
HISTORICAL ASPECT OF THE DEVELOPMENT OF THE INDUSTRIAL PRODUCTION INDEX IN THE SYSTEM OF OFFICIAL STATISTICS OF UKRAINE

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Abstract. This document shows the evolution of calculation of the industrial production index in Ukraine. Since the Soviet Union collapsed, in order to adapt Ukraine's industrial statistics to the conditions of a market economy and international standards, especially of the EU and the UN, a series of notable improvements were implemented in the methodology for the calculation of the industrial production index. Ultimately, according to the methodology for the industrial production index calculation introduced in 2009, which is currently implemented in Ukraine, the index is constructed by methods used in statistical practice in the majority of countries all over the world and the European statistical service (the so-called method of permanent set of goods). The article also describes the features of the construction of the index of industrial production in Ukraine in accordance with this methodology.

Keywords: industrial production index, methodology of calculation of industrial production index, gross value added.

1. Introduction

The industrial production index is one of the most important indicators of economic activity in any country that characterizes its industrial production dynamics and is the main indicator to assess the current state of the national economy.

This article describes the evolution of the industrial production index calculation in Ukraine, starting from the time when Ukraine was one of the USSR republics. At that time, under the conditions of a centralized Soviet economy, calculations of industrial production dynamics were carried out according to the methodology of preparing national economic plans for the reporting period. After the collapse of the Soviet Union and the proclamation of the independence of Ukraine in 1991, the country began economic reforms. Problems of government statistics were analysed as well. Special attention was paid to the industrial production index. The difficulty of index calculation is the choice of method considering the national specificity in terms of the industrial specialization of Ukraine, economic management and the available sources of information that can be used to calculate the index, within generally accepted approaches and international standards. Since independence, the statistical service of Ukraine approved 2 calculation methodologies for the industrial production index which consider international statistical guidelines and are close to international statistical practice.

2. Construction of the industrial production index in 1922-1991 when Ukraine was one of the Soviet Union republics

For a long time the development of industrial production indices and the improvement of their calculations have attracted the attention of scientists who are studying production output volumes and analysing production dynamics all over the world. In the statistical practice of Ukraine, the first attempts to analyse heterogeneous product output were made over 90 years ago, when Ukraine was one of the USSR republics. In 1922, the Central Statistics Office began to calculate the industrial production index according to the weighted arithmetic mean formula. Production volumes calculated using 1913 prices were the weights, and it caused fair criticism from the opponents of this method. It is also necessary to note the fundamental work of L.B.Kafengauz who developed the industrial production index as an indicator of the economic dynamics of the USSR in the 1920s [1].

In subsequent years the construction of the industrial production index was carried out on the basis of complete enumeration of all types of industrial products in kind assessed at comparable prices. For example, by 1950, the calculation of production growth rates of the USSR was held at 1927 prices, in 1951 – 1955 it was based on the wholesale prices of enterprises (i.e. exclusive of turnover taxes) as of January 1, 1952. The prices of January 1, 1982 were taken as base prices in 1982-1990. In concurrence with this, production growth rates over long periods, during which different base prices were used, were calculated using the chain-linking method.

Thus, under the conditions of the centralized Soviet economy, calculations of industrial production dynamics were carried out according to the methodology of preparing national economic plans for the reporting period (cumulative total from the beginning of the year) compared to the corresponding period in the previous year. For this purpose all companies were required to recalculate production volumes for the reporting and the previous periods in comparable prices. Price lists for products were used to determine the comparable prices. Usually they were valid for a long time and mandatory for all business entities.

3. Improvement in the calculation of the industrial production index after the declaration of independence of Ukraine

During Ukraine's independence, the industrial production index was calculated according to three methodologies. During the first 5 years of independence, the growth rate of industrial production in Ukraine continued to be calculated according to the methodology used in the Soviet Union. But the crisis in industry and the inadequacy of the current statistical methodology, used since the time of an administrative command system, led to a sharp decline in the quality of statistical information. The motivation of manufacturers has also changed: if in the centralized economy period enterprises sought to introduce statements positively describing their activities, after Ukraine's independence the opposite pattern started being observed: the illusion of a troubled economic situation was created in order to conceal income and evade taxes.

Thus, the transition to market economy principles, high levels of inflation and the constant change in product ranges made it impossible to calculate the production output in comparable prices. Therefore, comparable prices changed almost every year since 1991. For example, in 1992 – 1993 production output was calculated using base prices from January 1, 1992, in 1993 – 1996 the prices from January 1 of each reporting year were used. These methods, however, did not meet the methodological principles established by international organizations in the field of statistics. In this regard, in 1996 the Ministry of Statistics of Ukraine and the Ministry of the Economy of Ukraine developed the “Methodology for calculation of industrial production growth rates” based on the monthly growth rates of production volumes compared to the previous month. The essence of this methodology lies in the elimination of cumulative data and a transition to the determination of the industrial production index on a discrete basis.

According to the methodology of 1996, monthly growth rates of industrial production were calculated using the formula:

$$i_{t/t-1} = \sum q_t p_b / \sum q_{t-1} p_b \times 100, \quad (1)$$

where there i is the volume index of all products, comparing the reporting (t) and previous ($t-1$) months; p_b base price of each type of product (usually as of January 1 of the reporting year); q_t , q_{t-1} - the volume of commodity output in base prices in the reporting and previous months.

The rates of output change to the previous month (monthly indices) were calculated on the basis of monthly reports of enterprises on production output in comparable prices. In order to calculate the growth rate of output in the reporting month in comparison to any other month, it was necessary to multiply the appropriate number of monthly indices covering the period under investigation.

The adoption of the “Methodology for the calculation of industrial production growth rates” allowed the construction of production dynamics not only to the corresponding period of the last year, but to the previous one or any other period as well. The rates of output change to the previous month were calculated on the basis of monthly reports of enterprises on production output in comparable prices [4]. This approach was consistent with international practice, made it possible to compare the data of Ukraine with those of other countries, and also contributed to obtaining more accurate information, since the enterprises more precisely calculated their monthly production output for the reporting year in comparable prices, as there were no fundamental changes in the production structure and prices during a month.

4. Analysis of the methodology for industrial production index calculation currently implemented in Ukraine

Despite these advantages of the methodology of 1996 described in the previous section, the index calculation was based on monthly data on production provided by enterprises. In other words, the calculation quality depended directly on the enterprises which had to change the range of products in a competitive environment. Such output calculation in comparable prices was burdensome, especially for companies with a large range of products. This approach was consistent neither with any business opportunities nor with international standards, therefore, since 2009, the State Statistics Committee of Ukraine introduced a new methodology for industrial production index calculation which greatly reduced the burden on enterprises, shifting it to the statistics authorities and minimizing the magnitude of potential data distortion.

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Kernel Density Estimators for Gaussian Mixture Models

According to international standards, the “industrial production index” characterizes a change of the gross value added created in the industry according to factor cost (i.e. excluding any taxes on industry) for the periods selected for comparison. The basic formula for this index is a standard Laspeyres volume index [3]. But due to the impossibility of applying the Laspeyres formula to the full extent in the statistical practice in Ukraine, it became necessary to find a simplified approach to index construction. Therefore, in 2009 a generally recognized method of so-called permanent set of products was taken as a basis for the methodology of calculating the industrial production index in Ukraine. This method was recommended by the UN Statistical Commission. It is used in practice by European statistical agencies, and the majority of countries [2]. In Ukraine, nearly 1300 positions of “Nomenclature of industrial products” are used for the permanent list of products, with the vast majority of goods representatives acting in kind [5]. The industrial production index is calculated by type of activity and aggregated to the indices by groups, chapters, sections at the level of the whole country.

Under the new methodology, the industrial production index of Ukraine acts as a weighted average. The basis of its weight structure is the data on the distribution of value added among industrial activities. The basic information to calculate the index is the data on production in physical terms without any attempt to determine the consumed raw materials. Value added is used at the level of the type of activity. Meanwhile, it is assumed that the structure of value added by type of economic activity is constant for a certain period of time. It is recorded in the weight system of index calculation [5].

To calculate the industrial production index in Ukraine, the starting Laspeyres formula was transformed as follows:

$$I = \frac{\sum q_{i,t} p_{i,b}}{\sum q_{i,b} p_{i,b}} \quad (2)$$

where there t is the reporting period; b is base period; q is the quantity of products in physical units; p are prices for finished goods; i identifies the goods in each commodity group.

Since 2009, the algorithm for calculating the new industrial production index consists of two stages:

Stage 1:

1.1. Calculation of indices for goods presented in kind and estimated in average producer prices in the base year.

1.2. Calculation of indices for goods, works (services) represented in terms of value, using deflation, i.e. adjustment for price index (deflator).

Stage 2: Calculation of indices in classes, groups, chapters, sections and all industry as a weighted average of the indices calculated by classes (groups, chapters, sections). The value added for each class (group, division, section) was used as the weight.

The main differences of the 2009 methodology from the 1996 methodology are as follows:

1. *Observation Object.* Under the new 2009 methodology there is no criterion of employees quantity in the selection of respondents.

2. *Observation Subject (input information).* In calculating the industrial production index the old 1996 methodology used the cost of goods manufactured, calculated at the prices valid in December of the year previous to the reporting year. The new 2009 methodology uses the value of manufactured goods calculated on the actual average price per unit in the previous year, weighted by the gross value added.

3. *Research Results*. According to the 1996 methodology, the industrial production index was calculated by main type of activity and reflects commodity output. According to the 2009 methodology, the industrial production index is calculated by net type of activity and reflects short-term changes in gross value added volume created in the industry.

Thus, according to the new methodology for industrial production index calculation, the industrial production index characterizes the change in the gross value added volume created in the industry, and sector indices are aggregated by a weighing system on gross value added. The advantage of this index is the assessment of the dynamics of a certain type of industrial activity without double counting of the value of output produced within other activities.

5. Conclusion

The interest of scientists in the assessment of industrial production dynamics in Ukraine, including the construction of the industrial production index, arose as far back as early last century when Ukraine was a part of the Soviet Union. Thereafter the methodology of index calculation has undergone substantial evolution. To adapt to the new conditions of a transition economy, after the declaration of the independence of Ukraine, the Ministry of Statistics of Ukraine approved a new methodology for industrial production index calculation. The new approaches of industrial production index construction in this methodology already correspond to methodological principles established by international organizations in the field of statistics.

According to the methodology for industrial production index calculation introduced in 2009 and currently operating in Ukraine, the index is constructed by the methods used in statistical practice by the majority of countries all over the world and the European statistical service (the so-called method of permanent set of goods). This allows the comparison of the industrial production index of Ukraine with the indices of other countries and to carry out a deeper analysis.

Despite the improvement in the methodology for calculating the industrial production index in Ukraine, there are still some controversial issues. For example, it is very difficult to get such an indicator of industrial sector efficiency as the volume of value added at the enterprise level, especially for a month or a quarter, so it makes sense to use different types of “proxy” for value added within the weighting system built on the distribution of value added by type of activity. Also, Ukrainian industry has sectors with long production cycles (shipbuilding, aircraft industry) when the output is uneven, and there are certain difficulties in index calculation for these areas. It should be borne in mind that, although the industry of Ukraine unites a certain group of manufacturing companies, its composition is very diverse and requires individual approaches to separate types of activity. This is a relevant issue today to the development of a quality industrial production index in Ukraine.

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PRAMONĖS PRODUKCIJOS INDEKSO SKAIČIAVIMO ISTORINIAI ASPEKTAI UKRAINOS OFICIALIOSIOS STATISTIKOS SISTEMOJE

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Santrauka. Šiuo straipsniu siekiama atskleisti pramonės produkcijos indekso skaičiavimo raidą Ukrainoje. Po Sovietų Sąjungos žlugimo, siekiant pritaikyti Ukrainos pramonės statistiką prie rinkos ekonomikos ir tarptautinių Europos Sąjungos (ES) ir Jungtinių Tautų standartų, į produkcijos indekso skaičiavimo metodiką buvo įtraukta daug reikšmingų patobulinimų. 2009 m. įdiegtas produkcijos indekso skaičiavimo metodas (nuolatinis nustatytų gaminių stebėjimo metodas), kuris Ukrainoje galioja ir dabar, atitinka daugelyje pasaulio šalių naudojamus šio indekso skaičiavimo metodus. Remiantis minėtu metodu, aprašomi ir ateities planai produkcijos indeksui skaičiuoti.

Raktiniai žodžiai: pramonės produkcijos indeksas, produkcijos indekso skaičiavimo metodika, bendroji pridėtinė vertė.