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Oil and gas sector in Russian Supply and Use Tables

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1. Introduction

The Russian Federation is one of the major oil and gas superpowers of the world. More than 34% of natural gas reserves and around 13% of the world explored oil reserves are focused on its territory.

At the end of 2008 Russia ranked number 2 in the world production and export of oil. During 7 years, up to 2008 Russia ranked number 1 in the world production of natural gas, and in 2009 gave its leading position to the USA. Russia today is the major exporter of natural gas, providing more than 35% of the world export.

The oil and gas sector is of great importance to the economy of Russia, which determines and directs its economic development. There are lots of various indicators, which can characterize the role of this sector in the economy of a country in terms of labour input, capital assets, volumes of production output, foreign trade transactions with the rest of the world, etc. Thus, for instance, production of oil and gas makes more than 6% of output of all products and services of Russia. These goods make up approximately a half of the Russian export and half of the budget revenues. More than 700 thousand people are employed in this sphere (1.5% of the total average staff number of the country's enterprises) and nearly one fifth of the basic funds is concentrated here.

Which indicator can characterize the importance of the oil and gas complex in the economy of a country in the fullest possible measure? How its boundaries can be determined? That and other questions are the matter at issue of this paper.

The purpose of this paper is to discuss different methods of measuring the size of oil and gas sector using the data of Supply and Use tables as well as problems and limitations of the current estimates of this sector carried out by the Federal State Statistics Service of Russian Federation. This paper focuses on the measurement issues and contains some figures characterizing parameters of this sector and its role in GDP estimation.

The paper consists of 6 sections. The first section introduces the paper.

The second section determines the boundaries of the oil and gas sector.

The third section reveals some peculiarities of the oil and gas sector of Russia, reflected in the oil, gas and petroleum products purchasers' price structure.

The fourth section describes the information sources that can be sued for evaluation of the role of the oil and gas sector in the Russian economy, as well as some peculiarities of Russian Supply and Use Tables.

The fifth section presents the algorithm and results of estimation, based on the data of Russian Supply and Use Tables.

The sixth section brings the concluding remarks.

2. Oil and gas sector boundaries

Today there is no agreement of opinion on the way the boundaries of that or another sector of economy in general and those of the oil and gas complex (hereinafter referred to as the OGC) in particular should be determined. The term "sector" usually denotes a complex of economy sectors (kinds of economic activity), producing goods of a certain type. A sector, in its turn, represents a complex of statistical units, grouped by its attribute of the main kind of economic activity.

An indisputable fact is that the basis for the oil and gas sector should be composed of producers of oil and gas that carry out its production. Most analysts include oil refining into the oil and gas sector, in the process of which the production of primary petroleum products (gasoline, black oil fuel, diesel fuel, etc.) and raw materials for the petrochemical industry is carried out. But some of the researchers restrict the stage of refining by primary refining of oil and gas, and others suggest inclusion of petrochemistry, plastic articles manufacturing, etc.

Some researchers also suggest to include into the OGC the sectors, supplying production costs (spare parts, energy, services, etc.). Many analysts include into the OGC the pipeline transport, carrying out transfer of oil, gas and their refinery products to consumers, as well as trading of these types of production.

In other words, the OGC boundaries are diffuse, not fixed once for all, and can be changed depending both on the objective of a survey and on availability of necessary information.

Thus, to determine the role of the OGC in the economy of a country first of all it is necessary to determine its boundaries, i.e. the list of kinds of economic activity that should relate to that sector of economy.

In the terms of NACE Rev.1.1 this sector can include the following kinds of economic activity:

11.10	Production of crude petroleum and natural gas
11.20	Service activities incidental to oil and gas production, excluding surveying
23.2	Manufacture of refined petroleum products
50.5	Retail sale of automotive fuel
51.12.1	Agents involved in the sale of fuels
51.51.2	Wholesale of automotive fuels
51.51.3	Wholesale of liquid and gaseous fuels
51.51.4	Wholesale of other liquid and gaseous fuels
60.3	Transport via pipelines
63.12.21	Storage and warehousing of petroleum and products of it's manufacture
63.12.22	Storage and warehousing of gas and products of it's manufacture

The OGC basis is composed of its products manufacturers, i.e. sectors that carry out production of oil and gas (including services) and primary refining.

Pipeline transport should be included into this complex as a specific kind of transport, transferring only products of the oil and gas complex (oil, gas and their refinery products). Obviously, other kinds of transport also carry out transferring of these products, but nevertheless their inclusion into the OGC is scarcely practical. Storage and warehousing of oil, gas and their refinery products (NACE codes 63.12.21 and 63.12.22) should be as well included into that complex as a sector, carrying out auxiliary transportation.

Moreover, the OGC should include wholesaling of oil, gas and their refinery products (NACE codes 51.12.1, 51.51.1, 51.51.2, 51.51.3), as well as retail distribution of motor oil (NACE 50.5), carrying out sales of petroleum products (oil, motor oil, gas) to final consumers through the gasoline stations network.

Thus, within the framework of this research the OGC was determined as the complex of sectors, carrying out production, refining, storage, transportation and distribution of oil and gas.

3. Features of the oil and gas sector of Russia

Most of the major Russian oil and gas companies are shell vertically-integrated corporations, either directly or indirectly controlling its subsidiary enterprises that carry out production and refining of oil and gas. As owners of raw materials, these companies carry out not only its processing at their subsidiary enterprises on terms of domestic processing, but also

oil and petroleum products wholesaling. The most part of income from transactions with energy carriers goes not to the manufacturers, but to the group of ten major oil and gas companies that sale oil, gas and their refinery products to final consumers, and is formed due to the difference between the world and domestic oil and gas prices.

The peculiarities of functioning of the Russian oil and gas sector are reflected in the oil, gas and petroleum products purchasers' price structure, that can be computed on the basis of Supply Tables data.

The structure of the purchasers' price for OGC products is determined by interaction of various factors, and, first of all, by correlation of domestic and the world prices for energy carriers, the level of tax rates, share of export in the aggregate demand for these types of products and other.

As can be seen in Table 1, in 2006 the basic price for *oil* was a little higher than a half (58%0 of the purchasers' price. About one third of the purchasers' price fell at taxes for products, the basic one being the export tax. The trade margin was about 10%.

The structure of the purchasers' price for *petroleum products* was similar to the price for oil. The most part of the purchasers' price also fell at the basic price, which was 65% of the purchasers' price. The share of taxes on products was a little lower (17%), as the basic tax revenues to the budget depend on the volumes of oil and gas export, but not on realisation of petroleum products. The share of trade margin included approximately 15% of the purchasers' price for petroleum products.

A low share of the transport margins in the structure of the purchasers' price for oil and petroleum products (1.7 and 3.5 % correspondingly) is conditioned by the specific character of reflection of those margins in SUT. As oil and petroleum products transportation invoices are not, as a rule, issued to the purchaser separately, payment for these services is taken into account as a part of intermediate consumption of either producers (if realization of oil is carried out by producers), or other commercial agents reselling oil and petroleum products.

As for gas, there was an absolutely different structure. In the structure of the purchasers' price for *gas* the most part (57%) fell at the trade margin and only 19% to the basic price. In other words, the most part of the income from sales of gas to consumers (domestic and foreign) goes not to producers, but deposits in the commercial business. As approximately 40% of the Russian gas is exported, the main source for that income is the difference between the export price for gas and the gas producers' price. In 2006 the export price for gas was 15 (!) times higher than the producer's price. The most part of that income is concentrated in Gazprom, which has been an exclusive exporter of gas since 1994 and positions itself as a commercial organisation.

Despite the fact, that the transport margin for gas as a part of the purchasers' price structure is less than 2%, payment for services of pipeline transport as a part of the gas trade intermediate consumption is about 78%.

Thus, a great role of commercial business and transport in the Russian OGC functioning prove the necessity of inclusion of those sectors within its boundaries. Without accounting for these kinds of activity the assessments of the oil and gas complex can be understated.

4. Information sources

The share of the value added in the Gross Domestic Product is commonly used to evaluate the role of any sector (or group of sectors) in the economy of a country.

As the sector indicators of production accounts and generation of income accounts of the System of National Accounts (SNA) are developed, as a rule, on the higher level of NACE aggregation, this assessment should better be carried out on the basis of Supply and Use Tables.

Supply and Use Tables, being a component of SNA, reflect the detailed picture of production and use of goods and services in terms of kinds of economic activity and directions of final demand.

But the following peculiarities of Russian SUT should be taken into consideration.

The statistical unit of a sector in Russian national accounts and SUT is the enterprise, not the establishment. Therefore presence of secondary products, which have a significant specific weight in some sectors, is typical of any sector in the Supply Table. Accordingly, the value added of sectors from the Use Table can be not entirely "net", as it is referred not only to primary, but to secondary products as well.

As for the sectors, included into the oil and gas complex, it can be seen in Table 2 that the share of secondary products not related to this complex is insignificant and varies from 2.6% in production of oil and gas to 8.8% in pipeline transport. The share of the main activity production includes from 85% in pipeline transport to 95% in oil and gas production services. An exclusion is oil refining (manufacture of refined petroleum products), where approximately 77% of the sector's output falls at the main activity production, and 12% is taken by commercial business.

The release (the most detailed) version of Russian Supply and Use Tables over 2006 contained 155 sectors and 350 products. The detailed elaboration of sectors in those tables allows to estimate the value added of most sectors, included in the OGC. An exclusion is wholesaling of oil, gas and products of their refining, as wholesaling in Supply and Use Tables is represented by one column without breakdown by kinds of trade.

As a matter of fact, this problem can be solved in case of availability of primary, more detailed data on the trade outputs by kinds of economic activity, obtained from surveys. But the national accountants, as a rule, work with summary, more aggregated data. Nevertheless, the

way it will be shown further here, on the basis of SUT it is possible to determine with sufficient accuracy the share of wholesale trade, related to the OGC, without any detailed data on kinds of trade.

5. Algorithm and calculation results

The data of Supply and Use Tables allow to calculate GDP with three approaches: production approach, income approach, expenditure approach. But to our point of view the most preferable approach for calculation of the contribution of the oil and gas sector into GDP is production approach.

Calculation of GDP with production approach is carried out in the following order:

Total output at basic prices
- Intermediate consumption at purchasers' prices
= Gross value added at basic prices
+ Net taxes on products
= Gross domestic product at market prices

With the output and intermediate consumption for all sectors, included in the OGC, it is possible to calculate the gross value added of the OGC.

For calculation of the value added of wholesale trade of oil, gas and products of their refining, which was not reflected in SUT as a separate sector, a special algorithm was used, based on the specific character of reflection of trade in SUT.

The trade output is determined as a difference between the cost of goods sold and their purchase value. In Goods and Services Use Table the trade output is reflected as a column and, like any other sector, has its own intermediate consumption and value added. On the other side, in Supply Table the trade output is distributed between the goods and is reflected in the form of trade margins.

Generally the product lineup in SUT is more detailed, than the lineup of sectors. Having calculated the margin for that or another product in the total trade output, it is possible to conventionally determine that part of the trade output, which is formed due to reselling of that kind of products. Basing on an assumption, that the share of the value added is equal for all kinds of trade, with the help of those shares it is possible to calculate the amount of the value added of the trade output of a certain kind.

The approach adopted in the estimation of the output and value added of wholesale trade of oil and gas products can be represented as:

$$k = \sum TM_m / TM = X_n / X \quad (1)$$

$$X_n = k * X \quad (2)$$

$$VA_n = VA/X * X_n \quad (3)$$

where:

k - share of wholesale trade of OGC products in the total value of wholesale trade,

$\sum TM_m$ - OGC products wholesale trade,

TM - total value of wholesale trade,

X_n - OGC products wholesale trade output,

X - wholesale trade output,

VA_n - value added of OGC products wholesale trade,

VA - value added of wholesale trade.

The sum of values added of the sectors, included in the oil and gas complex, characterizes the role of that complex in formation of GDP at basic prices.

GDP at market prices differs from GDP at basic prices by the value of net taxes on products. These Supply Tables allow to determine the amount of taxes on products, related to oil, gas and petroleum products (subsidies on these products are not available). The main part of these taxes are export taxes, as well as excise taxes on gasoline and other kinds of motor oil. By adding the value of taxes on OGC products to the gross value added, it is possible to evaluate the role of this complex in GDP at market prices.

The results of calculation of the OGC share based on the data of SUT over 2004-2006 are shown in Table 3. As can be seen in Table 3, 18.6% of GDP at basic prices in 2006 fell at the share of the value added, formed in the OGC sectors. As the taxes on the oil and gas sector products in 2006 were 50% of all taxes on products, the share of the OGC sectors in GDP at market prices was significantly higher – 23.9%. Only in three years the OGC share in GDP increased by almost 4 percentage points (from 20.4 to 23.9%). The basic factor for such increase was the growth of taxes on products, connected with the increase of export duties for energy carriers.

Table 4 presents the structure of the OGC value added. The most part of the value added is formed in production of crude petroleum, trade and manufacturing of refined petroleum products, what reflects the peculiarities of functioning of the Russian oil and gas complex. It is trade that carries out realization of energy carriers to final consumers at the prices that are several times higher than the producers' prices, and concentrates the most part of incomes.

Figure 1 presents the dynamics of the oil and gas complex sectors in GDP of Russia over the period of 2002-2006. As can be seen in the figure, in 2004 there was a sudden increase of the share of petroleum refining and decrease of the share of trade in the OGC. This leap is conditioned by the changes in interpretation and technique of reflection of raw materials owners in SUT in connection with the introduction of a new classifier of kinds of economic activity.

Before 2004 Russian SUT were being compiled on the basis of the national classification of sectors, and raw materials owners that carried out its refining at other enterprises on terms of processing, were taken into account in trade. Their output was determined as the difference between the cost of petroleum products sold and the value of petroleum purchased. The cost of refined petroleum was charged to petroleum refineries.

From 2004 Russian SUT began to be compiled on the basis of the new classifier, harmonized with NACE. In accordance with the principles, laid in NACE, raw materials owners that carry out its refining at other enterprises began to be taken into account as if they carried out refining themselves. As far as in Russia about 90% of petroleum products are produced on terms of processing, the change of approaches to reflection of raw materials owners could not but led to a significant change in the OGC structure.

6. Final remarks

Detailed Supply and Use Tables are an ideal instrument for evaluation of the role of OGC in the economy of a country. For these purposes two indicators can be used:

1) share of the value added of OGC sectors in GDP at basic prices,
2) share of the value added of OGC sectors and net taxes on products in GDP at market prices.

Taking into account the significant role of the oil and gas sector in the volume of tax revenues to the budget, it is rational to use the second indicator for these purposes. The use of the first indicator can lead to underestimation of this sector in the economy of a country.

A narrow interpretation of the OGC boundaries, excluding trade and transport from its composition, will not reflect the peculiarities of that sector functioning in Russia and will lead to understatement of its role in GDP formation.

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Table 1. Structure of the Purchasers' Prices on Products of Oil and Gas sector in 2006 (in percent)

	Oil	Gas	Refined petroleum products
Purchasers' price	100,0	100,0	100,0
of which:			
Basic price	58,0	18,8	65,0
Trade margins	10,3	56,5	14,5
Transport margins	1,7	1,8	3,5
Net taxes on products	29,9	22,9	17,0

Table 2. Structure of Output of the Oil and Gas Sector Industries in 2006 (in percent)

Industry / Product	Extraction of crude petroleum and natural gas	Service activities incidental to oil and gas extraction	Manufacture of refined petroleum products	Retail sale of automotive fuel	Transport via pipelines
Crude petroleum and natural gas	93,3	0,8	4,7	0,0	1,7
Service activities incidental to oil and gas extraction	1,5	94,8	0,0	0,0	0,7
Refined petroleum products	2,0	0,2	77,4	0,2	1,3
Retail trade of automotive fuel	0,0	0,0	0,2	88,5	0,1
Wholesale trade	0,5	0,2	12,4	6,6	2,3
Transport via pipelines	0,1	0,1	0,1	0,0	85,0
Other products	2,6	4,0	5,3	4,7	8,8
Total	100,0	100,0	100,0	100,0	100,0

Table 3. Ratio of Oil and Gas Sector in GDP, 2004-2006

	Total, mlrd. rubles	of which oil and gas sector	
		mlrd. rubles	(%)
2004			
GDP at basic prices	14 875,0	2 656,6	17,8
Net taxes on products	2 352,1	852,4	36,2
GDP at market prices	17 227,1	3 509,0	20,4
2005			
GDP at basic prices	18 657,3	3 873,9	20,8
Net taxes on products	3 248,2	1 575,5	48,5
GDP at market prices	21 905,5	5 449,4	24,9
2006			
GDP at basic prices	22 956,7	4 282,5	18,6
Net taxes on products	4 090,1	2 169,9	53,0
GDP at market prices	27 046,8	6 452,4	23,9

Table 4. Structure of Value Added of Oil and Gas Sector by Industry

Industry	2004	2005	2006
Extraction of crude petroleum	38,7	43,0	44,9
Extraction of gas	5,9	4,4	4,5
Service activities incidental to oil and gas extraction	1,3	1,2	1,9
Manufacturing of refined petroleum products	14,1	19,2	18,2
Transport via pipelines	9,0	8,3	7,1
Trade	31,0	23,8	23,3
Value added of oil and gas sector	100,0	100,0	100,0

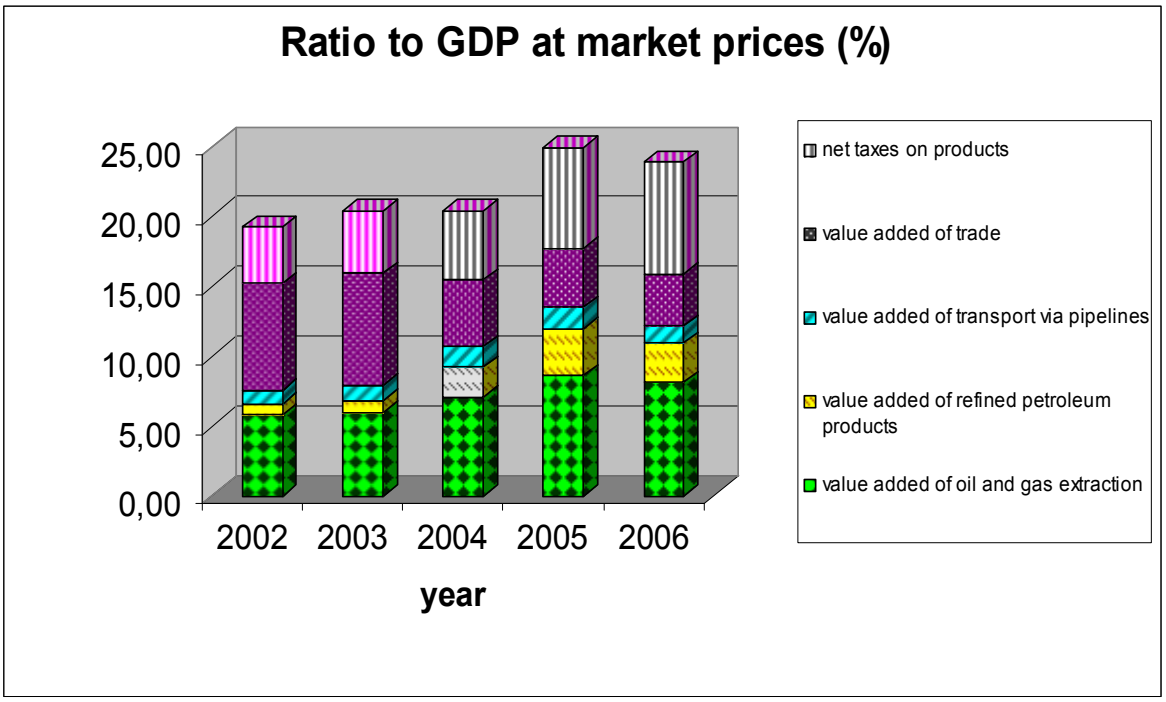

Fig.1. Value Added of Oil and Gas Sector (in percent of GDP)