

# Russia's Oil and Gas Flow Reconsidered

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## Introduction

Employing input-output data, particularly a trade-margin matrix in an analysis of the Russian economy enables us to find that many oil and gas output values have been absorbed into the trade sector, including foreign trade, rather than into the oil and gas production sector (Kuboniwa, 2002a; 2002b; Tabata, 2002).<sup>1</sup> This feature of Russian oil and gas flow has developed a configuration of Russia's peculiarities in marketization, namely the hollowing-out of industrial production, expansion of the trade sector, large scale capital flight, and so on. Needless to say, revenues from oil and gas exports have provided financial sources and real potential for Russia's economic growth, while the federal government and private or semi-private institutions in Russia have failed to make efficient use of these revenues for further modernization of the economic and technical basis.

In this paper we first confirm the fact-findings in the previous papers by using the latest input-output data, namely Russian input-output tables for 2000 compiled by Goskomstat (Goskomstat, 2003).

Our observations have relied heavily on the input-output data. However, investigation of the reliability of the input-output data has not yet been done anywhere. Thus, second, we would like to preliminarily examine the input-output data by employing physical energy balance data and price data. This study is partially

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1 Since we cannot learn anything about foreign trade organization activities from Russian statistical yearbooks and annual trade statistical yearbooks, the input-output data may be the sole statistical source to understand the foreign trade activities of oil and gas related companies, including Gazprom, in a consistent national accounting framework.

based upon a joint research program between the author and the SNA department of Goskomstat. It should be noted that an earlier draft of this paper which was read at the SRC summer conference in July 2003 was based upon misleading data and is completely revised in this article.

The relationship between the goods-production and service sectors is an important issue in a modern economy. General observations on this issue as well as a specific analysis of Russian peculiarities (singularities) may be remaining issues. So, third, this paper intends to provide an elementary analysis based on Miyazawa (1976) and a Russian 2000 input-output table of producers' prices.

## 1. Trade Sector Expansion: Statistical Confirmation

Tables 1.1 and 1.2 are domestic output structure and GDP structure by sector which were obtained from the official I-O data. Domestic output is evaluated at market prices or producers' prices including net taxes on products. GDP is also estimated at market prices including net taxes on products.

These Tables show the following.

(1) From 1991 to 2000, the oil and gas industry had a markedly large increase in share of output and GDP. The share of output increased from 3.3% to 11.4%. The share of GDP also showed an increase from 3.7% to 12.5%. The shares of crude oil, refined oil and natural gas in GDP in 2000 were respectively 7.3%, 2.5% and 2.7%. This implies that the contributions of oil and gas, in particular gas, to output and GDP were much smaller than usually assumed. Although crude oil showed a large increase from 1998 to 2000 in share of output as well as GDP, natural gas showed a slight decrease for the period in share of both output and GDP. This situation seems rather unusual for gas.

(2) The output share of the trade service sector in 2000 was 20.1%, approximately twice that in 1991 (11.4%), showing an increase of about 8 percentage points from 1998. GDP share of the

trade sector in 2000 (27.5%) was also about twice that of 1991 (16.1%). It also increased in 2000, rising 8 percentage points from the year 1997. The GDP share generated by the oil and gas trade amounted to 10.7% in 2000. Indeed, more than one-third of trade GDP was generated from oil and gas trade in that year. The trade sector was not influenced by the financial crisis as its share grew. In addition, the favorable conditions of international gas and oil prices led to an expansion of their market shares and helped contribute to share growth.

Table 1.3 displays the total trade-margin and export trade-margin in selected sectors, obtained from the 2000 trade-margin matrix. From Table 1.3 the following facts become clear:

First, total trade-margin occupied 1/3 of GDP in 2000, and it increased from 31.9% in 1999 to 32.4% in 2000.

Second, the oil and gas sector's trade-margin share of the total trade-margin in 2000 increased further from 1999 and accounted for 42% and 14% of GDP.

Third, in 2000 the export trade-margin, which was 44% of the total trade-margin, increased further from 1999 and occupied 14.2% of GDP.

Fourth, in 2000 the share of the oil and gas export trade-margin in the total export trade-margin increased from 65% in 1999 to 71%, while its share of GDP increased from 9% in 1999 to 10%.

From the above it is obvious that the trade-margin occupies an unusually large percentage of GDP, and this consists largely of export trade-margin; the pressure-applying part of export trade-margins consists of the oil and gas export trade-margins.

From the table it is also clear that about half of the total oil and gas export trade-margin (10% of GDP in 2000) was generated from the natural gas export trade-margin (5% of GDP in 2000). While almost all crude oil trade-margins (95%) came from the export trade-margin in 1999, their proportion decreased to 65% in 2000 due to a change in statistical methodology. The largest contribution to the trade-margin was provided by the gas and food sectors (17% in total trade-margin and 5.6% in GDP), while the

largest contribution to the export trade-margin was realized by the gas sector (34% in total export trade-margin and 4.8% in GDP).

Let us next look at the distribution-margin ratio, which is defined as (distribution-margin) / (price paid by final purchasers; purchaser's price).

Table 1.4 shows the export distribution-margin ratio by selected sector. In 1999, the export trade-margin ratio increased further from 31% in 1999 to 32% in 2000 and the transportation trade-margin ratio decreased from 3.6% to 3.1%. Looking at the macroeconomic level, the main factor in determining the distribution-margin ratio was the trade-margin ratio, and the transportation-margin ratio was secondary. It should be noted that transportation activities within trade organizations were entered as trade organization activities.

Broken down by sector, the oil and gas export trade-margin ratio decreased from 54% in 1999 to 47% in 2000. The crude oil export trade-margin ratio showed a huge jump to 46% in 1999, but decreased to 31% in 2000, while the gas export trade-margin ratio remained at 74% as compared to 75% in 1999.

Table 1.5 shows the results of a comparison of the export trade-margin in Russia, Japan and the United States based on input-output tables in these countries. From this table it can be seen that, firstly, Russia's export trade-margin share of GDP for 2000 was 20 times higher than that of Japan and the US. Second, Russia's export trade-margin ratio was more than four times that of Japan and the US. As well as this, Russia's export trade-margin was unusually inflated and the relative price for export trade services was also unusually high.

Table 1.5 also shows the US's oil and gas export trade-margin ratio which was 6.5% in 1992. This is very low when compared with Russia's 2000 figure of 47%. The relative price for export trade-margin in Russia can be understood to be unusual.

## 2. A Reappraisal of Oil and Gas Flows and Trade-Margins

Our observations have relied heavily on the input-output data. However, investigation of the reliability of the input-output data has not yet been conducted anywhere. Thus, we would like to preliminarily examine the input-output data by employing physical energy balance data and price data. This study is partially based upon a joint research program between the author and the SNA department of Goskomstat.

Table 2.1 shows energy balance data on line 1 and input-output data on lines 2 to 6 for natural gas in 2000. Line 7 shows industrial producers' prices derived from energy balance and input-output data. It should be noted that unlike the usual terminology, Russian industrial producers' prices equal basic prices. As can be seen, there are three kinds of domestic producers' prices, namely 163 rubles/tcm for domestic output, 73 rubles/tcm (line 9), and 295 rubles/tcm for exports (final destination).

When we employ 73 rubles/tcm as the average domestic producers' price for gas in 2000, which is near the reported price data, and energy balance data, we obtain an alternative output flow at producers' prices (basic prices) (line 11). Purchasers' prices, shown on line 10, were provided by Goskomstat. As for purchasers' prices (contract price for exports) there is no essential difference between lines 8 and 10. Thus we reached an alternative estimate of the gas trade-margin and gas export trade-margin (line 14), which were about 1.1 times the reported data, namely higher than the reported data by 10%. In our estimate gas domestic output amounted to 42.7 billion rubles, much less than the official gas output figure, 86.9 billion rubles.

However, this alternative estimate is rather misleading. It would be plausible that domestic prices of gas have double definitions of gas for domestic trade and gas for foreign trade. Namely, domestic prices of gas for foreign trade (295 rubles/tcm) have been set at a higher level than those for domestic trade (73 rubles/tcm). Our fact finding shows this double definitions of domestic gas prices which have not been made public.

Table 2.2 shows sources of reported gas trade-margin. The foreign trade-margin was reported by Gazprom and occupies 85 % of the total gas trade-margin. The remaining 13% and 2 % of the total gas-trade margin were reported by inter-regional traders and others respectively.

Table 2.3 over line 3 shows the estimated results by using energy balance data and price data, which were obtained at Goskomstat. By using these results we reached the estimated trade-margin on line 3. Table 2.3 below line 3 shows the reported (input-output) data. The estimated trade-margin of refined oil was only 43% of the reported trade-margin of refined oil, and the estimated export trade-margin of refined oil was 23% of the reported export trade-margin of refined oil *unless* we include “other refined oil” in the total refined oil values. If “other refined oil” is considered in a well defined manner as in Table 2.3, the estimated data entirely equal the reported data. It should be noted that unlike the case of gas, domestic prices of refined oil for domestic and foreign trade (final destination) are uniformly set. In conclusion, it can be stated that we obtain a plausible database for the estimation of trade-margins.

### 3. Preliminary Observations on the Relationship between the Goods-Producing Sectors and Service Sectors

Here we would like to provide an elementary analysis based on Miyazawa (1976) and a Russian 2000 input-output table of producers' prices.

Let us introduce *partitioned matrix multipliers* as follows:

Let us divide the  $n$  industries of the usual input-output table into two subgroups, designated P sector which consists of  $z$  industries, and S sector which consists of  $m$  industries. Then, the  $n \times n$  matrix of input coefficients,  $A$ , can be written as:

$$A = \left[ \begin{array}{c|c} \overbrace{P}^z & \overbrace{P_1}^m \\ \hline S_1 & S \end{array} \right] \begin{array}{l} z \\ m \end{array} \quad z + m = n \quad (3.1)$$

where  $P$  and  $P_1$  are submatrices of coefficients showing the input of P sector products in the P and S sectors respectively, and  $S_1$  and  $S$  are submatrices of coefficients showing the input of S sector's products in the P and S sectors respectively. Among these submatrices,  $P$  and  $S$  are square having the orders  $z \times z$  and  $m \times m$  respectively, and  $P_1$  and  $S_1$  are rectangular having the orders  $z \times m$  and  $m \times z$  respectively. Based on Miyazawa (1976) we can decompose the elements of the Leontief inverse as follows:

(i) Internal propagation activities inside the P sector industries. This aspect will be shown as the “internal matrix multiplier” of the P sector (having the order  $z \times z$ ):

$$B = (I - P)^{-1} \quad (3.2)$$

(ii) Internal propagation activities inside the S sector industries. This aspect will also be shown as the “internal matrix multiplier” of the S sector (having the order  $m \times m$ ):

$$T = (I - S)^{-1} \quad (3.3)$$

(iii) Intersectoral propagation activities between the P and S sector industries. This aspect will be shown as four rectangular sub-matrix-multipliers which naturally follow from the operation of internal multipliers  $B$  and  $T$ :

$B_1 = S_1 B$       S-goods input in P sector induced by internal propagation in P sector industries ( $m \times z$ ).

$B_2 = B P_1$       internal propagation in P sector industries induced by P-goods input in S sector ( $z \times m$ ).

Table 3.1 shows the coefficients of internal propagation in the goods-producing sector induced by input in the service sector, namely  $B_2$ , showing what service sectors have more inducible

power for goods-producing activity. As can be seen from this table, the transportation sector has rather high inducible power for refined oil, machinery, crude oil and electricity. The trade sector has relatively strong power for refined oil, machinery and food. Expansion of trade service has a very low inducible power for natural gas. Education, health, culture and arts services have a very strong power for electricity, followed by refined oil and natural gas.

Table 3.2 shows the coefficients of service input induced by internal propagation in the goods-producing sector, namely a transpose of  $B_1$ , showing what goods-producing sectors have more inducible power for service activity. From this table, natural gas production has a rather strong inducible power for the trade sector, a more than 3% inducement rate by the unit service, while non-ferrous metal production shows stronger power for trade service, a 4% inducement rate. The chemical industry has the strongest power for transportation, followed by crude oil.

We can state that both values of elements of  $B_2$  and  $B_1$  in Russia are generally smaller than those in developed economies. Namely, in contrast to value added, Russia is characterized by a relatively weak relation between the goods-producing sector and service in intermediate production.

## Concluding Remarks

In this paper, we followed up our previous fact-findings. Then we examined the plausibility of the input-output data. As was shown, the input-output data are rather reliable. We further proceeded to general observations on the relations between goods and services. Expansion of the production of gas and non-ferrous metals has relatively strong inducible power for trade service, while enlargement of trade service has a little power for gas production. Further comprehensive analysis including intermediate demand and final demand is one of the remaining tasks for this research.



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**Table 1.1 Share of Selected Sectoral Gross Domestic Output in Total Gross Domestic Output (I-O Accounts)**

|                                    | (%)   |             |             |             |
|------------------------------------|---|-------------|-------------|-------------|
|                                    | Gross Domestic Output<br>(at producers' prices) |             |             |             |
|                                    | 1991  | 1998        | 1999        | 2000        |
| <b>Oil and gas</b>                 | <b>3.3</b>                                      | <b>7.1</b>  | <b>8.6</b>  | <b>11.4</b> |
| Crude oil                          | ...   | 2.7         | 3.7         | 5.2         |
| Refined oil                        | ...   | 2.6         | 3.1         | 4.5         |
| Natural gas                        | ...   | 1.9         | 1.8         | 1.7         |
| Machine-building and metal working | 13.6  | 6.6         | 7.2         | 7.0         |
| Wood and paper                     | 3.2   | 1.4         | 1.8         | 1.9         |
| Construction materials             | 2.1   | 1.4         | 1.2         | 1.2         |
| Light industry                     | 9.3   | 1.1         | 1.1         | 1.0         |
| Industry, n.e.c.                   | 2.6   | 1.0         | 1.3         | 1.2         |
| Industry total                     | 53.6  | 40.2        | 43.6        | 44.7        |
| <b>Trade</b>                       | <b>11.4</b>                                     | <b>16.4</b> | <b>20.0</b> | <b>20.1</b> |

Sources: Goskomstat, *Input-Output Tables for 1991 and 1998-2000* and data provided by Goskomstat.

**Table 1.2 Share of Selected Sectoral GDP in Total GDP (I-O accounts)**

|                                    | (%)   |             |             |             |             |
|------------------------------------|---|-------------|-------------|-------------|-------------|
|                                    | Gross Domestic Products (GDP)<br>(at market prices) |             |             |             |             |
|                                    | 1991  | 1997        | 1998        | 1999        | 2000        |
| <b>Oil and gas</b>                 | <b>3.7</b>  | <b>8.5</b>  | <b>7.8</b>  | <b>10.0</b> | <b>12.5</b> |
| Crude oil                          | ...   | ...         | 3.2         | ...         | 7.3         |
| Refined oil                        | ...   | ...         | 1.7         | ...         | 2.5         |
| Natural gas                        | ...   | ...         | 2.9         | ...         | 2.7         |
| Machine-building and metal working | 11.8  | 5.6         | 5.8         | 5.8         | 5.6         |
| Wood and paper                     | 2.8   | 1.2         | 1.2         | 1.6         | 1.7         |
| Construction materials             | 2.0   | 1.3         | 1.1         | 0.9         | 0.9         |
| Light industry                     | 6.0   | 1.1         | 1.1         | 0.9         | 0.8         |
| <b>Trade</b>                       | <b>16.1</b>   | <b>19.8</b> | <b>22.7</b> | <b>26.9</b> | <b>27.5</b> |
| <b>Oil and gas trade</b>           | <b>...</b>  | <b>4.8</b>  | <b>4.7</b>  | <b>8.6</b>  | <b>10.7</b> |

Sources: Goskomstat, *Input-Output Tables for 1991 and 1998-2000* and data provided by Goskomstat.

**Table 1.3 Russia's Trade-Margin by Sector, 2000**

|                                    | Trade-margin |             | Of which : export trade-margin |            |             |
|------------------------------------|--------------|-------------|--------------------------------|------------|-------------|
|                                    | %            | %GDP        | %                              | %GDP       | b/a (%)     |
|                                    | a            |             | b                              |            |             |
| <b>Oil and gas</b>                 | <b>42.3</b>  | <b>13.7</b> | <b>68.8</b>                    | <b>9.8</b> | <b>71.3</b> |
| Crude oil                          | 14.5         | 4.7         | 21.4                           | 3.0        | 64.7        |
| Refined oil                        | 10.5         | 3.4         | 13.5                           | 1.9        | 56.2        |
| Natural gas                        | 17.3         | 5.6         | 33.9                           | 4.8        | 86.0        |
| Machine-building and metal working | 9.3          | 3.0         | 6.1                            | 0.9        | 29.0        |
| Light industry                     | 8.6          | 2.8         | 0.5                            | 0.1        | 2.6         |
| Food industry                      | 17.2         | 5.6         | 1.9                            | 0.3        | 4.8         |
| Industry total                     | 96.8         | 31.4        | 99.7                           | 14.2       | 45.2        |
| Total                              | 100.0        | 32.4        | 100.0                          | 14.2       | 43.9        |

Source: Goskomstat, *Input-Output Tables for 2000*.

**Table 1.4 Russia's Export Distribution-Margin Ratios**

|                                    | 2000                                 |                               |  |
|------------------------------------|--------------------------------------|-------------------------------|--|
|                                    | Export distribution-margin ratio (%) | Export trade-margin ratio (%) | Export transportation-margin ratio (%) |
| <b>Oil and gas</b>                 | <b>49.8</b>                          | <b>47.2</b>                   | <b>2.6</b>                             |
| Crude oil                          | 34.8                                 | 31.3                          | 3.5                                    |
| Refined oil                        | 46.3                                 | 42.9                          | 3.4                                    |
| Natural gas                        | 74.6                                 | 74.0                          | 0.6                                    |
| Coal                               | 37.5                                 | 18.2                          | 19.3                                   |
| Machine-building and metal working | 22.3                                 | 20.8                          | 1.5                                    |
| Industry total                     | 38.3                                 | 35.0                          | 3.3                                    |
| Total                              | 35.0                                 | 31.9                          | 3.1                                    |

Sources: Calculated using the data from input-output tables of purchasers' prices, trade-margin and transportation-margin tables.

**Table 1.5 An International Comparison of Export Trade-Margins**

|                                       |      | USA<br>1992 | Japan<br>1995 | Russia<br>2000 |
|---------------------------------------|------|-------------|---------------|----------------|
| Export trade-margin                   | %GDP | 0.7         | 0.6           | 14.2           |
| Oil and gas export trade-margin       | %GDP |             |               | 9.8            |
| Export trade-margin ratio             | %    | 7.0         | 6.4           | <b>31.9</b>    |
| Oil and gas export trade-margin ratio | %    | 6.5         | -             | 47.2           |

Sources: Kuboniwa (2002a) and Table 1.3 and Table 1.4 of this paper.

**Table 2.2 Sources of Reported Gas Trade-Margin in 2000**

|                             | Total supply | Domestic demand | Changes in inventories |            |       | Exports | Total demand |
|-----------------------------|--------------|-----------------|------------------------|------------|-------|---------|--------------|
|                             |              |                 | produc-ers             | consum-ers | trade |         |              |
| Foreign trade-margin        | 344,961      |                 |                        |            |       | 344,961 | 344,961      |
| Inter-regional trade-margin | 53,885       | 53,885          |                        |            |       |         | 53,885       |
| Other trade-margin          | 8,505        | 3,049           | 0                      | 27         | 2     | 5,427   | 8,505        |
| Total                       | 407,351      | 56,935          | 0                      | 27         | 2     | 350,388 | 407,351      |

Source: Data provided by Goskomstat.

**Table 2.1 A Reappraisal of Gas Flow and Trade-Margin in 2000**

|  |           | Domestic output excluding loss | Imports      | Total supply  | Domestic demand | Changes in inventories |           |          | Exports       | Total demand  |
|--|-----------|--------------------------------|--------------|---------------|-----------------|------------------------|-----------|----------|---------------|---------------|
|  |           |                                |              |               |                 | producers              | consumers | trade    |               |               |
| <b>Energy balance data (Goskomstat)</b>                            |           |                                |              |               |                 |                        |           |          |               |               |
| at mcm   | 1         | 582,734.2                      | 13,037.0     | 595,771.2     | 394,908.7       | 7,011.8                | 0.8       | 0.0      | 193,849.9     | 595,771.2     |
| <b>Input-Output data (Goskomstat)</b>                              |           |                                |              |               |                 |                        |           |          |               |               |
| at basic prices (thousand rubles)                                  | 2         | 94,842,400.0                   | 12,360,820.0 | 107,203,220.0 | 49,474,377.0    | 484,101.0              | 23,585.0  | 960.0    | 57,220,197.0  | 107,203,220.0 |
| at purchasers' prices (thousand rubles)                            | 3         |                                |              | 645,226,109.0 | 171,376,237.0   | 484,101.0              | 76,872.0  | 4,943.0  | 473,283,956.0 | 645,226,109.0 |
| VAT (thousand rubles)  |           |                                |              | 12,992,750.0  | 3,044,559.0     | 0.0                    | 0.0       | 588.0    | 9,947,603.0   | 12,992,750.0  |
| excises (thousand rubles)  |           |                                |              | 88,647,772.0  | 58,797,578.0    | 0.0                    | 25,176.0  | 1,620.0  | 29,823,398.0  | 88,647,772.0  |
| import duty (thousand rubles)                                      |           |                                |              | 931,546.0     | 931,396.0       | 0.0                    | 146.0     | 4.0      | 0.0           | 931,546.0     |
| export tax (thousand rubles)                                       |           |                                |              | 23,091,468.0  | 0.0             | 0.0                    | 0.0       | 0.0      | 23,091,468.0  | 23,091,468.0  |
| Total taxes on products and imports (thousand rubles)              | 4         |                                |              | 125,663,536.0 | 62,773,533.0    | 0.0                    | 25,322.0  | 2,212.0  | 62,862,469.0  | 125,663,536.0 |
| transport-margin (thousand rubles)                                 | 5         |                                |              | 5,007,924.0   | 2,193,743.0     | 0.0                    | 1,163.0   | 47.0     | 2,812,971.0   | 5,007,924.0   |
| Reported trade-margin (thousand rubles)                            | 6=3-2-4-5 |                                |              | 407,351,429.0 | 56,934,584.0    | 0.0                    | 26,802.0  | 1,724.0  | 350,388,319.0 | 407,351,429.0 |
| <b>Prices derived from I-O and energy balance</b>                  |           |                                |              |               |                 |                        |           |          |               |               |
| Producers' prices/ tcm (rubles)                                    | 7=2/1     | 162.8                          | 948.1        | 179.9         | 125.3           | 69.0                   | 29,481.3  |          | 295.2         | 179.9         |
| Purchasers' prices/ tcm (rubles)                                   | 8=3/1     |                                |              | 1,083.0       | 434.0           | 69.0                   | 96,090.0  |          | 2,441.5       | 1,083.0       |
| <b>Prices from Goskomstat price dept. and other sources</b>        |           |                                |              |               |                 |                        |           |          |               |               |
| Producers' prices/ tcm (rubles)                                    | 9         | 73.2                           | 948.1        | 92.3          | 102.1           | 73.2                   | 73.3      |          | 73.2          | 92.3          |
| Purchasers' prices/ tcm (rubles)                                   | 10=12/1   |                                |              | 1,080.5       | 429.3           | 73.2                   | 429.3     |          | 2,443.6       | 1,080.5       |
| <b>An alternative estimate of gas trade-margin</b>                 |           |                                |              |               |                 |                        |           |          |               |               |
| at basic prices (thousand rubles)                                  | 11=9*1    | 42,656,143.4                   | 12,360,820.0 | 55,016,963.4  | 40,313,828.4    | 513,263.8              | 58.6      | 0.0      | 14,189,812.7  | 55,016,963.4  |
| at purchasers' prices ; at contract prices for exports (th rubles) | 12=10*1   |                                |              | 643,731,868.1 | 169,534,304.9   | 513,263.8              | 343.4     | 0.0      | 473,683,956.0 | 643,731,868.1 |
| Differences  | 13=12-11  |                                |              | 588,714,904.7 | 129,220,476.5   | 0.0                    | 284.8     | 0.0      | 459,494,143.3 | 588,714,904.7 |
| Estimated trade-margin (thousand rubles)                           | 14=13-4-5 |                                |              | 458,043,444.7 | 64,253,200.5    | 0.0                    | -26,200.2 | -2,259.0 | 393,818,703.3 | 458,043,444.7 |
| Estimated/reported (%)   | 15=14/6   |                                |              | 112.4         | 112.9           |                        | -97.8     | -131.0   | 112.4         | 112.4         |

Sources: Goskomstat and author's estimates.

Notes: mcm= million cubic meter; tcm= thousand cubic meter. Line 12 was provided by Goskomstat. Line 10 was derived from line 12 and line 1.

On line 9, for domestic output, exports and changes in inventories, the price for changes in inventories at producers in lines 7 and 10 was employed.

**Table 2.3 A Reappraisal of Refined Oil Flow and Trade-Margin**

|  |           | Production<br>including loss | Imports    | Total supply       |
|--|-----------|------------------------------|------------|--------------------|
| <b>Energy balance data (Goskomstat; thousand tons)</b>                     |           |                              |            |                    |
| Gasoline   |           | 27,152                       | 146        | 27,298             |
| Heavy oil  |           | 51,702                       | 2          | 51,704             |
| Diesel   |           | 49,249                       | 114        | 49,363             |
| Kerosene   |           | 6,641                        | 11         | 6,652              |
| <b>Producers' price (Goskomstat; rubles/ton)</b>                           |           |                              |            |                    |
| Gasoline   |           | 4,704.2                      | 7,279.9    | 4,717.9            |
| Heavy oil  |           | 1,648.7                      |            | 1,648.6            |
| Diesel   |           | 4,090.7                      | 6,761.1    | 4,096.9            |
| Kerosene   |           | 5,698.0                      | 8,508.9    | 5,702.4            |
| <b>Purchasers' prices (Goskomstat; rubles/ton)</b>                         |           |                              |            |                    |
| Gasoline   |           |                              |            | 7,583              |
| Heavy oil  |           |                              |            | 2,716              |
| Diesel   |           |                              |            | 6,424              |
| Kerosene   |           |                              |            | 5,564              |
| <b>at producers' prices thousand rubles (Goskomstat; thousand rubles)</b>  |           |                              |            |                    |
| Gasoline   |           | 127,730,320                  | 1,059,224  | 128,789,544        |
| Heavy oil  |           | 85,240,593                   |            | 85,240,593         |
| Diesel   |           | 201,462,475                  | 768,742    | 202,231,218        |
| Kerosene   |           | 37,842,697                   | 89,344     | 37,932,041         |
| Other refined oil  |           | 52,975,721                   | 33,487,920 | 86,463,641         |
| <b>Total</b>   | 1         | 505,251,806                  | 35,405,230 | 540,657,036        |
| <b>at purchasers' prices thousand rubles (Goskomstat; thousand rubles)</b> |           |                              |            |                    |
| Gasoline   |           |                              |            | 207,006,718        |
| Heavy oil  |           |                              |            | 140,418,494        |
| Diesel   |           |                              |            | 317,118,342        |
| Kerosene   |           |                              |            | 37,010,332         |
| Other refined oil  |           |                              |            | 228,507,419        |
| <b>Total</b>   | 2         |                              |            | 930,061,305        |
| <b>Estimated trade-margin</b>  | 3=2-1-6-7 |                              |            | <b>247,524,736</b> |
| <b>Input-Output data (Goskomstat; thousand rubles)</b>                     |           |                              |            |                    |
| at basic prices (IOT)  | 4         | 505,251,806                  | 35,405,230 | 540,657,036        |
| at purchasers' prices (IOT)  | 5         |                              |            | 930,061,305        |
| VAT  |           |                              |            | 25,983,297         |
| excises  |           |                              |            | 12,185,016         |
| import duties  |           |                              |            | 379,709            |
| GSM tax  |           |                              |            | 22,953,300         |
| Export tax   |           |                              |            | 36,729,635         |
| Sales tax  |           |                              |            | 1,137,926          |
| Total taxes on products and imports  | 6         |                              |            | 99,368,883         |
| transport-margin   | 7         |                              |            | 42,510,650         |
| Reported trade-margin (calculated here)                                    | 8=5-4-6-7 |                              |            | 247,524,736        |
| Reported trade-margin (given in IOT)                                       | 9         |                              |            | <b>247,524,736</b> |
| <b>Estimated/ reported (%)</b>   | 10=3/8    |                              |            | <b>100.0</b>       |
|  | 11=3/9    |                              |            | <b>100.0</b>       |

Sources: Goskomstat and author's calculations.

## RUSSIA'S OIL AND GAS FLOW RECONSIDERED

in 2000

| Domestic demand    | Changes in inventories |                |              | Exports           | Total demand       |
|--------------------|------------------------|----------------|--------------|-------------------|--------------------|
|                    | Producers              | Consumers      | Trade        |                   |                    |
| 23,259             | -135                   | -17            |              | 4,191             | 27,298             |
| 28,164             | 2                      | 629            |              | 22,908            | 51,704             |
| 24,966             | 10                     | -227           |              | 24,614            | 49,363             |
| 4,674              | -4                     | -4             |              | 1,986             | 6,652              |
| 4,720.3            | 4,704.2                | 4,704.2        |              | 4,704             | 4,718              |
| 1,648.6            | 1,648.7                | 1,648.7        |              | 1,649             | 1,649              |
| 4,102.9            | 4,090.7                | 4,090.7        |              | 4,091             | 4,097              |
| 5,704.3            | 5,698.0                | 5,698.0        |              | 5,698             | 5,702              |
| 7,793              | 4,704                  | 7,793          |              | 6,327             | 7,583              |
| 2,368              | 1,649                  | 2,368          |              | 3,153             | 2,716              |
| 6,225              | 4,091                  | 6,225          |              | 6,626             | 6,424              |
| 7,270              | 5,698                  | 7,270          |              | 1,551             | 5,564              |
| 109,790,221        | -636,008               | -79,971        |              | 19,715,302        | 128,789,544        |
| 46,431,019         | 3,297                  | 1,037,527      |              | 37,768,749        | 85,240,593         |
| 102,432,455        | 38,862                 | -927,362       |              | 100,687,263       | 202,231,218        |
| 26,664,246         | -22,792                | -23,932        |              | 11,314,519        | 37,932,041         |
| 72,856,308         | 377,594                | -86,315        | 20,473       | 13,295,581        | 86,463,641         |
| 358,174,249        | -239,047               | -80,053        | 20,473       | 182,781,414       | 540,657,036        |
| 181,260,492        | -636,008               | -132,483       |              | 26,514,716        | 207,006,718        |
| 66,684,850         | 3,297                  | 1,489,994      |              | 72,240,353        | 140,418,494        |
| 155,403,986        | 38,862                 | -1,411,117     |              | 163,086,611       | 317,118,342        |
| 33,982,888         | -22,792                | -30,534        |              | 3,080,770         | 37,010,332         |
| 168,233,207        | 377,594                | -28,136        | 39,659       | 59,885,096        | 228,507,419        |
| 605,565,423        | -239,047               | -112,276       | 39,659       | 324,807,546       | 930,061,305        |
| <b>169,185,749</b> | <b>0</b>               | <b>-27,979</b> | <b>9,889</b> | <b>78,357,077</b> | <b>247,524,736</b> |
|                    |                        |                | -            |                   |                    |
| 358,174,249        | -239,047               | -80,053        | 20,473       | 182,781,414       | 540,657,036        |
| 605,565,423        | -239,047               | -112,276       | 39,659       | 324,807,546       | 930,061,305        |
| 22,458,113         |                        |                | 5,801        | 3,519,383         | 25,983,297         |
| 7,931,657          | 0                      | -1,471         | 519          | 4,254,311         | 12,185,016         |
| 379,711            |                        | -3             | 1            | 0                 | 379,709            |
| 14,941,116         | 0                      | -2,770         | 979          | 8,013,975         | 22,953,300         |
|                    |                        |                |              | 36,729,635        | 36,729,635         |
| 1,137,926          |                        |                |              |                   | 1,137,926          |
| 46,848,523         | 0                      | -4,244         | 7,300        | 52,517,304        | 99,368,883         |
| 31,356,902         |                        |                | 1,997        | 11,151,751        | 42,510,650         |
| 169,185,749        | 0                      | -27,979        | 9,889        | 78,357,077        | 247,524,736        |
| 169,185,749        |                        | -27,979        | 9,889        | 78,357,077        | 247,524,736        |
| <b>100.0</b>       |                        | <b>100.0</b>   | <b>100.0</b> | <b>100.0</b>      | <b>100.0</b>       |
| <b>100.0</b>       |                        | <b>100.0</b>   | <b>100.0</b> | <b>100.0</b>      | <b>100.0</b>       |

**Table 3.1 Coefficients of Internal Propagation in Goods-producing Sector Induced by Input in Service Sector ( $B_2$ )**

|                                       | Transportation<br>and<br>communications | Trade        | Education,<br>health, culture<br>and arts | Housing and<br>Public<br>utilities | Sciences     | Finance, credit,<br>insurance and<br>administration |
|---------------------------------------|---|--------------|---|------------------------------------|--------------|---|
| 1 Electricity                         | <b>0.043</b>                            | 0.011        | 0.179                                     | <b>0.083</b>                       | <b>0.039</b> | <b>0.036</b>  |
| 2 Crude oil                           | <b>0.037</b>                            | 0.010        | 0.031                                     | 0.018                              | 0.026        | 0.025   |
| 3 Refined oil                         | <b>0.092</b>                            | <b>0.026</b> | <b>0.082</b>                              | <b>0.046</b>                       | <b>0.061</b> | <b>0.068</b>  |
| 4 Natural gas                         | 0.013                                   | 0.003        | <b>0.082</b>                              | 0.016                              | 0.011        | 0.013   |
| 5 Coal                                | 0.003                                   | 0.001        | 0.014                                     | 0.009                              | 0.003        | 0.005   |
| 6 Other fuels                         | 0.000                                   | 0.000        | 0.000                                     | 0.000                              | 0.000        | 0.000   |
| 7 Ferrous metals                      | 0.020                                   | 0.006        | 0.049                                     | 0.012                              | 0.029        | 0.015   |
| 8 Non-ferrous metals                  | 0.011                                   | 0.005        | 0.022                                     | 0.012                              | 0.031        | 0.017   |
| 9 Chemical Industry                   | 0.019                                   | 0.018        | 0.044                                     | 0.094                              | <b>0.058</b> | 0.019   |
| 10 Machine-building and metal working | <b>0.071</b>                            | 0.021        | <b>0.078</b>                              | 0.039                              | <b>0.095</b> | 0.106   |
| 11 Wood and paper                     | 0.008                                   | 0.012        | 0.018                                     | 0.015                              | 0.012        | 0.016   |
| 12 Construction materials             | 0.010                                   | 0.006        | 0.041                                     | 0.012                              | 0.007        | 0.003   |
| 13 Light industry                     | 0.004                                   | 0.006        | 0.010                                     | 0.023                              | 0.007        | 0.025   |
| 14 Food industry                      | 0.002                                   | <b>0.021</b> | 0.005                                     | 0.107                              | 0.005        | 0.057   |
| 15 Industry, n.e.c.                   | 0.004                                   | 0.005        | 0.022                                     | 0.014                              | 0.009        | 0.018   |
| 16 Construction                       | 0.040                                   | 0.008        | 0.101                                     | 0.023                              | 0.017        | 0.013   |
| 17 Agriculture and forestry           | 0.001                                   | 0.013        | 0.005                                     | 0.048                              | 0.005        | 0.045   |



**Table 3.2 Coefficients of Service Input Induced by Internal Propagation in Goods-producing Sector ( $B_1^1$ )**

|                                       | Transportation and communications | Trade        | Education, health, culture and arts | Housing and public utilities | Sciences | Finance, credit, insurance and administration |
|---------------------------------------|-----------------------------------|--------------|-------------------------------------|------------------------------|----------|---|
| 1 Electricity                         | 0.013                             | 0.013        | 0.010                               | 0.001                        | 0.004    | 0.006   |
| 2 Crude oil                           | <b>0.027</b>                      | 0.006        | 0.003                               | 0.000                        | 0.043    | 0.010   |
| 3 Refined oil                         | 0.011                             | 0.005        | 0.003                               | 0.000                        | 0.016    | 0.004   |
| 4 Natural gas                         | 0.008                             | <b>0.032</b> | 0.002                               | 0.000                        | 0.003    | 0.003   |
| 5 Coal                                | 0.070                             | 0.011        | 0.020                               | 0.001                        | 0.010    | 0.006   |
| 6 Other fuels                         | 0.033                             | 0.010        | 0.034                               | 0.001                        | 0.008    | 0.010   |
| 7 Ferrous metals                      | 0.019                             | 0.008        | 0.008                               | 0.001                        | 0.004    | 0.013   |
| 8 Non-ferrous metals                  | 0.013                             | <b>0.040</b> | 0.009                               | 0.000                        | 0.009    | 0.012   |
| 9 Chemical Industry                   | <b>0.031</b>                      | 0.011        | 0.013                               | 0.000                        | 0.006    | 0.006   |
| 10 Machine-building and metal working | 0.015                             | 0.013        | 0.013                               | 0.001                        | 0.022    | 0.007   |
| 11 Wood and paper                     | 0.022                             | 0.011        | 0.007                               | 0.000                        | 0.003    | 0.008   |
| 12 Construction materials             | 0.022                             | 0.013        | 0.012                               | 0.000                        | 0.004    | 0.005   |
| 13 Light industry                     | 0.010                             | 0.008        | 0.013                               | 0.000                        | 0.002    | 0.004   |
| 14 Food industry                      | 0.014                             | 0.012        | 0.006                               | 0.000                        | 0.002    | 0.004   |
| 15 Industry, n.e.c.                   | 0.014                             | 0.014        | 0.008                               | 0.001                        | 0.004    | 0.005   |
| 16 Construction                       | 0.024                             | 0.011        | 0.007                               | 0.000                        | 0.004    | 0.004   |
| 17 Agriculture and forestry           | 0.018                             | 0.004        | 0.003                               | 0.000                        | 0.003    | 0.002   |