households as producers can often be regarded as reasonably good.

The arrival of all kinds of "sharing sites" is making this distinction a lot more problematic, both at a practical level and at the conceptual level. These sharing sites allow households to use their durable consumption goods to be easily used for production purposes, either by lending them out for money (e.g. a lawnmower) or by producing services in one's free time (e.g. as a taxi driver). Unfortunately, we do not have good data on the size of these phenomena, but these kinds of production have undoubtedly been on the increase over the last couple of years. In the US and the UK, a quarter of the population has used at least one of the sharing sites.[4] Furthermore, the value of the top 30 funded start-ups in this industry is valued at 77 billion dollar[5], showing the size of this phenomenon.

[4] Source: crowd companies, http://www.slideshare.net/jeremiah_owyang/sharingnewbuying

[5] Source: crowd companies, https://docs.google.com/a/crowdcompanies.com/spreadsheets/d/12xTPJNvdOZVzERueyA-dILGTtL_KWKTbmj6RyOg9XXs/edit?pli=1#gid=1214502450

A similar problem may arise with the advance of 3D-printing. 3D-printing allows households to produce some of the goods they require themselves. This will increase the production for own consumption of households, a part of the economy that is hard to measure. Moreover, it will make it easier for households to become producers of goods for other households. Just like sharing sites, this will undermine the distinction between households as consumers and households as producers.

For national accountants, the question arises how to record these new types of economic activities. When they are considered productive, unincorporated enterprises can be constructed, however this still does not solve the treatment of the durable goods that are used this way for production. The current split between final household consumption and gross fixed capital formation seems to hold no longer.

Consider for example the case where a consumer has bought a car in 2010. The purchase was (rightly) recorded as final household consumption. Then, in 2014, the consumer reads about Uber and decides to use his car part of the time for producing taxi services. Suddenly, part of the car is to be considered as a capital good instead of a consumer durable. Of course, this can be arranged in the other changes in volume account, in which the car is reclassified. This does however not seem to be a satisfying option. First of all, it could lead to a large reclassification of all consumer durables for each accounting period, dependent on how much of services consumers are producing in that period. Second, recording purchases as final household consumption and reclassifying it (or recording it as gross fixed capital formation and then reclassifying it to consumer durables) seriously hampers the interpretation of household consumption. After all, the direct relation between final consumption and the use as a consumption good is broken.

An alternative, continue to record the purchases purely as final consumption, is also not satisfying. This would mean that households would require no capital goods for their production, which they clearly need. Neither does splitting the asset proportionally between final consumption and gross fixed capital formation give a satisfying solution. First, it would require every "consumer durable" to be split into two parts, which would lead to a further distance between the national accounts and ordinary people's concept of what they are doing. More important, even if we would want to make such a split, it would be nearly impossible to do, since making this split would require the household making the purchase to know for what purpose the good is bought. Most people would have no idea. The cars now being used to drive people around were mostly purchased when people did not realise that using it for production was a possibility. They would all have been certain that they had bought the car purely for final consumption. Only in retrospect do we know that that is not the case.

A way forward may be to introduce a new final expenditure category, with all purchases of durable goods by households. These durable goods will subsequently produce capital services that partly go to final consumption and partly go into the production process of the households, depending on the amount of sharing services produced in the accounting period. This will require a new interpretation of final household consumption, but at least it would follow the actual use of the goods in the economy. Either way, it seems that the national accounts need adjustments to cope with the "sharing economy".

3.1.2. Consumption for free

In the national accounts, final consumption consists of households buying goods and services for a given price[6], which is deemed to be the value of the consumption. When a good or service is given away for free, the price of zero means that no final consumption of the specific good or service is recorded. In most businesses, this seems completely reasonable. If a company produces something to give away for free, its output is valued at nothing. There is one exception: if a company can convince someone else to pay for the product, it can give it away to consumers and still have output and profit. This other can be found by incorporating advertisement or other kinds of marketing in the

[6] Barter and consumption of own production can also occur, but these type of consumption are not relevant for this section.

product. Commercial broadcasters and sporting teams work partly this way. By allowing advertisements in or around sporting matches and television programs, the cost for consumers can be decreased or reduced to zero, creating more viewers and thus reason to advertise in the first place. This issue has been discussed already for a long time in National accounts community (e.g. Ruggles and Ruggles 1970, Brynjolfsson 2012).

For the total of final consumption, this does not necessarily cause problems. You could reason that the company buying the advertisement space or time may need to recoup its cost, for instance by selling its own product for a higher price than otherwise would be the case. So instead of buying soda and access to a television program, the consumer would buy costlier soda. In a functioning market, both cases should lead so comparable total consumption. The only difference is in the breakdown of consumption into different types of products.

In the world of IT, this business model seems to be quite popular. Companies like Google and Facebook offer their services for free and sell advertisement. Lots of apps are doing the same. In-app advertisement pays for creating the apps. Consumers are using it for free. As said above, for total final consumption, this is not necessarily a problem. For real consumption growth however, this makes quite a difference. The quality of the services is increasing enormously. The apps that are produced nowadays are incomparable with the apps of 5 years ago. Internet services are also offering more and more possibilities.

Note that these services may actually lead to reductions in economic growth. For example, in the past it was very common for families to own an encyclopaedia. Nowadays, such information can be found freely online on websites such as wikipedia.com and this has led to lower sales of paper encyclopaedia. One might argue that the quality of the information on Wikipedia is not yet on par with the Encyclopaedia Britannica but other quality factors are probably better (whether the information is up-to-date or the breadth of information on popular culture). What is even more striking about this example is that the consumption is free, but so is the production. Wikipedia is able to run on very low cost because its contributors provide information for free. In a sense the process of producing and consuming encyclopaedic information has been moved outside the realm of the national accounts. So, consumers are clearly consuming better services. Where is this volume increase registered in the national accounts? Unfortunately nowhere. Consumers are buying the same sodas and thus see no increase in consumption. Deflating their consumption of the IT services does not lead to any growth in consumption, since its value was recorded as zero in the first place. The IT-companies are still selling advertisements, in which the quality increase of the service does not play any role. But even when the quality increase is included in the growth of advertisements, it will not change GDP. The increase in value added growth of the selling company will be offset by an equal decrease of the value added growth of the buying company. The quality increase just does not enter the national accounts aggregates. This happens not only when products are given away for free. When advertisements are reducing the price of certain products, volume growth will not be completely absent, but it will be underestimated.

One reservation should be made with this argument. The argument above assumes that consumers would be willing to pay a higher price in the absence of advertisements. This appears at least to some extent to be the case. Some broadcasters (like HBO) are subscription only and offer television without commercials. Apps may offer the possibility to pay for an advertisement-free version of the app. Partly however, it remains speculation. If the possibility of getting the product with advertisement for free is no longer available, would consumers be willing to pay for the product? Some would, but others probably would not. And of course, advertisement is nothing new. Twenty years ago, advertisement also existed. However, it has now entered an industry with large quality increases in output.[7]

The underlying problem in these examples is that production cost and consumer utility are separate things. Notwithstanding frequent misinterpretation of GDP as an indicator of welfare, the

[7] Of course, it can also be argued that the quality of television programs has increased since twenty years ago. So perhaps this problem is of all times.

SNA is clear that it is about measuring economic activity, not welfare (herewith departing from the ideas of economists like Kuznets). Although there is nothing wrong with this position as such, the increase of business models based on (partly) free consumption, has arguably has driven a larger wedge between measures of activity and measures of welfare.

Alternative recording mechanisms are possible. Soloveichik (2014) for instance proposes to record an in-kind transaction in which "consumers 'earn' income by watching advertising and then 'purchase' media." (ibid p.2). Another option may be to reroute the quality increase in the underlying services – based on the value including advertisement – to final consumption. In current prices, final consumption would still be zero, but in constant prices a value could appear.

Conclusion

The presented cases illustrate that changes in the nature of economy activities increasingly challenge the basic conceptual model of the SNA with household as final consumers of goods and services produced by companies. Although the SNA may have conceptual answers (e.g. register all households as unincorporated enterprises; a focus on activity not utility), the gap between welfare and SNA derived aggregates will only widen. One could question whether such an approach enables the SNA to remain relevant going forward, as a lot of economic activities that may have a direct bearing on societal welfare are simply left out.

3.2 Globalisation

Although the 1993 SNA in principle followed ownership criteria for the recording of imports and exports, due to all sorts of exceptions in case of goods sent abroad for processing, merchanting and transactions between affiliated enterprises, in reality it concurred with a cross-border principle of recording trade flows. The 2008 SNA took a bit step forward towards strictly following the ownership criteria, but stopped short of a full enforcement as evidenced by the convention of recording merchanting in terms of negative exports.

The SNA recommendations are primarily motivated by the fact that this would allow for a closer alignment with business accounts, and would lead to quality improvement of the national accounts. For instance, goods processors resident in the Netherlands would no longer be obliged to report the value of transaction of goods in the business survey for which they had no financial transactions in their books, as they were only compensated for the service they provided by their parent company, causing discrepancies between the current account and the financial accounts. The 2008 SNA recommendations have however major implications for the environmental accounts and for input-output analysis.

One of the main consequences is that physical and monetary descriptions of the economy are no longer aligned (Van Rossum et al. 2014). To give an example, while a resident refinery that is a processor would according to the 1993 SNA import oil and export petrol, according to the new guidelines only a processing fee is exported. This causes difficulties for the air emission accounts which record all emissions by resident units (broken down by economic activities) and the economy-wide material flow accounts that register the material requirements of economic activities based upon a mass balance principle. Indeed, indicators such as emission intensities which are usually defined as emissions/production will become dependent upon the extent of processing that is occurring and will no longer have a straightforward interpretation.

The new guidelines will therefore complicate (environmental) input-output analysis.[8] In case of the existence of different production structures (e.g. processors and non-processors) within the same economic activity, the allocation of emission to final demand will become imprecise, unless processing activities are separately identified in the National accounts obtaining separate emission intensities.[9] Moreover, the compilation of multi-regional input-output tables (MRIOs) is also

[8] The International Input Output Association protested during the 2008 SNA revision discussions (http://www.iioa.org/news_and_links/newsletters/Newsletter6%20May09.pdf).

[9] But this might imply a new way of thinking about classifications such as ISIC.

undermined, for instance as for trade linking international trade in goods statistics are used that follow the cross-border principle. Take the example of production taking place abroad (a non-resident unit) under the control of a resident-unit which assumes economic ownership of the goods produced. The new guidelines stipulate that intermediate consumption of this unit needs to be recorded as Dutch imports and part of the production will be recorded as exports, which need not enter the Dutch economy. It will be very hard to split-up these imports and exports to countries for the compilation of an MRIO. Globalisation itself will likely increase the number of such difficult cases.

There is however as a result of globalisation an increasing demand for MRIOs: from an environmental perspective, for the analysis of consumption-based indicators (e.g. carbon footprints etc.), but also from an economic perspective. As a result of globalisation, production is increasingly organised into global supply chains due to the occurrence of outsourcing and off-shoring. There is a demand to get better data to analyse these phenomena as evidenced by a growing literature on Global Value Chains and Trade in Value Added.[10] The practice of MRIO compilation also frequently result in national accounts of individual country being altered through the balancing process, in order to resolve trade asymmetries and to obtain final integration. A potential way forward is to compile so-called single-country national accounts consistent (SNAC) MRIOs, that are fully consistent with national statistics (Edens et al. 2015).

We find ourselves therefore a bit in a Catch 22 situation: the 2008 SNA guidelines regarding global manufacturing were introduced to deal with problems caused by globalisation, but as a result partly seem to undermine the ability to analyse globalisation. There appears to be a need for better international statistical coordination (e.g. an international business register) as well as a need for enhanced engagement with the research community working on input-output measurement, in order to ensure relevance of the National accounts for analysing global phenomena requiring interlinked and consistent national accounts.

3.3 Beyond GDP

There is an increasing interest to go "beyond GDP", with as main objective complementing GDP with additional social, economic and environmental indicators in order to better capture "progress, true wealth, and the well-being of nations".[11] Highly influential in this regard was the Stiglitz report (Stiglitz et al. 2009) which examined alternative measures for assessing economic performance and societal progress. Within this broad area, various demands can be distinguished, of which we will discuss only three.

First of all, initiated by several seminal papers in the 1970s (such as Weitzman 1976) there is a large so-called "green accounting literature" (see Heal and Kriström 2005 for an overview). This literature challenges the SNA amongst others for its absence of a theoretical foundation in welfare theory. While there is some debate within the National accounts community regarding the definition of income (e.g. Hill and Hill 2003) - the definition of income is in fact one of the issues on the long term research agenda of the SNA - the green accounting literature criticizes the development of the SNA towards pragmatism relying upon "accounting conventions" such as the production and asset boundary etc. Although there are many rival theories in this literature, they have in common that they depart from the formulation of a theoretical model (with production and welfare functions) in order to investigate the relationship between concepts such as income, welfare and wealth. While earlier theories required very strong assumptions such as optimality or efficiency, more recent work (e.g. Dasgupta 2009, Arrow et al. 2012) has been successful in grounding notions of income and wealth in welfare requiring much weaker assumptions.[12] The green accounting literature often

[10] http://www.oecd.org/industry/ind/global-value-chains.htm

[11] In 2007, a conference with this name was organized by the European Commission, European Parliament, Club of Rome, OECD and WWF (see: http://ec.europa.eu/environment/beyond_gdp/index_en.html), followed in 2009 by a EU Roadmap.

[12] Requiring only the existence of a Resource Allocation Mechanism, which is a weaker assumption than optimality.

provides different recommendations compared to the SNA/SEEA regarding issues such as the treatment of discoveries, capital gains, or valuation of changes in land use/degradation.

Second, following on to the green accounting literature, there is a growing focus on obtaining extended measures of wealth. Well-known is the World Bank's approach for assessing comprehensive wealth (World Bank 2011), which estimates total wealth of countries as the net present value of sustainable consumption. In combination with direct estimates of produced capital, financial capital and natural capital, the residual is interpreted as 'intangible capital' which for the majority consists of co-called human capital. The World Bank's wealth accounts cover a panel of over 120 countries and contain a time series (1995-2005). A recent alternative approach sometimes called "inclusive wealth" is followed in the UNU-IHDP and UNEP report (2012) which contains estimates of inclusive wealth for over 20 countries. The inclusive wealth approach differs from the World Bank's approach in that it derives estimates of total wealth of countries as the sum of the components of wealth, where these individual assets are valued at their shadow prices (see also PIB 2014 for a discussion of comprehensive national accounting).

These approaches (sometimes called wealth accounting) have in common that they contain a much broader notion of assets than recognized in the SNA such as human capital (sometimes even health). Also within the statistical community, there has been a large interest in measuring human capital (see Eurostat/OECD taskforce and currently the UNECE Task Force Human Capital which is working on guidelines). The recognition of human capital as an asset may require however a drastic redesign of the SNA framework, taking into accounts issues such as the need to reclassify various types of transactions as investments (education, health), potentially requiring time use data. Finally, within the wealth accounting literature SNA based valuation approaches for example for fisheries or subsoil assets using net present value of resource rents are increasingly being criticized for their crude assumptions such as a unit resource rent remaining constant. By contrast, wealth accounting approaches (e.g. Mäler 2009, Fenichel and Abbott 2014) attempt to estimate natural capital based on the derivation of 'accounting prices' using underlying (biophysical) models.

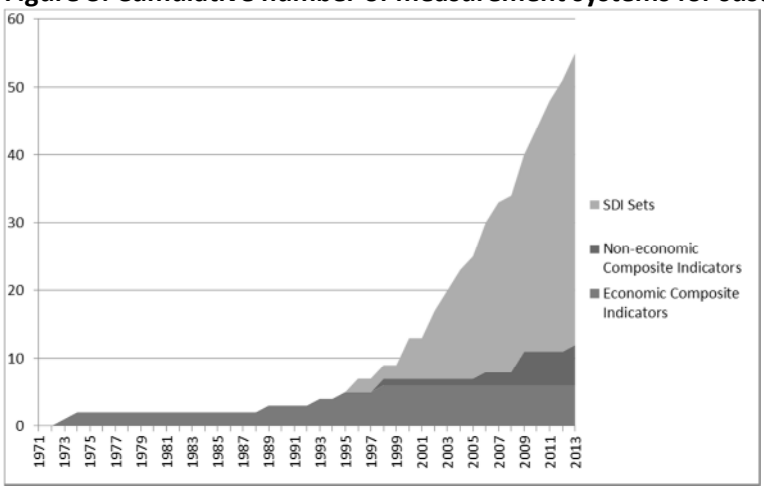
Third, in the same vein, there is a significant interest in taking an ecosystems perspective in assessing the dependency of the environment on the economy, sometimes called ecosystem accounting or Natural Capital Accounting (SEEA EEA; UN et al. 2014; Obst et al. 2013). The demand for these developments can be illustrated by the EU Biodiversity strategy (EC, 2011) (following on to the Convention of Biodiversity) calling upon its Member States to *"assess the state of ecosystems and their services in their national territory by 2014 and assess the economic value of such services, and promote the integration of these values into accounting and reporting systems at EU and national level by 2020"* (Edens and Hein 2012). The rapid increase in the availability of GIS and remote sensing data is one of the main drivers from the supply side for the increase of interest in NCA. There is an increasing demand for spatially explicit economic statistics for instance in order to analyze where economic activities are clustered in countries, that goes beyond what the SNA is designed for: it has regional accounts, but there is no spatially referenced underpinning.

There is a continuously growing demand for going "Beyond GDP", as shown in Figure 3, which gives an overview of the cumulative number of SDI Measurement systems. These are only the systems at the national level related to sustainable development. If we broaden the spatial scale (cities, regions, companies) or the conceptual scale (to include studies on wellbeing, green growth) then there are literally hundreds of different systems (IISD, 2015).

The harmonisation process that contributed to the success of the SNA is insufficient at the moment. The Stiglitz report provided a powerful coordinating narrative which is a good basis for harmonisation. At the same time UNECE, OECD and Eurostat have worked together in a working group from 2005-2008 (UN, 2008) and a Task Force from 2009-2014 (UN, 2014). The good news about these efforts is that they are based on concepts that are very similar to those the national accounts. Just like the wealth accounting initiatives named earlier, they base themselves on measuring assets to analyse the wellbeing of future generations and also have measures for

wellbeing n the “here and now”. The Task Force report was adopted by the Conference of European Statisticians (UN, 2014) but this is only a minor step when set against the harmonisation of the SNA.

Figure 3. Cumulative number of measurement systems for sustainable development



Source: Schoenaker et al. 2015.
Note: system recorded in the year that it was introduced; SDI= Sustainable Development Indicator.

4. Discussion and conclusions

The SNA has sought to strike a balance between measurability and relevance in dealing with changes in the nature of economic activities. This paper illustrates that the risk of this strategy is that we may end up in the near future with a system that is unsatisfying from both perspectives: it is neither fish nor fowl. On the one hand, from a measurement perspective, the SNA may have gone too far in its attempts to remain relevant for instance by expanding the asset boundary to include R&D. On the other hand, from a relevance perspective, it has not nearly gone far enough to satisfy users, when we think about demands as described in Section 3 such as analysing globalisation and going Beyond GDP. Partly this may be because the SNA has become a victim of its own success: the fact that virtually all countries in the world now compile national accounts also means that making adjustments to the system is becoming harder and harder.

The new strategy that we envisage for the SNA is to distinguish in the current accounts between a core SNA for which the quality of measurement is high and a peripheral SNA for elements that are more difficult to measure. The idea to distinguish between a core and periphery is reminiscent of the idea of satellite accounting that was already introduced during the 1993 SNA, but however should be based on a different set of principles. The main principles for establishing and delineating such a core/periphery are the following:

- Replace the production boundary by an alternative “revenue boundary” (or for lack of a better description “money-making boundary”), which is more closely aligned with business accounting principles such as the profit and loss accounts of companies. As we have seen in the discussion regarding transfer pricing and hedging, the current production boundary is an accounting convention that is increasingly detached from the business models companies actually use and the economic reality in which they operate. Such a new boundary would imply that some of the transactions that are now only included in the sectorial accounts would be in scope. To give an example, financial institutions such as investment funds incur costs (intermediate consumption, wages) but have no production (their income is only recorded in the sectorial accounts). It seems

advisable that in case relevant costs are within the boundary, the corresponding revenues should also (and vice versa).

- Include in the core only those transactions that are capable of being measured in a way that is meaningful (take place in the real world). If this is not possible, they should be excluded. For instance, FISIM would be a candidate for exclusion. While few people would deny that FISIM is part of the business model of banks, the actual measured values have no strong relation with the actual money earned by banks, and its measurement is highly dependent on models and assumptions. This can be illustrated by the counterintuitive implications it generates as evidenced by the large increase in Dutch value added that we saw during the recent financial and economic crisis. Another candidate would be investments in R&D. Expenditure on R&D can be measured. To measure the actual use of R&D in the production process is another story. Multinationals often do not know themselves in which countries the R&D is used. Is measuring investments in R&D in a country meaningful when there is no relation with the use of R&D? At the same time, non-market output (in current prices) would be still in scope. Inputs can be measured and while equating output with the sum of inputs is a convention, it can still be interpreted in a meaningful way.
- Reduce the current focus on volume estimates. For some activities (e.g. agriculture, manufacturing) volume measurement is expedient, for other activities this may not be the case. An overall volume measure such as GDP would be relegated to the periphery, due to the increasing measurement difficulties we face as described in Section 2.
- The periphery would contain volume measurements of all economic activity (defined according to the new boundary), as well as all sorts of additional satellite accounts (e.g. human capital) and/or alternative disaggregations (such as by class size e.g. SMEs, multinationals etc.), extended measures of wealth, may be added as satellites to increase relevance of the system as a whole.

There are several reasons why distinguishing a core from the periphery may be useful. First of all, it provides users a clear signal which parts of the accounts are measurable and which parts to a lesser extent. Second, having a periphery would allow having multiple satellites which need not all be internally consistent, herewith increasing the flexibility of the accounts and its potential for satisfying multiple users. Third, the periphery would allow more freedom for experimentation and therefore lead to faster adaptation to changing economic circumstances.

While the specifics of such a set-up would have to be further thought through, we envisage the following implications.

First of all, International comparability would be enhanced by a focus on the core of the SNA, allowing different speeds between countries depending on their statistical capacity and needs.

Second, there will always be a need to have insight in the production of national economies, but there is a growing tension between the importance of GDP and the current measurement difficulties that we face, and that are only expected to increase. There will continue to be a demand for measuring volumes for instance for productivity analysis, which will still be possible although it would be based upon information from the periphery. Relegating volume measurement to the periphery would make it easier to obtain a more inclusive larger set of indicators to assess economic activity and progress.

Third, for the design of such satellites engagement with academia is important. There is a joint responsibility here. Statisticians have the responsibility to observe changes in the world and devise solutions to be measure them, researchers have the responsibility to translate the new world into models. This requires increased cooperation between both communities, and a need to devise structures to facilitate further exchanges.

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