

Supply and Use Tables and Input-Output Tables for Russia

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Statisticians of Russia have a long tradition of compiling input-output tables. The first Russian Input-Output Tables called inter-industry balance of production and disposition of output were calculated for reporting year 1966 but they were based on the methodological principles of the material product system.

The first Supply and Use Tables based on the concepts the of SNA1993 were compiled for reporting year 1995, however these tables were used the national product and industry classifications which were not harmonized with corresponding international classifications recommended SNA 1993. It was the main difference SUT 1995 from SNA93 requirements.

The first SUT for Russia based on the new industry classification harmonized with Statistical classification of economic activities in the European Community (NACE Rev.1) were calculated for reporting year 2004.

The objective of this paper is to describe present situation and future development of SUT for Russia. This paper will focus on the experience of compilation of SUT 2004-2006 for Russia, on the classifications, data sources, compilation methods and specific practical problems (regarding the Russian case).

Keywords: Supply and Use Tables, National Accounts.

1. Introduction

During more than 40 years of existence, Russian Input-Output Tables have undergone significant changes. There were changes in the methodology of their compilation, classifications used, structure and format of tables, their information base and methods of calculation of their indicators. Development of IOTs gradually became closer to international standards, but it could not be separated from the system of the Russian state statistics.

The objective of this paper is to describe the development of the Russian Input-Output Tables and to characterize the main features of Supply and Use Tables for 2004-2006 based on the national version of Statistical classification of economic activities in the European Community (NACE).

This paper consists of four sections. The first section introduces the paper.

The second section contains the brief history of development of the Russian IOTs and the description of the most important stages of its progress from the first tables based on concepts of the material product system to the tables based on the concepts of the SNA1993.

The third section describes the peculiarities of the compilation of the Supply and Use Tables for 2004-2006, which were for the first time compiled on the basis of the new classification of kinds of economic activities harmonized with the NACE. It focuses on the classifications, data sources, compilation methods and other main features.

The fourth section deals with the main directions of the further development of the IOT for Russia and preparation for compiling new survey-based IOT for 2011.

2. Brief History of the Russian I-O Tables

The first IOTs for the USSR were compiled for 1959 by the Central Statistical Office of the USSR. These tables called inter-industry balance of production and distribution of products in the national economy of the USSR were based on the methodological principles of the Material Product System (MPS).

MPS represented a system of macroeconomic statistics based on statements of the Soviet political economy according to which national income of the country was generated only in the industries of the material sphere (such as industry, construction, agriculture and forestry, cargo transport and communication serving the material sphere, trade and some other industries). According to this theory, industries of the non-material sphere (housing and communal utilities, passenger transport, communication serving households and the non-material sphere, education, health care, science, public administration, etc.) participated only in distribution of national income.

There were 83 sectors (industries) in IOTs for 1959. The special sample survey on input-output was carried out in all industries of the economy in 1959.

The input-output method used in the IOTs for 1959 provided entirely new opportunities for economic planning. Therefore, starting from 1959, compilation of benchmark IOTs was performed in USSR on a regular basis.

Compilation of IOTs for the Soviet republics started in 1966; it was based on the unified methodology provided by the Central Statistical Office of the USSR. Therefore, the history of Russian I-O Tables began with compilation IOT for 1966.

The survey-based IOTs for Russia were normally compiled once every five years (in 1966, 1972, 1977, 1982 and 1987). There were more than 110 industries in these tables.

Since 1980 the compilation of annual IOTs for the periods between benchmark years started. IOTs for 1980, 1981, 1983-1986, 1988-1990 were updated ones. Annual IOTs were less detailed than survey-based IOTs and comprised only 22 industries. However, these tables were in demand, because they provided users with annual adjusted overview of macroeconomic picture by industries.

The market reforms in the Russian economy, which started in the 1990s, brought significant changes in all socioeconomic aspects of life. Transformation of the planned economy into the market one required a new system of indicators for macroeconomic calculations, which could adequately describe the structure and functioning of the Russian economy. 1993 SNA provided the required system of indicators and a conceptual framework for the Russian macroeconomic statistics.

Introduction of the SNA into national statistical practice began in 1991. Alongside with transition to 1993 SNA, a new methodology was developed for compilation of IOTs within the framework of the SNA. Experimental shortened IOTs, based on the SNA definition of production boundaries and treatment of the final demand, were compiled for 1991-1993. Production boundaries included all industries of the non-material sphere, which activities had been treated as «non-productive consumption».

According to the Russian Government Regulation, the first Russian IOTs based on 1993 SNA methodology were compiled for 1995. A special survey of production costs for enterprises in all industries of the economy was carried out to provide information base for it,

Compilation of the first benchmark IOT for 1995 within the framework of the SNA became a major landmark in the development of the Russian macroeconomic statistics. These tables:

- ensured methodological comparability between the Russian macroeconomic indicators and analogous indicators of other countries;

- ensured conceptual coherence of definitions and classifications used in the economic statistics;
- improved reconciliation of data obtained from different sources;
- enhanced the internal consistency of GDP indicators;
- created the information base for compilation of the subsequent annual shortened IOTs;
- provided to the government a reliable tool for economic forecasting.

Unfortunately, IOT for 1995 was the last survey-based IOT. The tables for 1996-2003 were updated ones and comprised only 22 (until 1999) and 24 (from 2000 to 2003) industries.

Tentative IOTs based on the new industry classification required of SNA were compiled for 2004 at first time (and then for 2005 and 2006 years). Thus only since 2004 Russian IOTs began completely to meet the requirements SNA both from the point of view of methodology and used classifications.

3. The Main Features of SUTs 2004-2006

3.1. Classification

Despite the fact that since the 1990s all macroeconomic statistics has adopted to the principally new methodology of the 1993 SNA, old national product and industrial classifications were still used in all statistical areas. By the beginning of the 1990s these classifications became outdated, they lacked some types of economic activities and products existed in reality.

National product and industrial classifications were not harmonized with corresponding classifications, recommended by the SNA. This fact made it difficult to use statistical data for international comparisons. From all existed classifications only commodity classification used in the external trade statistics, - the Foreign Economic Activity Commodity Nomenclature of the Russian Federation (FCN) - was harmonized with the Harmonized Commodity Description and Coding System (HS) and Combined Nomenclature (CN).

However, the crucial fact was that all those classifications were practically incompatible with each other; therefore, it complicated the process of balancing supply and use of products while compiling IOTs.

Starting January 1, 2003, the new Russian Classification of Kinds of Economic Activities (RCEA) was implemented. RCEA was harmonized with the Statistical Classification of Economic Activities in the European Community (NACE, Rev.1) at the 4-digit level. The 5th and 6th digits of the RCEA code reflected national peculiarities and specific characteristics of the Russian economy.

Beginning with the data for 2003, all industrial national accounts have been produced based on RCEA. SUTs, based on RCEA, were compiled for 2004 for the first time.

As far as RCEA was implemented without (!) concurrent introduction of a new product classification, harmonized with RCEA, neither industrial classification nor product classification of SUTs for 2004-2006 were based on RCEA.

3.2. Structure, format and valuation

Before 1998 all Russian IOTs were square symmetric tables reflecting links between homogeneous branches which were defined as a group of homogeneous goods and services, produced by all economic industries.

Output of homogeneous branches was formed by transfer of secondary production output and costs to an industry, where these products were primary. For example, if the motor car industry produced refrigerators as a secondary product, then output of refrigerators was transferred to the refrigerator industry. Production matrix were not constructed in an explicit form. Transformation both of output and production costs was carried out with the help of automatic data processing.

Since 1998 not only symmetric input-output table but both supply and use tables were included in the IOT framework.

Until 2004 SUTs were square tables with the same number of products and industries. Symmetric product-by-product tables have been compiled using mathematical methods based on the commodity technology assumption.

SUTs 2004-2006 were the first rectangular tables. The number of products in the working version of these tables was higher than the number of industries which allowed using the commodity flow method of compiling SUTs.

IOTs 2004-2006 contained a full set of the tables according to the requirements of the SNA 2003 and the ESA 2005, excluding the symmetric input-output table. The symmetric input-output table was not compiled due to lack of reliable data on intermediate consumption by product (the problem of availability of the data will be considered in a more detailed way in the part 3.4).

Supply Tables 2004-2006 were compiled in basic prices with transformation into purchaser's prices. Use Tables 2004-2006 were compiled both in basic and in purchaser's prices included the valuation matrices (trade margins, transport margins, taxes and subsidies on products. Use Table in basic prices included separate use tables for both output and import.

3.3. Level of aggregation

The choice of level of aggregation for SUTs usually depends on many factors, main of which are the user needs and the availability of data.

In the case of compilation of SUTs 2004-2006 these factors contradicted each other. On the one hand, it was obvious that the detailed information on national accounts aggregates by products and industries based on the SNA classifications was very necessary for the users. At the same time, not all data were available in order to compile SUTs with a high degree of desegregation of industries and products (the problem of availability of the data will be considered below in a more detailed way).

The working level of desegregation of industries (the most detailed level) was the same as for compilation of the national accounts, and included 155 items. The product classification adopted for SUTs included 350 items. However, in the official publication these tables were presented at more aggregated level. Officially published SUTs 2004-2005 was based on the aggregation level A*15 of NACE, Rev.1 and contained 15 industries and 15 products.¹

3.4. Data sources and compilation methods

Compilation of SUTs requires integration and reconciliation of large quantity of the diverse information obtained from different sources. For compiling SUTs for 2004-2006 not only all accessible data of annual statistical surveys of Rosstat, but also statistical data of government and financial institutions were used.

The Supply Table

For compiling the Supply Table there were used the same data sources as for account of output in the production account.

The calculation of output was carry out separately for every institutional sector of economy.

The main data sources for calculation of output of the sector of non-financial corporations referred to annual structural business surveys covering all industries including service industries, except for financial service activities and insurance.

As far as production statistics for 2004-2006 was based on the national product classification, which was not harmonized with the RCEA, these data could not be used for calculating output by product. For these purposes the data of annual structural business surveys on shipments by kinds of activity RCEA were used, which allowed calculating the primery and secondary output of industries.

The output of non-financial corporation sector was calculated separately for the large and small enterprises.

For calculation of output of the small enterprises the data of the summary business accounting of the small enterprises, as well as the data of sample surveys of the small enterprises

¹ The level of aggregation of the officially published Production Account by industry is the same: 15 industries, based on level A*15 of NACE, Rev.1.

were used. Thus, because of the absence of the information on sales of the small enterprises by products it was assumed that the small enterprises carry out only one (main) kind of activity. Therefore, production matrix for the small enterprises contained only diagonal elements.

In the production matrix output of industries contains market output (sales), output produced for own final demand, and other non-market output.

For calculation of import of goods (and export of goods in Use Table) the detailed data of the foreign trade statistics on 6-digit codes of the FCN were used and aggregated into items of the product classification of SUTs. Besides the data foreign trade statistics were used, which allowed to estimate import (export) of the goods which do not cross border (export of fish, import/export of fuel bought abroad for the air and sea transport units etc.).

For calculation of import (export) of services the data of balance of payments, developed by Bank of Russia were used.

Calculation of output of the sector of financial corporations (as well as of intermediate consumption and value added, including FISIM) was carried out by Bank of Russia. Calculation of output of insurance was carried out by Rosstat basing on the data of the special survey of the insurance organizations.

For calculation of output of the general government sector by industry the data of the Report on execution of the federal budget and budgets of the subjects of Federation and reports on execution of extra budgetary funds were used. The same data were used for calculating of the taxes and subsidies for production and on products.

Computation of output of the household sector was based on the data of agricultural statistics, sample surveys of individual entrepreneurs in various kinds of activity (and first of all, in trade, transport), household budget survey, etc.

For calculation of output of sector of the non-profit institutions serving households, there were used the data of surveys of these organizations carried out by Rosstat once in two years.

The trade margins were estimated using gross output of trade by product groups and cost of purchased products for trade, derived from the Annual structural business survey of trade. Besides the rates of the trade margins by products were used, which have been computed using the data of SUTs for the past years. For example, for seven products in the working version of IOT for 2004 (pulp, wood pulp, paper, cardboard and products from them), the trade margin rate for paper-pulp industry products, taken from IOT for 1995, was used. When balancing SUTs ratios of the trade margin could be corrected.

The transport margins were computed using the data of the special surveys of transport services, as well as ratios of the transport margins received from SUTs for the past years.

Thus, compilation of the Supply Table based on the new industrial classification did not arouse any difficulties, because all the necessary data were available. It is not possible to say so about the Use Table. When compiling it we have confronted with the large difficulties due to lack of the information on intermediate consumption of industries by products.

The Use Table

For compilation of the Use Table the main sources of the information were the same, as for compiling GDP by income and expenditure approaches, namely:

- Annual structural business statistics,
- Employment statistics,
- Government expenditure and revenues,
- Tax statistics,
- Household budget survey,
- Retail trade statistics,
- Investment survey,
- Foreign trade statistics,
- Balance of payments, etc.

In the process of compilation of the Use Table, it was easy to calculate practically all components of the final demand by product and value added by industry.

For calculation of household final consumption expenditure by product the household budget surveys' data in the codes of COICOP were used, as well as the data of annual retail trade statistics.

Calculation of individual and collective final consumption expenditure of the general government by product was based on the data of the government expenditure and revenues, while calculation of final consumption expenditure of non-profit institutions serving households (NPISHs) - on the data of surveys of NPISHs.

Calculation of gross fixed capital formation by product was based on annual investment survey using the commodity flow method.

Changes in inventories in SUTs for 2004-2006 were calculated by kind of inventories (raw materials, finished goods, work-in-progress, goods for resale) using the data of annual structural business surveys and structure of intermediate consumption of each industry by product or matrix of output.

The category of valuables, which includes precious metals and stones, jewels made from them, as well as paintings and sculptures recognized as works of art, has been also presented as a category of final use in the Use Table.

The main challenge referred to calculating the intermediate consumption matrix.

The control totals of intermediate consumption of industries (without its allocating to products) were obtained from the production account. The main problem consisted in allocating the data on intermediate consumption of industries to products.

As it was mentioned above, the Use Tables for 1996-2003 were compiled on the basis of the data of the survey carried out in 1995. Intermediate consumption by products for SUTs for 1996-2003 calculated with the help of the data of annual business surveys and input coefficients for 1995. It means that for all SUTs compiled previous to 2004, the basic method used was the input approach.

When compiling SUTs for 2004-2006 this method could not be used, because the RCEA was implemented, and there were no special cost structure surveys based on it. The data of cost structure surveys for 1995 could not be directly used for these purposes, as the national classification of industries, which was used in all statistical areas in Russia until 2003, essentially differed from the RCEA, introduced since 2003.²

Besides during the period of almost ten years, which passed since the last cost structure survey, the structure of intermediate consumption changed significantly due to technological changes, changes in the output structure in the industries, institutional changes, changes in the relative prices of products, and so on.

Detailed data on input of materials and supplies by products were not available from annual structural business statistics for 2004-2006. It contained some data that enabled to calculate input of the electric power, different kinds of fuel, transport, communication, advertising, auditing and some other types of products by industries. However, these data covered only 20 % of all input. Therefore, the commodity flow method became the basic method for calculation of intermediate consumption by product.

Due to detailed product classification, the commodity flow method allowed to identify a specific consumer (industry or final demand category) for selected products. For example, textiles were mainly used as intermediate demand for production of clothing; pulp and wood pulp - for production of paper and cardboard; crude petroleum - in oil refining industry; fertilizers - in agriculture, parts and accessories of cars and their engines- in car production, etc.

In some cases missing data on intermediate consumption were calculated using expert estimates based on input and distribution coefficients for analogous products and industries, taken from survey-based IOTs for 1995. Conversion tables between old and new classifications of industry were used for selecting analogous industries and groups of products.

² It is sufficient to say, that the old national classification of industries comprised about 600 industries, but the RCEA comprises about 1200. In some cases, one old industry could be broken down into ten industries of NACE, but their shares are unknown.

For some industries, which market was defined by one or several large companies, the data of company annual report and accounts, placed on web-sites of the companies were used.

Compilation of the use tables of import for 2004-2006 was carried out by using indirect mixed method. We had no direct information on the use of imported goods and services by industries and final users. As the first step, the commodity flow method for import data on the level of 6-digit codes of FCN (when appropriate) was used. The work with detailed import data in many cases helped to define more precisely the structure of intermediate demand for some products. After that, the method of proportional allocation of imports to the various uses on the higher level of aggregation was applied.

Although it was a long and painstaking work but it was the only way out due to the information gap.

In the process of compilation of the intermediate demand matrix the balance of supply and use at purchasers' prices and basic prices, and for each industry output at basic prices and intermediate consumption were constantly controlled.

Compiling SUT for 2004 based on a new industrial classification was clearly much more laborious and time consuming than compiling SUT for 2005 and SUT for 2006 year. In the latter cases, for compiling intermediate consumption by product the structure from the previous years was used.

3.5. Relationship with the SNA

One of the main requirements of the SNA 1993 and the ESA 1995 is that compilation of the national accounts should be based on SUT framework.

As a part of system of the national accounts, Russian SUTs use the same concepts, definitions, database and accounting rules, which are used in the national accounts compilation. However, SUT are calculated after the preliminary estimates of GDP are completed.

According to Rosstat Regulation of releasing GDP data five estimates of annual GDP exist:

- the first estimate of GDP for the year **t** is carried out in January of the year **t+1**,
- the second – in March of the year **t+1**,
- the third – in December of the year **t+1**,
- the forth – in March of the year **t+2**,
- the fifth - in December of the year **t+2**.

The first three estimates of annual GDP are not based on the compilation of SUT. Compilation of SUT for year **t** begins in December of the year **t+1** using the control totals of the third estimate of the GDP and is finished in November of the year **t+2**. Only the fifth estimate of GDP is based on the SUT.

From this point of view Russian SUTs are not fully integrated with the SNA. Many efforts should be undertaken by Rosstat yet to create integrated compilation system for macroeconomic data.

4. Future Development of IOTs in Russia

Despite their tentative form and using the specific adjustment methods for computation of intermediate consumption by product, SUTs for 2004-2006 proved to be very important.

Firstly, they were used to check the internal coherence of the SNA accounts and indicators computed using the principally new industrial classification.

Secondly, although these tables were published at a highly aggregated level, they provided users with information on structural economic proportions based on the new industrial classification, which adequately reflected realities of the modern economy.

Thirdly, due to using the new industrial classification, harmonized with NACE, the Russian IOTs became fully comparable with IOTs of other countries, and, first of all, the EU countries.

More detailed IOTs could be compiled if all the necessary data are available.

The development of new survey-based IOTs which use NACE and CPA is important not only for exhaustive and qualitative estimates of GDP, but also for meeting interests of its users, and first of all, the government. Understanding that, Rosstat negotiated since 2001 with the government authorities for allocation of additional funds on execution of this large-scale work.

Only at the beginning of 2009 this negotiation was a success. In March the government of Russian Federation issued an order providing a legal and financial basis for organization a special survey on input-output for compilation IOTs for reporting year 2011. The same order contains regulation for compiling the survey-based IOTs (at least once per five years).

IOTs 2011 will contain a full set of the tables according to the requirements of the SNA 2003 and the ESA 2005, including the symmetric “input-output” table.

As the industrial classification IOTs 2011 will use the national version of NACE, Rev.1.1, for products - the national version of CPA 2002. The national version of NACE, Rev.2 and the national version of CPA 2008 will be introduced in the Russian statistics not before 2012. The working version of IOTs 2011 will contain at least 150 industries and 600 products.

Taking into account that the work of such scale in Russia will be carried out for the first time, the development of Russian survey-based IOTs for 2011 will not be completed before 2015.

Rosstat started preparation for realization of this large-scale work.

The survey for 2011 will cover enterprises and organizations of all industries of economy. For this purpose the program and questionnaires of the survey are being developed, as

well as the software for processing of data to be received from the survey and other sources of the information. The main difficulty of the given stage is connected with the necessity of development in short terms of a plenty of the questionnaires, differentiated by kinds of economic activity. Besides the general questions, common for all kinds of activity, the questionnaires will contain the specific lists of inputs by product taking into account technological characteristics of production.

The questionnaires will be differentiated also by the sizes of enterprises. For the large enterprises the questionnaires will be more detailed (will contain a lot of questions), than for the small enterprises and individual entrepreneurs.

Classifications of industries and products are being developed now, which will be used for compilation and publication of IOTs 2011. The methods of computation of indicators of these tables are specified, the requirements to the applied software for compilation and reconciliation of the SUTs are determined, etc.

The compilation of survey-based IOTs 2011 will have a huge importance for the Russian statistics. They become a starting point for the further serious work on integration of these tables in the structure of SNA. The compilation of these tables will allow to solve the following tasks:

- creation of a basis for compilation IOTs not only in current, but in constant prices,
- increase in quality and reliability of basic macro economic aggregates;
- creation of reliable base for development of the annual shortened “input-output” tables;
- creation of an information basis for development of the satellite accounts (for tourism, agriculture, public health services, etc.);
- possibility of the international comparisons of IOTs’ indicators at the detailed level of industries and products.

The users of the information will receive the reliable tool for realization of forecasting of processes in economy with the purposes of development of economic policy of the country.

References

Commission of European Communities, IMF, OECD, United Nations and World Bank (1993), **System of National Accounts 1993** (United Nations, New York).

Eurostat (1996), **European System of Accounts, ESA 1995** (Eurostat, Luxembourg).

Eurostat (2008), **Eurostat Manual of Supply, Use and Input-Output Tables** (Eurostat, Luxembourg).

Masakova, I.D., Ustinova, N.E. (2009), Rossiyskie tablicy “zatraty-vipusk”: opyt i perspektivy razvitiya (Russian Input – Output Tables: Experience and Perspectives), **Voprosy statistiki**, 3, pp.39-46.

United Nations Statistics Division (1999), **The United Nations Handbook of Input-Output Table Compilation and Analysis** (United Nations, New York).