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Development of Supply and Use Tables

Russian supply, use and input-output tables: experience, problems and prospects

Transmitted by the Russian Federation Federal Government Statistics Service¹

Summary

This report gives an overview of current practice in compiling Russian supply, use and input-output tables, methodological adjustments related to the introduction of the System of National Accounts 2008 and the main areas for improving these tables. The approach to transforming the supply and use tables into symmetric input-output tables is described in detail.

I. Introduction

1. Russian statisticians have extensive experience in compiling input-output tables. The first such tables, which were called intersector balances of production and distribution, were developed in 1966. They were based on the concepts of material production dominant in macroeconomic statistics in countries with planned economies.
2. Supply and use tables were first included in the System of National Accounts (SNA) in 1995. The development of these tables was a great achievement for Russian statisticians.

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The tables helped to produce the first detailed picture of reproduction proportions and intersectoral linkages in transition economies on the basis of a methodology that was fundamentally new for the Russian Federation.

3. In subsequent years, the development of supply, use and input-output tables was aimed at improving the methodology and practices used in their compilation, in accordance with international SNA standards. At certain times, this work was hindered by the lack of a system of interrelated classifications that met current SNA requirements, the lack of a legislative framework, inadequate financial resources, etc.

4. Currently, from the point of view of methodology, composition, format and classifications used, the supply and use tables are basically in line with the 2008 SNA recommendations and the requirements of the Organisation for Economic Co-operation and Development (OECD).

5. This report provides an overview of the methodology and practice used in the compilation of Russian supply, use and input-output tables, describes specific approaches to transforming supply and use tables into symmetric input-output tables and outlines the prospects for their improvement.

II. Review of current practice in the compilation of Russian supply, use and input-output tables

6. Russian supply and use tables are an integral part of SNA. They use common concepts, definitions and classifications. Adding to the coherence of the accounts, they provide a more detailed analysis of the process of production and the use of goods and services and are a reliable way of improving the quality and consistency of the key components of SNA.

7. The compilation of supply and use tables is being improved as the national accounts of the Russian Federation are developed in line with the plans adopted by the Federal State Statistics Service and agreed with the government agencies concerned.

8. The national accounts development plan 2011-2017 was adopted in 2011 and provided for the phased introduction of the 2008 SNA recommendations.

9. In 2014, pursuant to a joint order of the Federal State Statistics Service, the Ministry of Economic Development and the Ministry of Finance, a plan of measures prepared in accordance with a government decision was approved to implement the OECD recommendations on developing the country's system of national accounts. The aim is to accelerate the development of the country's national accounts to bring them into compliance with international standards and to further encourage interdepartmental cooperation in establishing official statistical indicators. The plan provides for the full introduction of 2008 SNA into the national accounts by 2020. A decision should be taken by 2016 on a separate section of the plan addressing the compilation of supply, use and input-output tables.

10. Currently, the Federal State Statistics Service compiles a complete set of tables, as recommended by international standards, including:

- A supply table for goods and services at basic prices, with transformation into purchasers' prices (annual);
- Use tables for goods and services at purchasers' prices and at basic prices (annual);
- Symmetric input-output tables, including separate tables for domestic and imported products (once in 5 years).

11. All the tables are compiled at current prices but, under the plan of measures to implement the OECD recommendations, supply and use tables will, from 2016, be compiled regularly at constant prices.

12. As a rule, more detailed (benchmark) tables are compiled every five years, based on data from special surveys of production inputs and sales. In the intervals between the benchmark years, annual tables are compiled on the basis of current statistics and the structure of the benchmark tables.

13. The most recent benchmark tables were produced in 2011. A large-scale survey was conducted of production inputs and sales of enterprises and organizations in all sectors of the economy. The survey covered more than 470,000 legal entities and about 370,000 individual entrepreneurs.

14. In accordance with a government decree of 14 February 2009, benchmark tables have been produced regularly since 2011 for all years ending in 1 and 6.

15. The benchmark tables for 2011 established a solid foundation for the development of the annual supply and use tables for 2012-2014. The Statistics Service is currently working on supply and use tables for 2014, which are scheduled for publication in December 2016.

III. Some methodological aspects

16. The system of national accounts is the conceptual basis for supply and use tables. The first supply and use tables, based on 1993 SNA, a radically new concept for the Russian Federation, were developed for 1995. The methodology used for the 1995 input-output tables adhered as closely as possible to the requirements of 1993 SNA in terms of production boundaries, cost estimates and scope of operations. Some of the differences (e.g., estimates of residential rents) were due to the transitional nature of the Russian economy, the characteristics of the information base and the statistical accounting practices of the time.

17. The 2008 SNA recommendations concerning extension of the asset boundary and the expression of processes related to the globalization of production on the basis of the principle of transition of ownership rights were taken into account for the first time in the benchmark supply and use tables for 2011. In particular, the 2011 supply and use tables showed:

- Capitalized expenditure on research and development;
- Capitalized multiple use weapons systems;
- Goods sent for processing recorded on a “clean” basis;
- Goods for resale reflected on a gross basis as exports of goods, not services.

18. In addition, the 2011 supply and use tables were compiled in line with 1993 SNA recommendations that had not previously been reflected in the national accounts, for instance, imputed rents for dwellings were calculated using the user cost method.

19. All changes associated with implementation of 2008 SNA and other adjustments arising in the course of compilation of the 2011 supply and use tables were taken into account in the national accounts. The benchmark year was changed and the time series of GDP and its elements was recalculated for 2011-2014.

20. There were problems with the publication of supply and use tables related to the presentation of certain operations in the national accounts in accordance with the 2008 SNA

concepts. The Russian Government is currently deciding whether to opt for open publication of the supply and use tables for 2011-2013.

21. The classifications system used is a determining factor for the international comparability of supply and use tables. Unfortunately, it has not yet been possible to overcome the country's backwardness in the area of classification systems and the relevant 2008 SNA recommendations.

22. The classification of industries in supply and use tables is based on the Russian Classification of Economic Activities (OKVED), harmonized with the Statistical Classification of Economic Activities in the European Community (NACE), Rev. 1.1, and that of products on the Russian Classification of Products by Economic Activity (OKPD), harmonized with the Statistical Classification of Products by Activity in the European Economic Community (CPA) 2002.

23. The introduction of new classifications of industries and products, harmonized with NACE Rev. 2 and CPA 2008, has been repeatedly postponed due to the unwillingness of users and the business community to change from the current classifications. In November 2015, the introduction of OKVED 2 and OKPD 2 by government decision was once again postponed by one year to 1 January 2017. This has necessitated an urgent review of the Statistical Service production plans for 2016, the statistical monitoring forms, modifications to software, etc., as the entire statistical system was ready to collect and process information on the basis of the new classifications.

24. The dimensions of supply and use tables are determined on the basis of the volume of production, the homogeneity of production technology and type of product use, the availability of the necessary information, the objective of satisfying the interests of a wide range of users (including international organizations), respect for the principles of confidentiality of information and the requirement to protect information containing State secrets. The benchmark supply and use tables for 2011 were developed using dimensions of 188 industries and 338 products. The annual supply and use tables for 2012-2014 used 124 industries and 263 products.

25. In respect of the statistical units used in the compilation of industrial sector accounts and supply and use tables, the SNA recommendation is to use the establishment as the most homogeneous unit in terms of output and intermediate consumption structure.

26. For the establishment to be used as a statistical unit when compiling the production and generation of income accounts, it must be possible to obtain (or calculate) data on output, intermediate consumption, compensation of employees, taxes and subsidies on production, etc. The availability of such information depends on the statistical and accounting systems used in the country.

27. In practice, the persons compiling national accounts do not always have the above-mentioned information at the level of establishments, which is why many countries use local units, and some use enterprises, as the statistical units in the production and generation of income accounts by industry.

28. Because of the lack of official statistical data on intermediate consumption at the level of smaller production units, the enterprise is the statistical unit used in the Russian Federation for production and generation of income accounts and supply and use tables.

29. The main information source for calculating indicators for production and generation of income accounts and supply and use tables is the structural survey of enterprises. Output, intermediate consumption and value added by enterprise are grouped into composite indicators by industry, based on the principal activity.

30. Taking the enterprise as the statistical unit in the compilation of supply and use tables, which are the coordinating structure of macroeconomic statistics, is consistent with the objectives set for their use. In supply and use tables, there is agreement between the definitions, classifications and quantitative data from different sources. These tables improve the quality and reliability of the main SNA indicators and help to improve their internal balance.

31. However, using the enterprise as the statistical unit in supply and use tables leads to heterogeneity between industries. In the industry output matrix, in addition to primary output, there is also secondary output of products, and that is expressed in the use table as mixed costs for the entire output of the industry. Economic analysis and forecasting from the point of view of the technological structure of production, carried out on the basis of supply and use tables, can lead to inaccurate assessments and incorrect conclusions.

32. For these purposes, SNA recommends using symmetric input-output tables that describe the technological linkages in the economy. Symmetric tables are based on so-called units of homogeneous production, which constitute analytical units that do not exist in reality, and where, by definition, there is no secondary production (except for the potential production of by-products and related products).

33. Due to the fact that the Russian supply and use tables use enterprises rather than establishments as a basis, the compilation of symmetric tables is quite challenging, and special approaches are used.

IV. Conversion of supply and use tables into symmetric input-output tables

34. Basically, the compilation of symmetric input-output tables should be based on balanced supply and use tables at basic prices, in which the industries are sufficiently homogeneous, because they are formed as a set of establishments. The task of the persons compiling the symmetric input-output tables is to redefine the various types of secondary products present in insignificant quantities in the industries in the supply and use tables. As a result of the redefinition of output and the input for production, the supply and use tables are transformed into symmetric product-product or industry-industry tables. This transformation is usually done with the help of mathematical methods based on assumptions about the technology of production or sales structure, which are described in detail in the literature. In some cases, a mixed approach is used when, for some product groups or branches, model A is used in the context of a technology producing goods, but for others, model B is used in the context of a technology based on the industry.

35. Some countries apply a two-step approach to the compilation of symmetric tables, where supply and use tables are created for the more homogenous units on the basis of statistical information and then, in the second step, the reconfigured supply and use tables are transformed into symmetric tables using mathematical methods.

36. In compiling the Russian benchmark input-output tables for 2011, the two-step approach was used for the compilation of the symmetric table.

37. In the first phase, the main task was to increase the degree of homogeneity of industries in the supply and use tables by minimizing secondary output. This was done by redefining the most important secondary products and their production costs to the industries of which they were the principal products. That process is done manually on the basis of statistical data from enterprises, information from companies' official websites and the assessments of experts on national accounts.

38. Before redefining, the overall level of homogeneity in the industries, calculated from 60 x 60 supply and use tables, was 92.9%. This is a fairly high level, which suggests that the major part of production is industry-based, i.e. is produced as the principal activity.

39. Nevertheless, the level of homogeneity differed by industry. For example, before redefinition, the share of industrial products in output in fishing and fish farming was 67.6%; in petroleum production, it was 78.7%; in metal ore extraction, it was 83.6%; in wholesale, it was 85.8%; and in forestry, logging and services in those branches, it was 87.3%.

40. In some sectors of the economy, the significant relative share of secondary output depends not so much on the use of enterprises as statistical units as on the specificities of the Russian economy, namely the use of specific and quite complex production formats.

41. In virtually all sectors of the economy in the Russian Federation, there are large vertically-integrated enterprises which carry out the extraction, production, processing and transportation of products. They are, however, particularly prevalent in the following sectors: the oil and gas complex, metallurgy, the chemical and petrochemical industries and wholesale trade.

42. Such enterprises are characterized by:

- The existence of exclusive mining rights (licences);
- Ownership of the raw materials and/or means of transport;
- Lack of production capacity and/or workforce for the mining and processing of own raw materials;
- Lack of workforce for transport activities;
- Implementation of mining, processing and transportation of raw materials by other (usually subsidiary) enterprises;
- Implementation of payment services for the mining, processing and transportation of raw materials by other enterprises;
- Ownership of the final product produced by other enterprises supplying production services;
- Sale of the finished product.

43. Because there are many different formats for the organization of production, for most large enterprises the redefining of output and input was carried out at the level of individual data.

44. Tables 1 and 2 give an illustration of the redefinition of output and input for a major oil company working primarily in the production of petroleum products.

Table 1
Matrix of output before and after redefinition

	<i>Output matrix</i>							
	<i>before redefinition</i>				<i>after redefinition</i>			
	<i>Oil extraction</i>	<i>Petroleum production</i>	<i>Wholesale trade</i>	<i>Total</i>	<i>Oil extraction</i>	<i>Petroleum production</i>	<i>Wholesale trade</i>	<i>Total</i>
Oil		200		200	200			200
Petroleum products		300		300		300		300
Wholesale trade		100		100			100	100

	<i>Output matrix</i>							
	<i>before redefinition</i>				<i>after redefinition</i>			
	<i>Oil extraction</i>	<i>Petroleum production</i>	<i>Wholesale trade</i>	<i>Total</i>	<i>Oil extraction</i>	<i>Petroleum production</i>	<i>Wholesale trade</i>	<i>Total</i>
Other goods and services								
Output		600		600	200	300	100	600

Table 2
Detail of use table before and after redefinition

	<i>Detail of use table</i>							
	<i>before redefinition</i>				<i>after redefinition</i>			
	<i>Oil extraction</i>	<i>Petroleum production</i>	<i>Wholesale trade</i>	<i>Total</i>	<i>Oil extraction</i>	<i>Petroleum production</i>	<i>Wholesale trade</i>	<i>Total</i>
Oil		180		180	50	130		180
including:								
Goods		130		130		130		130
Mining services		50		50	50			50
Petroleum products		30		30		30		30
including:								
Goods								
Processing services		30		30		30		30
Wholesale trade								
Other goods and services		20		20		20		20
Intermediate consumption	0	230	0	230	50	180	0	230
Value added	0	370	0	370	150	120	100	370
Output	0	600	0	600	200	300	100	600

45. Intermediate consumption for the redefined outputs was defined differently. If a company only owned a licence for oil production, but the oil production itself was carried out by other enterprises, intermediate consumption for oil output was assessed as payment for oil production services (50).

46. Intermediate consumption for wholesale trade was conventionally equated to zero because the company incurred minimal costs associated with the completion of commercial transactions, and those could not be separated from the company's main activity.

47. The process of redefining output and input took a lot of time and was laborious, since the adoption of any given decision involved analysing large amounts of additional information.

48. The next step was the redefining of output of certain sectors at the level of aggregate data. In the second phase, the following were redefined:

- Income from renting machinery and equipment received in all industries (redefined as leasing);

- Income from renting buildings and structures acquired in all industries (redefined as real estate operations);
- Secondary output from trade of non-commercial industries (redefined as trade);
- The largest output of manufacturing industries from trade is redefined to manufacturing industries, etc.

49. For a redefined secondary product, total intermediate consumption is determined by its relative share of output of the industry in which it is the principal product.

50. The product structure of intermediate consumption for secondary output was calculated on the basis of the structure of intermediate consumption of the industry into which the secondary product was redefined.

51. The value added elements were calculated on the basis of their share in the industry in which the redefined product was the principal product. Net profit (net mixed income) was calculated by the balance method.

52. When redefining the secondary output of rent, it was assumed that the costs to enterprises of providing their property for rent were insignificant and could not be separated from their principal production. Therefore, in order to redefine rent outputs, intermediate consumption was conventionally equated to zero.

53. As a result of the redefinition procedure, the degree of uniformity of industries in the supply and use tables increased by 3.2 points to 96.1% (table 3).

54. The supply and use tables at basic prices after redefinition have not been published, but have been used to compile a symmetric product-product-type input-output table based on the assumption about the industry's production technology (model B).

	<i>Proportion of principal type of activity</i>		<i>Difference</i>
	<i>before redefining</i>	<i>after redefining</i>	
Total	92.9	96.1	3.2
including:			
agriculture	91.5	98.3	6.8
forestry	87.3	94.4	7.0
oil and gas extraction	91.7	98.5	6.8
petroleum products	78.7	95.3	16.6
wholesale	85.8	93.6	7.9
retail trade	92.4	95.9	3.4
rental of machinery and equipment	97.4	98.6	1.2

V. Prospects

55. Currently, the Federal Statistics Service is preparing for 2017 in line with the results of the 2016 federal statistical survey of the production costs and product sales required to develop the regular benchmark supply and use tables for 2016.

56. A plan of action for its implementation has been developed, along with the major methodological principles of the proposed monitoring, forms and instructions for their completion. Applied software is being developed to process the results of the monitoring.

57. Given the cuts in available funding, the number of items monitored has been reduced since 2011. The 2016 survey will include large and medium-sized commercial enterprises in the non-financial corporations sector, small enterprises and State budget-funded organizations. Individual entrepreneurs are excluded from the survey, as are non-profit institutions serving households (NPISHs), banks, insurance companies, notaries and lawyers.

58. Large and medium-sized enterprises will be examined thoroughly, small enterprises and State-funded organizations will be considered on the basis of sampling.

59. The survey of input of large and medium-sized enterprises will be carried out in the framework of the structural survey, with additional questionnaires detailing expenditure on the acquisition of raw materials, materials and services. The questionnaires will be differentiated depending on the type of principal activities of the enterprise.

60. As the introduction of the new classifications of industries and products has been postponed to 1 January 2017, the benchmark supply and use tables for 2016 will be developed on the basis of OKVED (NACE Rev. 1.1) and OKPD (CPA 2002). In order to ensure international comparability and the creation of an information database for the compilation of subsequent annual supply and use tables, it is planned to recalculate the benchmark tables for 2016 in line with the new OKVED 2 (NACE Rev. 2) and OKPD 2 (CPA 2008) classifications.
