

Antoine-Laurent de Lavoisier A Precursor of National Accounting

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Abstract: *National economy is a broad field of research and efforts to develop a national accounting have intensified. In the context of development of economic relations, national accounting is a necessity. Building a system of information on gross domestic product, size of national wealth, financial relations and cash flows determine studies on the economic forecast, the distribution and accumulation of national wealth. Efforts in this direction have been numerous and have their roots in the work of Antoine Laurent Lavoisier . Known as the father of modern chemistry, Lavoisier was he who first promulgated the concepts and specific national accounting methods. He was a precursor of modern economic thought.*

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Introduction

Antoine-Laurent Lavoisier is known in the scientific world as a renowned chemist. Called the father of modern chemistry, he lived between 1743-1794. His most important discovery is the role of oxygen in combustion and the law of conservation of mass. He studied law, mathematics, astronomy, botany, geology. At 25 years old he became a member of the Academy of Sciences.

Less known is his role as an economist and public servant. Sometimes it is only about being an investor and manager of a private tax collection company called General Farm, Chairman of the Board of Directors of France Bank. Vocational training, the accuracy of scientific method and involvement in economic life have created the basis for the development of new economic theory concerning statistics and gross domestic product, concepts at that time little

known. In an attempt to solve scientific some national economic problems , Lavoisier is the one who laid the foundations for quantitative analysis and national accounting.

Lavoisier, economist and public servant

a) At 25 years old, Lavoisier joined the private company General Farm. The principal objective of this company was to collect for the Royal Treasury indirect taxes composed of taxes on salt tax, duties and taxes on tobacco and alcohol. Appointed inspector for Regional Tobacco Commission it was intended to eliminate smuggling and fraud and also to collect taxes on goods going into Paris. In this respect Lavoisier pursued a policy of modernization of factories and productivity growth. He was the one who proposed a system of surveillance of goods going into Paris by building a barrier around the city [Poirier, 1993].

b) In 1776 Lavoisier became one of the four commissioner members of Gunpowder and Saltpeter Administration. In this institution he was able to increase the production of gunpowder by the construction of factories, by setting quality standards and by qualification of personnel [History of Science, 2010].

c) Another contribution of Lavoisier in economic field depended on his membership in the Committe on Agriculture starting 1783. He encouraged the creation of private companies and also to reduce imports by creating the necessary infrastructure for the development of industries. Through its work, the committee assumed the role of the ministry and was involved in a large scale program of financial, fiscal and technical reforms [Poirier, 1993].

Lavoisier continued to study the economy through direct involvement in agriculture. To see exactly what are the factors that contribute to the welfare of the nation as a whole, begining with the ideas of physiocrats who argued that agriculture was the main source of wealth and the most productive activity, Lavoisier tried to apply the rigors of science in agriculture by making statistical calculations. Lavoisier adopted a scientific approach by using the balance sheet and by dividing all in terms of revenues and expenses using systematical measuring and production records. Lavoisier calculated farmer's net income after deducting all expenses: worker's incomes, cost of equipment used in agriculture, raw materials costs, farmer's expenses on procuring goods and food for their families, the rent and indirect taxes [Poirier, 1993].

d) Since 1787, when tooked place the decentralization of France, Lavoisier became a member of the Provincial Assemblies of Orleans in the Commission of Public Welfare and Agriculture. He stood out by submitting proposals on economic and social reform [Poirier, 1993].

e) The position of Chairman of the Board of Directors in the Discount Bank fited much better to Lavoisier. Lavoisier took advantage of hir position and borrowed considerable sums of money to the state.

In 1791, the Constituent Assembly became the institution responsible for public finances. Lavoisier has played an important role in this institution: he organized the administration and introduced modern management techniques; he centralized revenues and expenses; he established the rate of pension and interest; he determined the rate of currency; he established

a new tax policy based on direct taxes; he estimated for the first the gross domestic product and realized a forecast budget [Hystory of Science, 2010].

Lavoisier- a precursor of national accounting

In 1791 the Taxation Committee of the National Assembly called Lavoisier's knowledge and experience and asked him to put on a new system of taxes and new tax theories. This requirement came because of the impossibility of determining the resources collected by the state and of defining national income. There were many opinions and estimates of national income, but no methodological choice was scientifically sustained. The most used method was the following one: to determine an appropriate gross domestic product, first you should know each farmer's net income and then multiply it. Here you face the first problem of the method, because there wasn't any national registry to include such data in 1790, although such a register had been required by law. Once obtained the information the process involved a series of difficult calculations. To simplify the methodology deputies assumed that the net income of each farmer is equal to the rent and the taxes should be equal to the sixth part of this amount. Although, they could not accurately determine the amounts collected by the State [Poirier, 1993].

At the request of the Constituent Assembly Lavoisier undertook a survey of territorial wealth of France in 1791. The research results, submitted to Taxation Committee, were made public in 'On the territorial Wealth of the Kingdom of France' published the same year. The paper presents concrete estimates on the 'net agricultural output of the Kingdom; total daily earnings and expenditure of certain types of gainfully employed persons; total per capita consumption and expenditure of the whole population and of its different classes; and data on specific kinds of consumption and expenditures regarded as indicative of the welfare of the population' [Collette, 2000, p. 18].

The booklet published by Lavoisier in 1791 was a solution to a seemingly trivial but important question: finding a significant economic aggregate to define the nation wealth in the context of the French tax system reform [Arkhipoff, 1990].

The theories published in that article are the result of studies undertaken since 1784, when, with Dupont de Nemours, Lavoisier has begun a series of studies on population and the French national production. He collected data on population, its income, production and consumption [Collette, 2000]. Lavoisier used as sources the ideas of Pauton Alexis, Joseph d Expillz Abbé Jean Louis Messance. However his experience as a landowner, his participation in socio-economic studies and involvement in economic and French tax system are much more relevant. Although the study was inspired by Dupont, Lavoisier is considered an original author and a genuine national accounting [Tabără, 2008, p. 27].

a) Lavoisier's definition of aggregates

Lavoisier began the article by defining gross domestic product as the sum of net income of farmers [Poirier, 1993, p. 267]. In analyzing it he started from physiocrat's assumption who believed that the agricultural sector is the only producer of revenue and economic benefits.

Although, he approached to Adam Smith's view assuming that industry and commerce are also producing wealth. Lavoisier considered flows more important than stocks [Klotz, 1989].

Lavoisier defined three economic aggregates: the territorial yield in kind, the territorial income in money and the net income.

This territorial yield in kind has no value if the products are not sold on the market. This aggregate has two components: territorial product used by people considered national income and product used by animals considered intermediate consumption. Intermediate term finds its roots in the work of Lavoisier [Klotz, p. 10]. Lavoisier believed that this product should be divided for having a reasonable statistical observation. He divided the agricultural products in several categories and recorded for each category observed data. He developed the idea of a classification of products [Arkhipoff, 1990, p. 40].

Because territorial yield in kind can not be used at tax policy, Lavoisier developed a second aggregate called the territorial income in money. This represents 'the portion of the preceding that could be converted into money' [Lavoisier, 1791, in Poirier, 1993, p. 267]. This aggregate corresponds to a real income, meaning an income from actual sales to potential customers.

The net income is according to Lavoisier 'what remained of the territorial revenue in money after subtracting all expenses and costs connected with an agricultural exploitation, in particular, the feeding and maintenance of workers' [Lavoisier, 1791, in Poirier, 1993, p. 267]. This aggregate is the one which will be named gross domestic product.

b) Lavoisier's principles of national accounting

For having the possibility of estimating these three aggregates, Lavoisier proposed the establishment of a national statistical office with the task of data collecting and processing. The absence at that time of such institutions determined Lavoisier to state and uses the following principles:

1. The first principle according to which there is equality between what is produced and what is consumed: 'There is an equation, an equality, between what is produced and what is consumed; thus, to know what is produced, it suffices to know what is consumed, and vice versa' [Lavoisier, 1791, in Poirier, 1993, p. 267].
2. The second principle as the basis for calculating annual consumption emphasizes the idea that 'the total consumption of a kingdom is equal to the average consumption of individuals, multiplied by their number' [Lavoisier, 1791, in Poirier, 1993, p. 267].

In this respect Lavoisier estimated that in 1791 the French population was about 25 million. The next step was to estimate the typical family consumption based on prices of basic elements, those needed to survive. What Lavoisier took in consideration was an average individual consumption applied to all citizens of France with certain reservations. The product of the two values leads to estimate domestic consumption. He estimated the value of annual consumption of France to 2 Billion, 750 million.

The next step was to equalize the national consumption with gross domestic product based on the principle set by chemistry 'nothing was lost, nothing was created'. The national gross

product is estimated as a result of multiplying the area under their yield. The value obtained by the two methods of calculation is almost the same.

To obtain the gross domestic product Lavoisier had to subtract the costs of cultivation, the expenses incurred by those who participated in the cultivation and all agricultural expenditure. Gross domestic product obtained was of 1.2 Billion livres. This was the amount for which taxes were applied.

What Lavoisier proposed was a statistical description of the economy of a country by using aggregates. He planned to establish a general account or balance of all the provinces of France, which would be a thermometer of public prosperity. So, it is wanted the creation of a public institution through which to confront the results of agriculture, trade and population, the country wealth in people, production, industry and aggregate capital. Lavoisier predicted a system of partial indicators that were making the overall economic picture [Tabără, 2008, p. 28]. Jean-Pierre Poirier considered Lavoisier as being a precursor of national accounting. He also considered that his work 'marked a milestone in the history of science and national economic statistics and accounting' [Poirier, 1993, p. 266].

Conclusions

The ideas promulgated by Lavoisier have long remained without a resounding echo in the economy. As Arkhipoff pointed out [Arkhipoff, 1990, p. 37] the reasons for this can be found in the fact that Lavoisier spoke about statistics and national accounting long before they became an object of research for economists and the fact that most of his economic ideas were presented to the public in an inappropriate way in a tiny booklet published in 1791. Lavoisier published only the results of the study undertaken during 1784 - 1791 without giving many details about the methodology and assumptions. This raised many questions. Another element that has questioned the originality of his works lies in taking over from physiocrat theories. However, he differentiated from their ideas in developing national accounting. Oleg Arkhipoff considered Lavoisier a physiocrat by definition

Another critical opinion about his study refers to the fact that Lavoisier defines three aggregates for a common year and not for a given one. The gross domestic product is different from a year to another making impossible to accept Lavoisier's methodology. However, Arkhipoff Oleg finds in this an element of originality [Arkhipoff, 1990, p. 46].

Lepetit Bernard says that Lavoisier wanted to develop arithmetic of national production and income. Interest in this area comes because of the deplorable situation of agriculture in France, the need for tax reform and a better assessment of the wealth of nation. The developed statistical logic it's used to achieve a positive response [Bernard, 1989, 1142].

Gérard Klotz largely criticizes the method used by Lavoisier considering numbers as being rustic and largely unfounded statistical, methodology and certain assumptions difficult to understand. However in his article *Réforme fiscale, physiocratie et statistique: le cas Lavoisier* he appreciates the ideas developed by Lavoisier and his initiative in developing some aggregates at the national level and the use of statistics..

Only in 1948 Lavoisier was considered as the precursor of the national accounts by Francois Sellier in the article 'A precurseur sans Disciples: Lavoisier'. Oleg Arkhipoff considered Lavoisier a precursor of national accounting, also [Arkhipoff, 1990].

His research is intended to be more than a simple calculation of the aggregate and centralized data. However he has not given enough attention to the multiplier as a part of the second principle and its demonstration orientated more on equality between consumption and national product by the types of activities.

In the booklet published and in his research, Lavoisier does not take into account a third principle, according to which, 'the total income of an individual equals to the amount provided by his work', an important aspect of the double entry bookkeeping [Arkhipoff, 1990, p. 47]. However it creates consistency across the national economy and the link between public accounting and simple bookkeeping.

Lavoisier remained for a long time a precursor of the national accounts without followers. His work began to be understood in its true sense much later when other scientists have dared to address this very vast area of national wealth. Lavoisier remains in history as one who has defined and developed the first method for calculating gross domestic product, the one who centralized for the first time data and statistical information on the components of national wealth. Although sometimes criticized, Lavoisier's attempt remains the first attempt in history and although presented in a simplistic manner creates the basis for the development of national accounting.

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