

Determining National Income, an Endless Journey Started 400 Years Ago

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Abstract

Nowadays, the Gross Domestic Product "GDP" is one of the most relevant indicators of economic growth. Because of its importance, it may be thought an unquestionable indicator, but it is not. Over the years, a number of economists have pointed out several shortcomings of it, such as the fact that some areas are disregarded and the fact that it does not take into account the economic development but only the economic growth.. Only a detailed analysis of its creation can give a good basis to understand how to intervene for corrections and understand why no alternative indicators could replace GDP. It is a 400 years long journey, from Sir William Petty to Sir John Richard Stone, where the different needs within a country have offered the basis to the new economic theories on determining the national income.

Keywords: GDP; Gross Domestic Product; History of Gross Domestic Product;

1.1 The first attempts to determine national income from Sir William Petty's theories to the Physiocrats

The increasing need to know the national income, in order to allow the rulers to determine the income tax, is the starting point for studies that will lead to determine the modern GDP. As a matter of fact, to get a clear view of the taxes to be collected, it is necessary to know the income and its components. (Toniolo 2008) The first attempts to study aggregated indicators from a macroeconomic point of view related to the national income, not only for the above-mentioned purposes, but also to make international comparisons. What is said above shows the reason why the first attempts of determining the national income coincided with the birth of the Political Arithmetic.

The Political Arithmetic was founded by Giovanni Graund and Sir William Petty. This new "science" studies and analyzes data about the government. The methods developed by the political arithmetic are empirical inductive, typical of natural sciences, and enumerate data acquired from experience. (Perelli D'Argenzio) The first attempts to calculate aggregate wealth date back to the 17th century in England, by Petty. (Stone, 1984) In his *Essays in Political Arithmetic and Political Survey* (1672), he calculates estimates of population and of social income. (Encyclopedia Britannica) He was one of the first authors to understand the importance of quantitative aspects in economic systems to understand reality. (Petty 1986) The birth and evolution of the Political Arithmetic by Petty date back to 1652, when Cromwell charged him with drawing up the Down Survey of Ireland. Petty had to establish the value of confiscated land after the military expedition to reconquer the territories seized from the Crown during the Irish Rebellion in 1641. The aforesaid land had to be redistributed among the financiers of the expedition, the soldiers of the New Model Army and the settlers from England and North America. All this was stated in the *Act for the Settlement of Ireland* (1652). This reinforces the fact that the study of economic variables is always a tool in the rulers' hands: according to quantitative data, they can make political-economic decisions. What has been said up to now, was not an easy task for Petty, who had to create a very complex method that would have represented the starting point of his Political Arithmetic. Thanks to this work, Petty took an interest in the study of economics and social sciences, joined the Invisible College and the Royal Society and drew the *"Treatise of Taxes and Contributions"* in the same year. (Fornasari)

Petty needed computational tools to determine the income, because, as his idea about taxation was based on the principles of consumption taxes, the system could be equitable if only complete information on taxpayers was provided. (Uniba) In order to fully understand Petty's theory about taxation, the concept of rent must be defined. The rent corresponds to extra remuneration in contrast with normal remuneration given by the scarcity of resources, such as the land factor. (Cavalieri 2007) According to Petty, only the rent has to be subjected to taxation, because it is a surplus that is not part of the production costs and therefore does not impact on the prices of products.

In addition, according to the author's theories, rent in whole is not taxable: rent dedicated to the consumption is taxable but rent dedicated to investment or savings is not. In Petty's opinion, non-essential goods should be taxed more than the other ones because they better show the economic conditions of a subject. (Fornasari)

What has been said so far highlights the relevance of getting complete information about the national income at the aggregate level to find a more equitable taxation system. This belief leads Petty in 1664/1665 to the drafting of a method to determine the national income, as explained in "*Verbum Sapienti*". The system he developed is particularly "brilliant" at that time, although the data actually considered are few. The "genius" is represented by the leveling of income to the expenditure as all that is necessary for the life of a subject. (Stone 1984) This concept, that we take for granted today, was born in those years and represented an element of innovation.

According to his division of the national income made in 1664 within England and Wales, Petty emphasized the personal estates and the workforce remuneration. The latter is the difference between the national income and the return on equity and this element would be objectionable unless it did not provide a figure that equals the figure obtained by multiplying the number of workers by the average wage in that period. The income calculated by the author coincides with the national expenditure. (Stone, 1984)

One of Petty's followers was Gregory King, a British economist regarded as one of the fathers of econometrics and national income accounting. He was also famous for the so-called "King's law" on inelastic demand. (Fornasari)

King's interest for national accounting is not a coincidence, as matter of fact the economist was in charge of the Royal Commissioner Office in England. As mentioned before, one of the first reasons that led to find a calculation of national income was linked to taxation. King's studies start from Petty's ones and, thanks to the information received from tax inspectors, 10 years later, he is able to take a picture of the English national income. The innovation in the new calculation is given by the estimates of population, wealth and popular products. King included popular products in his calculation because they were the most taxed products and, as the sources he drew from were fiscal, they had to be taken into account. (Toniolo 2008)

A work by King which is relevant to study his approach to national accounting is: "*A Scheme of the Income and Expense of the several Families of England Calculated for the Year 1688*" (Stone 1984). In his tables, not only are the income divided into categories such as "Spiritual Lords", "Gentlemen", "Persons in greater Offices and Places", etc, but he also highlighted the increase or decrease in the Wealth of Kingdom. In addition, other tables are provided, such as the one that highlights the per capita income, the total income, and the total increase. To determine the total increase, we have to subtract the total expenditure from the total income, although in his tables there was not the column of the total expenditure that, for this reason, had to be inferred. The tables proposed by King provided the Sovereign with an overview of the wealth of his people and allowed him to prepare a plan of taxation. In addition, national accounting allowed comparing the wealth of other countries, from a commercial or military point of view. An example of this kind of accounting can be found in another work by King: "*The General Account of England, France & Holland for the Years 1688 & 1695.*" (Stone 1984) The calculation presented in this work refers to England compared with France and the Netherlands, which were its political and commercial rivals. In this table, that summarizes the total and the pro capita income of the three countries, we can see that income and expenditure are equivalent, which is an element from Petty's theories.

The calculation of the national income changed significantly with the advent of Physiocracy, an economic theory which considered agriculture as the only productive activity capable of creating a surplus, also known as Net Product, which is what remains after subtracting the cost of production. (Treccani.it The encyclopedia Italian) The founding father of this current of thought is François Quesnay, who wrote the "*Tableau économique*" (1758), the first example of a schematic representation of an integrated system. (Sapere.it)

Quesnay's contribution was relevant and, thanks to his theories, the concept of interdependence of economic activities starts developing. The limitation of Quesnay's theory is due to the basis of the physiocratic theories, that is, agriculture is the only productive activity. The national income and its composition can be very different according to which productive sectors and flows are taken into consideration when creating the same. (Uniba) This last statement allows us to understand why national income accounting in the history has changed.

The economic system analyzed by the author in his work lacks in capital for agricultural development. It generates the poverty of the French peasantry of the time and the need for a social reform.

The Net Product from agriculture ends up in the hands of the landowners and this income has to be taxed according to the exponents of Physiocracy. (Ranocchi) Even in this case, it is clear that the need to determine the national income is closely related to the tax system.

To better understand the system of national income theorized by Quesnay, one need only consider the areas examined (Bellino, 2006):

- ✓ productive class consists of agricultural and mining laborers. The amount of produced product is superior to the product used to produce it, which implies the creation of Net Product;
- ✓ sterile class is made up of artisans and people employed in the manufacturing sector. It performs only transformation process and therefore it does not create Net Product from a quantitative point of view. As a matter of fact, in the physiocratic system, the surplus is only quantitative and qualitative;
- ✓ aristocratic class includes nobles and clergy, who, as owners of the land, receive the net product, as an income, from the productive class.

Quesnay's analysis has a microeconomic perspective, but, according to the author, to get the aggregated data, that are macroeconomic, we have to multiply the results by the number of subjects of each social class. The "annual wealth" is determined by the flow of produced and reproduced goods, returning to the concept of net product. (Quesnay 1973)

1.2 The National Income According To the Classical Economists

The physiocratic approach just mentioned can be considered outclassed by the publication of Adam Smith's main work "*The Wealth of Nations*" (1776). In this essay, the concept of economics appears as an independent subject. (Uniba) Smith was not a political arithmetic, as he did not consider reliable the expressions of the economic conditions in terms of number, weight or measure. For these reasons, the author opposed Sir Petty's theories, appreciated King's perspective but rejected the "King's law". But despite these criticisms, Smith frequently used time series to represent any variable that could be expressed numerically, such as the prices of goods, the precious metals flow, the annual product, etc. .. (Smith 2006)

Smith as well has theorized a way to determine the wealth of a nation, which is also the title of his *opera magna*, which did not take into account only agriculture but rather all the productive activities. The more the available work is, the more a nation is rich and productivity has to be taken into consideration, too. Therefore, the greater the work and productivity are, the higher the national income is (Pellizzari 2008)

The concept of productive work is very important, as according to Smith all of the sectors that create, that are productive by definition, must be considered. On the other hand, the sectors which provide services have to be considered unproductive and therefore not taken into account to determine the national income. (Smith 2006) In this case, it is clear that the calculation of the national income is strongly connected to the basic theories of the economists, on productivity and on what is to be considered important. For this reason, criticism about the fact that, in determining GDP, the welfare is not taken into account, is a "contemporary" matter, as before it was not even remotely contemplated. In Smith's theories, the author talks about the "invisible hand", he states that the interest of the individual is the virtue of the community and that each person by pursuing his/her own interest improves the community. (Smith 2006) All these assumptions prevent logically the author from taking into account the welfare of a society, because he assumes that it has already reached its optimal level.

To Smith, the wealth of a nation is determined by the extension of the market, that is the ability to ask that is given by the per capita income, that is the income Y divided by the number of workers N . (Gatto 2012) In fact, in the famous example of a pin factory, the author points out that the process of increasing wealth does not take place unless there is the possibility of selling the pins. (Smith 2006) Once you have defined the need for new products, the "division of labor", in other terms the specialization of the workers, increases the productivity of each worker, which may also use new machinery. This state of things increases production with the same number of workers and the per capita income, as well. What has been said triggers a spiral where wealth feeds new wealth, but according to the author there are evident limitations expressed by the extension and the division of the market. Summing up what has been said so far on Adam Smith's theories, the per capita income depends on the division of labor and the number of workers.

Thus, with the same number of workers, an increase in the income is due to an increase in productivity of the same, which also implies a change in the productive structure, in the social relationships, etc. These changes show that, according to the author, the division of labor implies both an economic growth and an economic development. (Gatto 2012)

The theories of the economist to determine the national income can be considered as previews of what other economists have theorized later. To better understand what has been stated, the main steps of the productive circuit of the wealth of a nation have to be analyzed.

The first element is the extension of the market. The author considers, as a starting point to increase productivity, a market that could absorb the "pins" (Smith 2006). In a way, it is possible to find a correlation with John Maynard Keynes's theories, where, for the first time, the author theorized that the demand determines and limits the supply. According to the economist if the subjects ask, companies can offer and in this way, a kind of economic growth can result. (Keynes, *General Theory of Employment, Interest and Money*, 2013) It is obviously just a small correlation, because Smith is a classical economist and, as such, the market reaches balance by itself, thanks to the well-known "invisible hand" (Smith 2006) theorized by Smith himself. It is not possible in the system theorized by Keynes, where there might be deficiency in demand. So, it can be argued that in reality the theory of supply and demand, by Smith, contributes to the economic growth rather than to unemployment. As a matter of fact, the extension of the market is determined by an increase in the demand that implies an increase in the productivity. For this reason, a new division of labor has to enhance. At the same time, an increase in productivity reduces the cost of production, therefore greater wealth can be accumulated and new investments in production can be made; in turn, they increase productivity and reduce costs. In short, a higher income with the same number of workers implies a higher per capita income. In addition, a higher degree of specialization of workers implies an increase in wages; in turn, a higher purchasing power for workers implies an increase in the extension of the market. (Forges Davanzati 2007)

Thus, according to Adam Smith, the creation, and the determination as well, of a national income is strictly connected to the number of workers and their productivity. Wage is another essential element in determining the national income and it is shared by later economists. An increased division of labor leads to workers' alienation, due to the repetitiveness of their activity. This negative counterpart has to be rewarded with an increase of wages as an element of compensation. In addition, the more workers are specialized, the more it is difficult to replace them and therefore they need to be better remunerated. (Smith 2006) In turn, Smith affirms that a wage increase causes a further increase in productivity given by psychological factors. (Forges Davanzati 2007) What has just been said is connected to Henry Ford's theory about "efficiency wage". A higher wage for workers leads to an increase in productivity, because workers do not want to lose a well-paid job and the resources to be consumers of the products they produce. (Cavalieri 2007) These theories are essentially very similar, as according the two theorists a higher wage binds workers in a stronger way and increases their productive capacity. All things considered, one can say that a close correlation exists between Smith's "theory of high wages" (Forges Davanzati 2007) and Henry Ford's "efficiency wage theory".

In consideration of the above and returning specifically to the calculation of GDP according to Smith, it is clear that:

- An element of innovation is the per capita wealth of work, where wages are one of the main calculation bases;
- The calculation basis of the GDP is the productive labor, and not agriculture as it was according to the

Physiocrats. On the one hand, this element enhances the calculation but on the other hand, it makes the calculation objectionable, as it does not take into account the income from the "unproductive labor", that is the one connected to services.

In short, Smith's contribution to determine a national GDP emphasizes the fact that the national product is taken as a result of goods and net income, meaning all income from wages, rents and profits, except for those from unproductive labor. This exclusion is determined by the fact that, according to author, the remuneration for services is only a redistribution of an income previously generated and already calculated, therefore its consideration would only lead to a double calculation of the same values. (Forges Davanzati 2007)

Adam Smith is not the only classical economist who dealt with the calculation of a national income. Take the case of Thomas Malthus, famous for his “Essay on the Principle of Population”, whose last version was released in 1803, that wrote a lot about economic theory.

Thomas Malthus in his calculation of a national income make a distinction between the concepts of gross and net. Gross income is the total income of an economy from wages, profits and rents. Net income is gross income minus production costs, that is wages. What has been said shows that, according to the author as well, gross income equals production and can be determined by multiplying workers by their productivity. Net income can be determined in an alternative way by adding profits to rents, but there is another approach to the question that takes into account the definitions of these quantities. Profits are a part of the income that manufacturers turn into investments, while rents are used to purchase and pay for services, that is for unproductive labor. For the above-mentioned reasons, net income is the sum of investment and wages from unproductive labor. (Graziani 1984)

What has been said reveals a similarity between Smith’s and Malthus’s theory about national income, as, according to both authors, unproductive labor is not relevant to determine a national income.

Another classic author who dealt with the calculation of a national income is David Ricardo in his “Essay on the Influence of a Low Price of Corn on the Profits of Stock” (1815) and “On the Principles of Political Economy and Taxation” (1817, III edition in 1821). According to Ricardo, as well as to Malthus, a national income is generated by the sum of the income of the three social before mentioned, the distinction between net income and gross income is still valid. (Perri 1989)

On the other hand, Friedrich Heinrich Storch was an author who developed the concept of product and income, by avoiding limiting the concept of product to that of wealth. First of all, national product means all that has been “created” in a year; creation can be seen in the strict sense or as creation of value, such as the unproductive labor. In this way the limitation imposed by Smith is removed, although the author is one of Smith’s disciples. The theory just exposed could be compared to Ricardo’s theory, but in reality it is different with regard to the net product. As a matter of fact, according to Storch, net product cannot be obtained by eliminating only the costs, because, at this point, it would be still gross income, or, more to the point, Gross National Income. According to the economist, GNI is an add up of the incomes of the social classes involved in the production. On the other hand, net income is Net National Product minus the part indispensable to production, that is the “Needed Income” for the remuneration aimed at the restitution of the productive system. (Torrens, et al. 1856)

The theories of economists so far presented have shown the limit of adding up heterogeneous values. For this reason, John Hicks criticized them *«there is no doubt that the wealth flow means production; some goods are produced and the wealth flow consists of these goods. Nevertheless, the goods that are produced are heterogeneous: it is not obvious that it would be possible to consider them all together and reduce them to a common ‘substance’. The classical approach assumes that, for relevant reasons, it is possible to consider in a homogeneous way heterogeneous goods. [According to the classical economists] we can represent such goods as a wealth flow, so homogeneous, that we can apply addition and subtraction to it. The classical economists called political economy exactly the study of this wealth flow»*. (Hicks 1983)

1.3 The Latest Approaches to Determine Income Up To the Currently Used Definition

An extended version of the theory of national income is due to Alfred Marshall, who wrote in 1890 “Principles of Economics”. The theories of this author are still appreciated, in particular his definition of “national income as the sum of all goods and services” (University of Michigan, 1974). Today, we can find a definition of GDP that is not so different as a “sum of all the finished goods and services within an economy” (Blanchard 2009)

In Marshall’s definition, the most relevant aspect is the absence of any distinction between productive and unproductive labor. The annual net income of an economy is also called by the author “National Dividend”. In this case, to determine the net value, all intermediate products must be subtracted, in accordance with the current definition of GDP as well. (Marshall 1972)

The national dividend identified by Marshall therefore equals the income available for consumer goods, in real and non-monetary terms. If factors of production increase, that is if production increases, the available income increases as well. This fact allows us to study growing economies as well as steady state economies. But, if we link goods to the market, goods out of the markets are not taken into account. Take the case of the current imprecise definition that does not consider “the personal consumption” and the “barter”.

What has been pointed out until now is that the economists work in accordance with the needs of a society, and as a matter of fact, the theories on GDP that have gradually followed are an example. Therefore it is not difficult to understand why the most important theories to determine a national income evolved starting from the Great Depression of 1929. It created a growing need for more and more effective systems to measure the economic performance of a country. (Consiglio Nazionale dell'Economia e del Lavoro)

One of the leading economists at that time was John Maynard Keynes, who determines precisely the GDP as the add up of consumption, investments, public spending and net exportations. This definition is still valid nowadays. (Gardini, et al. 2000)

Another element introduced by Keynes that is still significant today is the potential national income, which is the maximum output that a country is able to produce under certain conditions. (Maital 2009)

In addition, Keynes definitely equalizes income, production and expenditure, as other economists did before. (Keynes 2006)

After the first world war, in order to prevent future wars and to improve the national welfare and quality of life, during the Paris Peace Conference in 1919, an intergovernmental organization was founded: the League of Nations. In 1928, it organized an international conference: on that occasion, the need for economic statistics, that could be compared and studied worldwide, was expressed. (Proceedings of the International Conference Relating to Economic Statistics, 1928) In 1938, the League of Nations published the first report on the estimates of national income for the period 1929-1938 about 26 countries belonging to the World Economic Survey. (Kendrick 1957)

In the same period, the National Bureau of Economic Research funded another economist (Kuznets, Epstein and Jenks 1954) to determine a national income: Simon Kuznets. His research was so precise that it is universally recognized as a model. After this research, he cooperated with the U.S. Department of Commerce, but Kuznets's firm belief that the National Product was the only measure to determine the national welfare and inclusion of domestic labor in the calculation led to a breakdown in the cooperation. In 1934, the economist presented his first calculation of GDP to the U.S. Congress. He developed a method that could be adopted to make any comparison and to determine a national income. (S. Kuznets) The only countries that opted for some changes in the definition of GDP presented by Kuznets were the socialist ones, that, in accordance with their different organizational structure, opted for a calculation that did not include the services and the "Net Material Product", NMP. (Khomenko 2007)

In 1971, Kuznets won the Nobel Prize, not only for his calculation of the GDP but also for his economic theories about the economic growth and the distribution of income. The most relevant element in Kuznets's measurement of GDP is the capillarity of the statistical data collected over several decades, because it was something that no author had done before. (Kuznets, Epstein and Jenks 1954)

These statistical data led the economist to develop the so-called "Kuznets curve" that connects economic growth with the distribution of income and thus the equality/inequality of the distribution. This curve shows that, in pre-industrial societies the economic growth implied a greater distributional equality. After the transition period, that is, in the industrial societies, the opposite happens. For this reason, to the author the GDP growth is not a reliable indicator of welfare. Clearly some problems about interpreting the curve might occur, since the outsourcing is not taken into account and production and it remains a concept that has not global application. (Istituto di Studi Politici "S. Pio V" 2011)

Another economist who gave his contribution to the definition of the GDP in England is Colin Clark, who published in his book "Conditions of Economic Progress" (1940), the results of his research. According to it, GDP indicated the wealth required to meet both private and public financial needs. His work had great success, was translated into several languages and was also quoted by Pope Paul VI in his encyclical "*Populorum Progressio*" in 1967. This quote is due to the fact that in Clark's opinion economy and technology should make our planet more habitable. (Nebbia 2006)

Clark's study emphasizes also the composition of GDP. As a matter of fact, the so-called "Three-sector hypothesis", also called "Clark's law", highlights that, according to the predominant sector in the GDP, it is possible to understand at what stage a nation is. The more a nation "evolves", the more the following sector prevails over the previous one. Thus, in a capitalist society, the industrial sector which had downgraded the agricultural one, in turn, will be downgraded by services. (Unioncamere 2004)

Thanks to his theories about the definition of GDP, Sir John Richard Stone won the Nobel Prize in 1984. (Treccani.it) Stone published “*The accounts of society. Nobel memorial lecture*”, a document where he explains the different historical basis of his studies and advantages and disadvantages in the calculation of GDP. The calculation of the Gross National Product, as proposed by Stone, is currently used in the United States. This system was developed by the economist to describe what happens in a country, according to measures that rely on double-entry accounting.

According to Stone, the national income derives from macro-economic factors, such as companies, families, public administration and the rest of the world. (Vasapollo 2006)

Thanks to Stone's contribution, the “System of National Accounts – SNA” was born. (Institute for Studies and Economic Analyses). This system is a macroeconomic accounting technique based on international accounting rules that are generally shared and accepted. Therefore, thanks to the SNA, it is possible to provide the basis for economic policy choices and to compare data internationally. The first version of the SNA was released in 1953. Then it was modified in 1960 and in 1964, up to the final version released in 1968 by the Statistical Office of the United Nations, UNSO. In fact, the current version was released in 1993, after the EU, the IMF, the OECD and the WTO had introduced some changes. To both UNSO, whom Kuznets cooperated with, and OECD, whom Stone cooperated with, the SNA had to be able to provide the basis for economic policy choices in the run. In reality, this system does not represent adequately the development, the welfare and the wealth of an economy. Take the case of environmental issues caused by economic activities. They can be measured in the long run but they cannot be measured in a given stock, like the GDP. Despite the limitations of GDP that have come to light in the course of its history, it is a relatively new necessity to find an indicator that might complete or replace the GDP in order to analyze variables such as the environment and the welfare and that might take into account not only quantitative but also qualitative aspects. As already seen in the history, each economic theory is the child of its time; for this reason, as the social, environmental and national welfare issues are more and more commonly known, it is clear that this situation will lead to new theories and new indicators. Thus far, several indicators have been developed, but there is still much to do to provide a reliable indicator.

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