

Development of the Measurement of Product

Jaroslav Sixta¹ | *University of Economics; Czech Statistical Office, Prague, Czech Republic*

Abstract

The measurement of economy is a very long issue closely connected with the development of economic theories and the level of knowledge. Origin of modern measurement can be found in 17th century when Francois Quesnay compiled his Economic Table. Lots of successors developed economic concepts that are currently represented by the system of national accounting. Although national accounting has not a long history since it was established in 1950s, it has become known as a general tool for the description of economy. Development of national accounts was in line with development of economic theory and it respected the changes in economy and society. Both western and socialist countries we looking for methods and rules for the measurement of economy. The West relied on the System of National Accounts and the East focused on Material Product System based on Marx theories. After the collapse of communist regimes in the East, there remained only one universal measurement standard – national accounting. National accounts have been developed for more than 60 years and with several milestones. Currently, the new milestone – SNA 2008 / ESA 2010 is going to be put into practice. And the consequences will be very significant for many users.

Keywords

Production, national accounts, ESA 2010

JEL code

E01, N01

INTRODUCTION

National accounts currently represent universally adopted tool for the measurement of economy. National accounts can be described as a macroeconomic statistical model with two main branches. The first leads to the description of creation of product and the second leads to the generation of income, distribution and redistribution. The complete description of national accounts far exceeds the possibilities of this paper and therefore I focus on the product measurement only.

Gross domestic product (GDP) is probably the most important macroeconomic indicator (aggregate) that is used for many purposes. Unfortunately, national accounts are very often simplified into GDP and all other parts are neglected. Only complete analysis of national accounts can provide sufficient information about living conditions, economic power and wealth. GDP represents created product and it pro-

¹ University of Economics, Faculty of Informatics and Statistics, Nám. W. Churchilla 4, 130 67 Prague 3. E-mail: sixta@vse.cz. Author is also working also at the Czech Statistical Office, Na padesátém 81, 100 82 Prague 10, Czech Republic.

vides content to economic definition of product (Samuelson and Nordhaus, 2009). Unfortunately, many times the product is not correctly distinguished from income. From statistical perspective, the difference is crucial. Product is a result of productive activity laying in production of goods and services. Income is generated by both production and distribution. Even income and the balance of incomes with the rest of the world may be more important than production; the position of product is on the top. There can be found many reasons why product is regarded as the most important indicator. Among them, estimation of product is easier than income and the level of international comparison is higher. Product can be estimated even for countries with less developed statistical systems. Product is also emphasised by many international bodies ranging from gross domestic product per capita at purchasing power parity to the share of government deficit and debt in gross domestic product.

Current state of art in macroeconomic statistics is focused on strengthening of international comparability and quality. Gross domestic product as the main indicator is under a deep control of international bodies, analysts and researchers. The role of official statistical authorities increased since statistical outcomes have become a part of international agreements or domestic law system like Stability and Growth Pact, countries' contribution to EU budget based on gross national income etc.

1 HISTORICAL DEVELOPMENT

Historically, the development of measurement of product is connected with the existing productive activity. This condition is still valid and therefore the definition of product is not fixed for ever. In the 17th century, Gregory King defined national income that represented an important milestone, see Frits. Besides, French physician Francois Quesnay compiled his economic table (Tableau Économique).² Economic table can be regarded as the first input-output table where only agriculture producers create product and all other processing activities are regarded as sterile. It means that productive sphere contained agriculture producers only, the rest of economy was not created value added. Adam Smith's theoretical description and Karl Marx theories influenced economics and scientists dealing with the measurement of economy had to react to it.

In 1930s, Wassily Leontief presented input-output tables for U.S. economy, see Miller and Blair (2009). Besides the input-output table, independent economic discipline was set up – input-output analysis. Wassily Leontief is a Nobel Prize economist (1973) and his ideas and approach to production have many successors.³ The first U.S. national accounts were published in 1947 and they were called National income and products accounts (NIPA).⁴

During 1930s, Keynes' theories and Leontief's structural model became the main foundations of national accounts. The two concepts prevailed in the construction of national accounts. The first was devoted to national income and other macro-aggregates and the second concept lied in the application of accounting procedures commonly used on the level of businesses. This resulted in ongoing creation of national accounts in the West (Bos, 1992). The East focused on application of Marx's Labour theory of value that resulted in Material Product System (MPS), see Sixta and Fischer, 2014.

After the end of the Second World War, UN expert Richard Stone⁵ prepared a system of accounts and this is regarded as a begging of national accounts. The first system of national accounts was issued in 1952. The process of standardisation of national accounting went on in 1960s and it resulted in complex and deep national accounts' standard – SNA 1968. Reaction to the changes in economy in 1980s resulted in a completely new standard SNA 1993. Implementation of updated national accounts' standards

² Explanation can be found at: <<https://www.marxists.org/reference/subject/economics/quesnay/1759/tableau.htm>>.

³ See <www.iioa.org>.

⁴ See <<http://www.bea.gov>>.

⁵ See <http://www.nobelprize.org/nobel_prizes/economic-sciences/laureates/1984/stone-bio.html>.

takes always some time. It means that international comparability is temporarily reduced before the new standards are worldwide adopted. Currently, new standard SNA 2008 is going to be put into practice and it brings some fundamental changes in the measurement of product.

Even SNA 1952, SNA 1968, SNA 1993 and SNA 2008 are universal standards issued by the UN, the EU issues its own standards that are focused on higher level of comparability and standardisation of both results and procedures in member countries. The EU member countries' data is used for administrative purposes and therefore deeper standardisation is necessary. The main frame is taken over from the UN standards. Hence, the EU standards are usually issued few years after the UN and they are obligatory for member states, Council Regulation (EC) No 2223/96. Current ESA 1995 (modification of SNA 1993) is going to be replaced by ESA 2010 (modification of SNA 2008). After September 2014, all figures should be published in ESA 2010 methodology.⁶ Implementation of SNA 2008/ESA 2010 is process that is significantly harmonised in the EU. Fortunately, this process is in line with the implementation of the 6th Manual of Balance of Payment (IMF, 2009) and there is a high possibility that this will encourage countries to implement rapidly SNA 2008 around the world.

2 PRODUCT AND PRODUCTION

The role of output in national accounts is crucial. Output is closely linked to the classification of units into institutional sectors (IS) that represent the key players in national accounts. IS are formed by groups of institutional units (companies, government units, households, non-profit organisations, etc.) with similar behaviour that is determined by the type of output.

Measurement of product is related to the definition of productive activity. This crucial phenomenon is not uniform in all branches of statistics.⁷ Gross domestic product is regarded as final product. It means that the definition of the key indicator of economy depends on many aspects. Final product means that intermediates are excluded and the borderline between final user and intermediate user affects the results. The system of national accounts distinguishes between production and output. The main difference between production and output lies in the definition of productive activities. ESA 2010 (3.07) defines production as "an activity carried out under the control, responsibility and management of an institutional unit that uses inputs of labour, capital and goods and services to produce outputs of goods and services." The key difference subsists in ancillary activities like marketing, accounting, etc. The principal activity and secondary activity are defined by so-called kind-of-activity unit (KAU).⁸

Modern approach to output covers three main categories:

- a. Market output.
- b. Output for own use.
- c. Other non-market output.

Market output covers goods and services (products) sold on the market at economically significant prices. Output for own use includes both household production of selected products (e.g. imputed rent, self-supply) and own capital formation (e.g. individual housing construction). Other non-market output represents government and non-profit institutions output that is given by the sum of costs (total output of other non-market producers) less sales. Contrary to market output, both output for own use and other non-market output have the same user and producer.

⁶ According to the EU law, member states can ask for derogations that allow them to postpone the transmission of data according to new methodology. Eurostat allows member states to ask for derogation and the last derogations will expire 1 January 2020.

⁷ There are different approaches to the measurement of production of households products, intra-company sales etc.

⁸ Besides national accounts, regional accounts are based on local units or local kind-of-activity units. Generally, production approach to GDP is preferred and officially published. Expenditure approach is very scarce, details can be found in Kramulova and Musil (2013).

Modern statistics rely on the complex approach to output. It is not important whether economic events are easy to measure. It is not even important if the activity is legal, hidden or unethical. The emphasis is put on the complete estimate of economic transactions. That is why prostitution, drug production, black market trade, thefts, etc. should be statistically estimated (Fischer and Fischer, 2005). It is connected with “statistical measurement” that in fact means estimate. For example, only about 87% of Czech GDP is surveyed, see GNI Inventory (CZSO, 2012). The development of national accounts is related to continual increase of imputed (not measured) items. SNA 1993 (ESA 1995) improved production and assets boundary. It also clearly recognised formal and informal sectors are also clearly defined. Ongoing development of national accounts standards (currently SNA 2008) means that more activities are covered by output (e.g. research and development). Definitely, it is only a convention. Some activities like home planting of tomatoes are regarded as productive while other activities like home sewing of clothes or cleaning are not. This approach tries to focus on the most important issues in current society but on the other hand, it is not rigid or stable.

Even the society is changing very fast in recent times, frequent changes of statistical standards and regulation has always been a problem for the users. Hence the implementation of ESA 2010 / SNA 2008 represents significant changes in national accounts, GDP will be affected very seriously.⁹ Actually, SNA 2008 and ESA 2010 are very well developed statistical standards that try to meet recent development in both economics and economy. Unfortunately, general preparation of both national accounts producers (statistical offices) and universities is not sufficient. The theory is far ahead of routine praxis.

3 IMPACT OF ECONOMIC THEORIES ON PRODUCT MEASUREMENT

Very often it seems that economic theories are far away from statistical praxis. But this is not absolutely true. It should be honestly admitted that economic theory defines the framework of statistical measurement. In other words, total level of product is influenced by generally accepted economic theory. National accounts were built up on the basis of the work of J. M. Keynes combined with W. Leontief and his production function and other economists. Obvious example is Francois Quesnay who regarded agriculture production as productive activity and all other activities were sterile in terms of production.

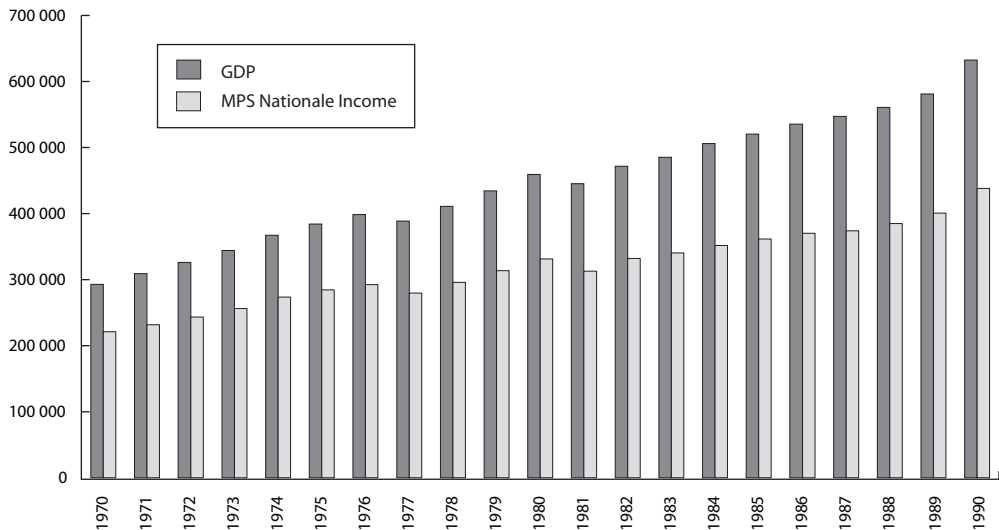
Western economic thinking based mainly on Keynes work was transformed into national accounts after 1950s. Countries of socialist bloc led by the Soviet Union relied on Marx labour theory of value, see Marx (1975). The main difference subsisted in the definition of productive activities. National accounts distinguish three types of output and corresponding types of producers. Socialist system called Material Product System splits the economy into two main parts. Productive sphere and non-productive sphere. Productive sphere contained selected market industries – agriculture, mining, energy, manufacturing, construction and services for productive sphere. Other industries that covered government activities and services provided to households were recorded as non-productive. Decision which industries belong to productive and non-productive was rather arbitrary. Moreover, what was applicable in 1950s, was hardly possible in 1980s. A good example represents telecommunications. Usually big and monopolistic company had to be split between productive and non-productive sphere. Since majority of the costs are fixed costs, it is impossible to split them. Practical solution when 50% belongs to productive and 50% belongs to non-productive was far from the theory. Moreover, telecommunications were very profitable and they can be hardly regarded as non-productive.

This led to the situation when socialist countries were not able to measure significant part of the economy and economic growth. The following Figure 1 compares the level of product for the Czech Republic measured by two systems since 1970, see Sixta and Fischer (2014). It is obvious that with increased de-

⁹ Updated estimate of impact of ESA 2010 on Czech GDP is more about 3%, see <www.czso.cz>.

velopment of services and IT products in 1980s, original Marx based system relying on physical products (goods) could not be sufficient. It resulted in the increased difference between National Accounts' GDP and Material Product Systems' national income. In 1990, the difference between both concepts was about 30%. Correct measurement of economy is not a fixed issue forever. Statistical concepts based on more or less harmonised standards are always developing, improving and updating. Both development of economic theory and changes in the society have to be taken into account. Globalisation and new phenomena connected with knowledge society were implemented into revised National Accounts' standards.

Figure 1 Comparison of GDP (ESA 1995) and MPS' national income, CZK mil.



Source: Own computations

4 ESA 2010 AND ESA 1995

Fast development of society in 1990s caused that national accounts' standards issued in 1993 (SNA 1993) and in 1995 (ESA 1995) became obsolete soon. While SNA 1968 was valid 25 years, SNA 1993 only 15 years. Last year (2013), the European Union issued regulation No 549/2013 that put in practice ESA 2010 (European modification of SNA 2008) where new data have to be transmitted to European Commission from 1st September.

As well as previous updates, ESA 2010 keeps the basic logic of accounts in the same form but substantial changes in the definition of assets boundaries were made. From the point of the product measurement, the following changes can be regarded as the most important:

- a. Capitalisation of expenditures for research and development.
- b. Capitalisation of small tools.
- c. Capitalisation of military expenditures.

The most changes are connected with output for own use and other non-market output. Market output is affected very slightly.

There are lots of other changes connected with SNA 2008 / ESA 2010 that affect sector accounts and balance sheets. Among them, the most important changes are found in financial institutions where new sectorisation is put into practice and in financial assets. Significant impact is on Input-Output Tables (IOT) where new concepts in foreign trade change technical coefficients.

There are lots of factors that initiated the changes in ESA 2010 and lots of them are connected with economic research conducted in the U.S. or by the OECD. For example, neoclassical theories mostly reflected in capital services (Jorgenson, 1963) finally stay outside of the core framework and they remained as supplementary tables but as a part of SNA 1993.

4.1 Capitalisation of research and development expenditures

Expenditures on research and development (R&D) were recorded mainly in intermediate consumption and compensation of employees in line with common practice in business accounting. The issue of R&D is connected with the measurement of economy. If we take into account production function, it is supposed that:

$$Y = f(K, L), \tag{1}$$

where Y is product, K represents capital and L represents labour (Fischer and Sixta, 2009). When R&D expenditures are recorded as intermediates then these expenditures do not contribute to the future benefits (product increase). For example, when using Cobb-Douglas production function¹⁰ (Formula 2), the role of total factor productivity is overestimated since capital does not include R&D assets.

$$Y = AK^\alpha L^{1-\alpha}. \tag{2}$$

This theoretical construction has empirical evidence in U.S. data. Practically it has two impacts on the users of statistics. First, logical explanation of the development in hi-tech industries. Second, recording R&D as gross fixed capital formation means the increase of the level of GDP. Current approach used in the EU consists in the use of FRASCATI based data (OECD, 2002) and it means the use of intramural expenditures. Investments into R&D can originate from two resources:

- a. Purchased R&D services.
- b. Own-account production of R&D.

The impacts on product measurement are different in both cases. Purchased R&D services are reclassified from intermediate consumption into gross fixed capital formation. Own account production of R&D subsists in capitalisation of all expenditures connected with research and development. These expenditures covers mainly intermediate consumption (e.g. electricity), compensation of employees (wages for researches), consumption of fixed capital of assets used for R&D and mark-up factor for market producers that ensures the same valuation of market R&D and own account produced R&D.

There is a different approach to market and non-market producers covering government institutions (S.13) and non-profit institutions serving households (S.15). Both output and consumption expenditures are given by the sum of their costs less sales and output for own use. Practically it means that mainly universities have to be split into at least two kind-of-activity units The first provides standard non-market services (education) and the second produces R&D. Total output will be slightly changed and the increase of gross fixed capital formation (own account produced) will be compensated by the decrease of consumption expenditures. The following Table 1 shows approximate impact of capitalisation of research and development on gross domestic product.

¹⁰ Alternative interpretation can be found in Čadil (2007).

¹¹ This resulted from work of the OECD, for example see <www.oecd.org>.

¹² Output is measured by sum of cost and because consumption of fixed capital will be increased by depreciation of R&D assets, the total output will rise. Such computed output is split between consumption expenditures (other non-market output), gross fixed capital formation (own account production) and sales (from products sold to different customers).

Table 1 Capitalisation of R&D, CZK billion

	1995	2000	2005	2010
Output	19.4	32.8	40.6	63.0
GFCF	13.3	26.5	36.8	47.8
Impact on GDP	13.1	28.1	36.6	45.4
- capitalisation of market R&D	1.0	4.1	5.1	2.6
- capitalisation of own account	12.3	22.4	31.7	45.1
- decrease of consumption expenditures in S13	-3.3	-8.1	-12.6	-18.0
- consumption of fixed capital in S13	3.2	9.7	12.4	15.7

Note: S13 – sector of general government.

Source: Czech Statistical Office

Estimation of impact of R&D on GDP is not straightforward. For example, in 2010 total output of both market R&D and R&D for own use is about 63 CZK billion. The impact on GDP has four components. It includes capitalisation of market R&D products (2.6), own account production (45.1), decrease of government consumption expenditures (-18.0) caused by own account production of R&D mainly at universities. Final impact comes from holding of government assets. If government institutions hold assets, their consumption of fixed capital is a part of both output and consumption expenditures. Besides roads, railways, building etc. government institutions also own R&D products and therefore depreciation of these products is part of government output (15.7).

Capitalisation of R&D products represents the most important effect in updated SNA standards. Since R&D issue is conceptually the most important, it enjoys a great attention in statistical community. However, even a long discussion about freely available R&D services or research with no success, there are still lots of outstanding issues connected with R&D. It will take long time for both users and producers to get familiar with it.

4.2 Capitalisation of small tools

Asset boundary has a crucial impact on the measurement of product. The distinction between intermediates and capital (assets) defines recording of transactions. Intermediates are recorded in intermediate consumption and they do not create wealth. On the contrary, purchases of assets are recorded as capital formation. ESA 1995 determines fixed assets as products used in the production process for more than one year and with the price over 500 ECU at prices of 1995.¹³ Currently, ESA 2010 removed the price criteria and only the requirement for service-life remained. Practically it means, that the difference between business and national accounts increased. Even relatively cheap assets that are kept for more than one year should be capitalised. This group includes wide ranges of IT products (laptops, printers, tablets, cell phones), small machineries (e.g. grass cutters) etc. Besides, these criteria are applied on intangible assets, as well. Currently, software has a specific position in national accounts. Capitalisation covers software purchased below accounting (tax) limits¹⁴ and own account production of software. Since capitalisation of own account software was conducted in line with ESA 1995, the implementation of ESA 2010 requires

¹³ Czech national accounts used equivalent of CZK 20 000.

¹⁴ Czech tax limit is CZK 60 000.

additional capitalisation of software below the limit only. The following Table 2 describes the impact of capitalisation of small tools. Overall impact on Czech GDP in 2010 is about CZK 59.6 billion. It is obvious that software was relatively negligible in early 1990s. Nowadays software represents significant part of capital formation ranging from package to specialised software.

Table 2 Capitalisation of small tools, CZK billion

	1995	2000	2005	2010
Impact on GDP	32.3	27.9	48.7	59.6
- tangible assets	28.8	26.2	36.8	43.1
- intangible assets (software)	3.5	1.7	11.9	16.5

Source: Czech Statistical Office

4.3 Capitalisation of military expenditures

Military expenditures were treated as current expenditures that do not create wealth and services in the future. They were recorded in intermediate consumptions of defence industry in the government institution sector. ESA 2010 brought a different concept of treatment of military expenditures. Even the change of the value of GDP is not significantly affected, the key difference lies in the concept. It is assumed that purchases of different kind of weapons provide services of defence regardless of its use. Investments into weapons deter potential enemies and these services of deterrence can be measured by consumption of fixed capital.¹⁵

Government defence services are measured by the sum of the costs since ministry of defence (including the army) is treated as non-market produces. The costs of defence consist of intermediate consumption (material, energy and services for the army), wages of soldiers and depreciation (consumption of fixed capital) of fixed assets. When ESA 2010 is applied, purchases of weapons are recorded in capital formation. Therefore, government output is decreased due to the decrease of intermediate consumption. On the contrary, government gross value added is higher because of inclusion of consumption of fixed capital of weapons.

The influence of capitalisation of military assets is similar to R&D for non-market producers. The impact on the product is given by previous investments that are currently expressed by consumption of fixed capital. Table 3 illustrates consumption of fixed capital of weapons and its impact on GDP. Since the measurement of other components of defence services have not changed (compensation of employees, intermediate consumption, consumption of fixed capital of other assets, etc.), the impact is given only by weapons.

Table 3 Consumption of fixed capital of weapons, CZK billion

	1995	2000	2005	2010
Impact on GDP (CFC of weapons)	4.4	5.7	6.7	5.2

Source: Czech Statistical Office

¹⁵ It is in line with computation of non-market output. Since ministry of defence is regarded as government unit (other non-market producer), the output is estimated by the cost approach. It is in line with computation of non-market output. Since ministry of defence is regarded as government unit (other non-market producer), the output is estimated by the cost approach.

The development of CFC of weapons is influenced by the stock of weapons. It means that socialist Czechoslovakia (and subsequently the Czech Socialist Republic) had a plenty of weapons. Even, the quality of some of them (e.g. old soviet models of tanks) was disputable, the depreciation of such assets was relatively higher than today. After 1991, lots of these old and unused assets were sold or discarded. Investment into military assets could not compensate such decrease of stocks. Since CFC is computed from existing stocks (it is assumed that these assets provide services), it was relatively decreasing throughout the whole period 1990–2010.¹⁶

5 UPDATED GDP

ESA 2010 changes GDP in order to react to the changes in society. All the main impacts mentioned above were driven by the effort for capturing economic development in modern world. The selection of issues for updates of national accounts' standards corresponds to the importance of these phenomena. The existence of knowledge-based economy is undisputable and old procedures that reflect traditional business accounting cannot record the complexity of economic development. In 1990s, the emphasis was put on software and IT services. Currently it is clear that it was not enough. Knowledge is also incorporated into procedures, techniques, manuals etc. and know-how became a leading factor for progress and wealth. Within all the changes given by the ESA 2010, asset boundary is the most important. It is reflected in R&D, small tools and change in classification of IT (both hardware and software) assets. Special emphasis was also put on databases as a collector of information with significant value.

Different reasons can be found behind the concept of capitalisation of military assets. The key issue lies in the factual accuracy of expenditures with their recording in national accounts. Weapons have usually service-life longer than one year and according to ESA 2010 they bring benefits to holder even not used. The benefit from holding weapons can be expressed by consumption of fixed capital that represents the service provided by the weapons.

Overview of all mentioned changes¹⁷ is presented in Table 4. Since the impact is estimated on nominal GDP (at current prices) and price relations changed significantly over the whole period, it is necessary to emphasise relative comparison (in %). In 1995, the overall impact of these changes is about 3.25% and in 2010 only 2.91%.

Table 4 Impact of selected ESA 2010 changes on Czech GDP, CZK billion (%)

	1995	2000	2005	2010
R&D	13.1	28.1	36.5	45.4
Small tools	32.3	27.9	48.7	59.6
CFC of military assets	4.4	5.7	6.7	5.2
Total	49.8	61.6	91.9	110.2
% of original GDP	3.25	2.72	2.95	2.91

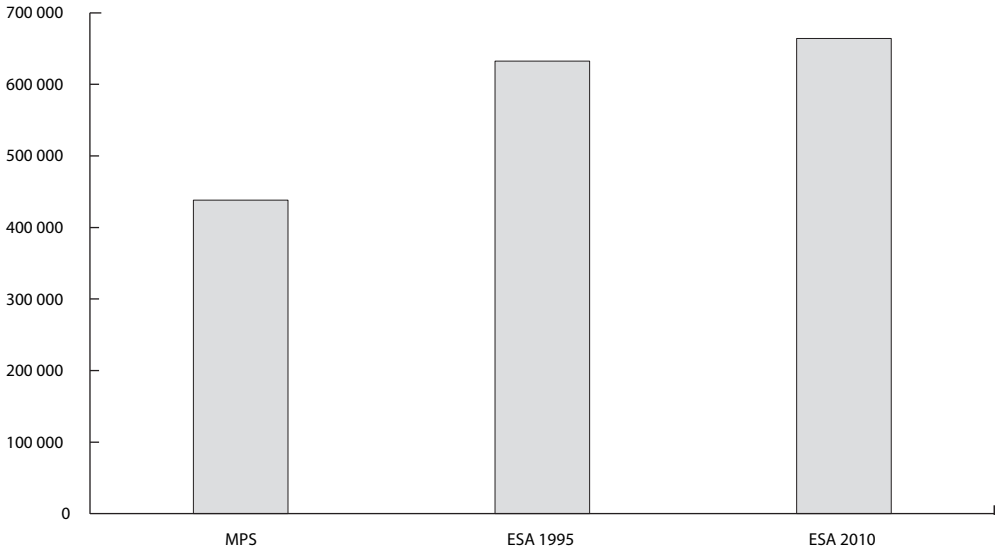
Source: Czech Statistical Office

¹⁶ Data for 1990 has not been processed yet.

¹⁷ There can also be found other changes in concepts that influence product measurement (e.g. insurance services) but with lower impact on GDP. The overall impact of ESA 2010 on GDP for 2010 is 3.2%, see <http://www.czso.cz/csu/tz.nsf/i/narodni_ucty_implementace_esa_2010_20141001>.

When comparing these adjustments throughout different statistical standards, it is obvious that product is crucially affected. While MPS national income was about CZK 438 billion in 1990, ESA 95 GDP was 44% higher.¹⁸ Comparison of ESA 2010 and MPS indicates very high difference (53%) given by the pure change of statistical standards representing mainly assets boundaries, see Figure 2.

Figure 2 Comparison of product between MPS, ESA 1995 and ESA 2010, CZK mil.



Source: Own computations

The update of GDP is not only European issue. Countries that used SNA 1993 or SNA 1968 are currently switching to SNA 2008. There are no significant differences between SNA 2008 and ESA 2010. For example, Australia¹⁹ increased its GDP by 4.4% and France²⁰ 3.2%. It means that international comparison in purchasing power parity will be affected, as well.

6 FUTURE DEVELOPMENT

Even the revision of national accounts’ rules was finished; it can be assumed that this was not the last revision. There are different factors that prove this assumption. First, the economy is still changing very fast and there is no reason to neglect it. Second, national accounts serve to many users ranging from official institutions EU, IMF, OECD, etc. to analysts. The users’ demands are developing, as well. Finally, it is always recognised that previous revision brought some outstanding issues that should have be corrected.

One of the conceptual issues with its place in SNA 2008 is capital services. Capital services remained in SNA 2008 as voluntary item. Originally, it was supposed that capital services should become an integral part of national accounts with significant influence on the computation of output for non-market

¹⁸ National income from MPS presented within this paper is based on gross basis for better comparison with national accounts. Within Balances of National Economy, national product was usually preferred on net basis.

¹⁹ See <<http://www.abs.gov.au>>.

²⁰ See <<http://www.insee.fr/en/themes/comptes-nationaux/default.asp?page=base-2010.htm>>.

producers, see Sixta and Fischer (2009). Capital services represent benefits from using assets as production factor. Prevailing concepts links capital services with gross operating surplus, see Harrison (2004). Since many countries opposed to that concept, final decision on capital services classified them as voluntary or satellite item.

It is generally known that current statistics serves for administrative purposes very often. In the EU, statistics is connected mainly with the measurement of government deficit and debt representing Maastricht criteria.²¹ For the EU budget, countries' contributions are from 85% based on national accounts' figures namely gross national income (GNI) and weighted average rate (WAR) of value added tax. On one hand, administrative use of statistics promotes its importance and provides some guarantees for statistical surveys. On the other hand, statistics can never be 100% precise or very high rate of precision is inefficient, costly or unachievable. It is clearly seen on the Maastricht criteria, the share of government net lending/borrowing (surplus/deficit) on GDP about 2.9% is considered as correct. Government deficit about 3.1% is considered as incorrect with legal and practical consequences in many EU countries even nobody can guarantee very small differences in statistical measurement.

As the society is developing, the pressure on statistics is rising. A group of qualified users is rising and tools for advanced data analysis are freely available. It means that statistics has many everyday users ranging from general public to the most skilled users at universities. It all leads to the higher pressure on official statistics. In the area of product measurement, there is a strong EUROSTAT effort on shortening publication deadlines and increasing of published detail. Currently, flash estimate of quarterly GDP is published 45 days after reference quarter. EUROSTAT intends to shorten it to 30 days after reference quarter in next two or three years.

CONCLUSION

The development of the measurement of economy is significantly influenced by economic theory and by the level of understanding of society. When the economy started to be discussed in complex in the 17th century, the quantification was aimed at the most important issues. Tableau Économique compiled by Francois Quesnay was focused on agriculture as the main source of the product. Since then, the list of activities that are regarded as productive and lead to the creation of product is still expanding. In 1930s, the quantification of economy resulted in input-output tables and later with preparation of the basis for further national accounts. The division of the world given by the cold war resulted in different development of economic measurement in the West (national accounts) and in the East (material product). Time to time, the efforts for strengthening cooperation and looking for the compromise between two different statistical systems was not successful. After the collapse of communist regimes, countries started to switch to more developed system of national accounts. System of national accounts is currently the only worldwide accepted system that is being still under the development. SNA 1993 and European modification ESA 1995 introduced exhausting and complex approach to the measurement. The principles set by SNA 1993 lasted for long time even the world has been changing. The changes in economy connected with the fast development and wide spread of computers, software and intellectual assets led statistical community to the preparation of updated system of national accounts. In September 2014, SNA 2008 and ESA 2010 come into force in the EU. Even the main principles remained unchanged, significant changes in gross domestic product can be observed due to the different approach to the productive activity. Obviously, the most important change in terms of domestic product is capitalisation of research and development expenditures. Similarly to the previous changes, the aim of SNA 2008/ESA 2010 updates is the effort to keep statistical measurement of economy in touch with reality.

¹⁸ See the Maastricht Treaty – the Treaty on European Union signed in 1992 in Maastricht, Netherlands.

References

- BOS, F. *The history of national accounting*. Statistics Netherlands, 1992.
- CZSO. *Gross National Income Inventory 2002*. Prague, 2012.
- ČADIL, J. Growth Accounting, Total Factor Productivity and Approximation Problem. *Prague Economic Papers*, 2007, Vol. 12, No. 4, pp. 347–357.
- EUROSTAT. *European System of Accounts (ESA 1995)*. Luxembourg: Eurostat, 1996.
- EUROSTAT. *European System of Accounts (ESA 2010)*. Luxembourg: Eurostat, 2011.
- FISCHER, J., FISCHER, J. Měříme správně hrubý domácí produkt? (Do we measure GDP correctly?). *Statistika*, 2005, Vol. 42, No. 3, pp. 177–187.
- FISCHER, J., SIXTA, J. K propočtu souhrnné produktivity faktorů (To the calculation of total factor productivity). *Politická ekonomie*. 2009, Vol. 57, No. 5, pp. 544–554.
- HARRISON, A. *Measuring the contribution of non-financial assets to non-market production* [online]. OECD, 2004. <<http://unstats.un.org/unsd/nationalaccount/AEG/papers/m2assets.pdf>>.
- IMF. *Balance of payments manual* (6th). Washington, 2009.
- JORGENSON, D. W. Capital Theory and Investment Behavior. *The American Economic Review*. 1963, Vol. 53, No. 2, pp. 247–259.
- KRAMULOVÁ, J., MUSIL, P. Experimentální odhad složek výdajové metody regionálního HDP v ČR (Experimental estimation of components of the expenditure approach of the regional GDP in the Czech Republic). *Politická ekonomie*, 2013, Vol. 61, No. 6, pp. 24–36.
- MARX, K. *Wage-labour and Capital and Value, Price, and Profit*. New York, 1975.
- MILLER, R. E., BLAIR, P. D. *Input-Output Analysis: Foundations and Extensions*. Cambridge, 2009.
- MPIA Paper* [online]. No. 5952, posted 26. November 2007. <<http://mpia.uni-muenchen.de/5952/1/historyNA.pdf>>.
- OECD. *Frascati Manual 2002*. Paris, 2002.
- SIXTA, J., FISCHER, J. Capital services and supply and tables compilation. In: *17th International Input-Output Conference*, 13.07.2009–17.07.2009, Sao Paulo.
- SIXTA, J., FISCHER, J. Using Input-Output Tables for Estimates of Czech GDP 1970–1989. *Economic Systems Research*, 2014, Vol. 26, No. 2, pp. 177–196.
- SAMUELSON, P., NORDHAUS, W. *Economics*. McGraw-Hill Education – Europe, 2009.