

**“Compiling the disaggregated version of “input-output” tables on the Russian Federation for 1995 year for consequent use as a basic data for building the general equilibrium model for the Russian Federation”**

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In the framework of conducted research the following results were obtained:

1. The table “input-output” (IO) was compiled on 1995 for the Russian Federation in purchasers’ prices with desegregation up to 39 “pure” sectors instead of 22 in an original table which was officially published by the Gosstandard of the Russian Federation.

2. According to disaggregated IO table the matrices of transport and trade services prices were arranged as well as matrices of net taxes on goods (by each tax type).

3. The expert assessment of the tax on wages and salaries was conducted by sectors of economy in the disaggregated IO table on 1995.

4. The expert assessment of payments of enterprises from their profits to the state budget was conducted by sectors of economy in the disaggregated IO table on 1995.

The content and methodology of the estimations performed are considered below.

### **I. Disaggregation of the original IO table for 1995**

**First stage.** First of all the disaggregation of a number of sectors that produce goods and services was conducted using available data of the one-time survey on the structure of production cost. This survey was conducted by the Goscomstat of the Russian Federation with regard to compiling IO tables for 1995. At the same time the total figures of inter-industry flows were provided equal to the value of corresponding inter-industry flows in the original IO table with 22 sectors.

Using the above mentioned method the following industries were disaggregated in following manner:

- ◆ Oil and gas were separated on oil extraction, oil processing, and natural gas industry;
- ◆ Circulation sphere – on trade and catering;
- ◆ Housing and communal services and consumer services for population – on sectors of market and non-market services;

- ◆ Public health, physical training, social security, culture and art – on public health, physical training and social security (from the angle of sectors of market and non-market services), and on education, culture and art (also from the angle of market and non-market services);
- ◆ Science and scientific services, geology, bowels prospecting, geodesy (i.e. land-surveying) and hydro-meteorological services – on science and scientific services (from the angle of sectors of market and non-market services), and on geology, bowels prospecting, and on geodesy and hydro-meteorological services;
- ◆ Finance, credit, insurance, management, social associations – on finance, credit, insurance, and on management, social associations (from the angle of sectors of market and non-market services).

**Second stage.** Disaggregation of transport along the line of its sub-sectors on railway transport, motor transport, pipeline transport, sea transport, air transport, and other transport (the last position includes domestic water transport, timber rafting, urban electrical transport, material handling and expeditionary works and services, highway keeping management, and other types of transport).

The data in columns on transport sub-sectors within the quadrants I and III of the IO table, as well as on the first stage, were obtained using the data of nonrecurring surveys of the structure of production cost for 1995 year, and with consideration that the total figure by sub-sectors is provided equal to the value of corresponding figure by transport sector as a whole.

Similarly taking into account the available statistical data on construction of IO table for 1995, the diaggregation of **column “Transport tariff”** was done within the balancing items in order to assure the conversion of usage of domestic goods and services in main prices – the transport tariff was split up by “pure” sectors in terms of tariffs of railway, motor transport, pipeline transport, domestic water transport, timber rafting, sea transport, and air transport.

There is no any data in the one-time survey necessary to split up indicators in the **row “Transport”** by different types of transport within the quadrants I and II of the IO table. That is why to obtain adequate assessments the phased expert procedure was used, which was based on the following considerations.

1. Taking into consideration the relation between the volume of output in certain transport sub-sector and the value of transport tariff on given type of transport, the transport sub-sectors were split up by the following two groups:

a) types of transport which are not counted in the intermediate demand of all other sectors (output of a given transport sub-sector in terms of main prices is equal or almost equal to corresponding transport tariff). To this group the following transport sub-sectors were attached: pipeline transport, sea transport, and domestic water transport, including timber rafting. In the same group the urban electrical transport was also included and its services were assumed to be consumed by the households. The balancing of indicators by rows of those types of transport was conducted only within positions of the quadrant II of the IO matrix (export, household consumption) and adjustment items (imports, value-added tax and special tax in use, and other net taxes on commodities which equal to subsidies);

b) types of transport which are accounted in the intermediate demand of all industries. This group contains railway transport, motor transport, air transport as well as all other transport sub-sectors that are not mentioned in this item. The balancing of indicators by rows of those types of transport was conducted within the quadrants I and II of the IO matrix and adjustment items.

2. In order to more precisely distribute the indicators of consumption of services by the types of transport it would be also necessary to split up their output in main prices between the cargo and passenger transports. The cargo transport group includes the railway transport, pipeline transport, timber rafting, and other types of transport. The passenger group of transport includes the urban electric transport. The split of output of all types of transport (i.e. railway, motor, sea, domestic water) between the cargo and passenger transports was done in proportion to the distribution of revenues of those types of transport from cargo and passenger shipping operations in 1995 (an additional estimation on motor transport was done in terms of its services produced by households). On air transport the split of output between the cargo and passenger transports was done in proportion to the distribution of “turnover of goods” by different types of transport. With all this the “passenger turnover” was translated into a “cargo turnover” based on assumption that the average weight of a passenger together with his or her luggage is equal to 100 kg. A part of material handling and expedition works and services was classified as the passenger transport in a proportion to the share of related services delivered to population in their total amount (according to data of the form 5-“3” for 1995), and the highways keeping management was split up in proportion to the share of passenger transport in the motor transport output.

3. The split up of figures in the row “Transport” by types of transport was done simultaneously with the splitting up of figures of analogous row of the matrix “Value-added tax and special tax in use”. Otherwise it appeared practically impossible to ensure their mutual conformity with the above mentioned figures on transport in total.

4. Estimations on splitting up figures of the row “Transport” in IO matrix and matrix “Value-added tax and special tax in use” by types of transport were done in the reverse order to their recorded sequence in tables, i.e. in the following sequence: “output in main prices” ± “adjustment items” = “total used in terms of purchaser’ prices”. From the last indicator one should subtract figures of exports and household consumption, which mean the value of intermediate demand that is distributed then by individual industries.

5. When import is split up between the transport sub-sectors the assessments of the Goskomstat’s experts were taken into consideration in the part of sea and air transport. The import through pipeline transport is considered equal to a difference between the output in main prices and the transport tariff. For other types of transport the original volumes of import are considered as expert valuations.

6. When product subsidies are distributed between the types of transport it is taken into consideration that those subsidies are given to passenger types of transport meaning urban and sub-urban transport, i.e. were belonged to urban electric, motor, railway transports and partly to material handling and expeditionary costs. Subsidies were distributed approximately in proportion to the value of balance of the out-of-sale costs in the total profit of above mentioned types of transport in compliance with accounting reports for 1995.

7. The initial assessments of the value-added tax and ‘special tax in use’ per unit of output and imports of services of corresponding type of transport were identified based on such factors as:

- the difference between rates in output usage for the purpose of final and intermediate consumption;

- tax exemptions from the value-added tax on urban and sub-urban transportation.

After finishing all estimations these figures are to be made more precise.

8. The indicator “Total services consumed valued in purchasers’ prices” has to be calculated using the formula: “Output in main prices” + “Imports” – “Net commodity taxes (subsidies)” + “Value-added tax and special tax in use” – “Transport tariff”.

9. While distributing exports between industries the assessments of Goskomstat’s experts in the part of sea and air transport are taken into consideration. A remaining part of the total exports is arbitrarily distributed between the railway, motor, and domestic water transports. The value-added tax was calculated based on the rate for export of services of the transport as a whole.

10. The household consumption was distributed by types of transport in two stages:

a) the following services are accredited in full to this position: the services of urban electrical transport; a part of services of passenger motor transport that produced by households as well as by passenger sea and domestic water transports;

b) a remaining part of services of the passenger railway, motor, air, and other types of transports in part of their consumption by households is determined in proportion to the shares of total output volume of services rendered by the respective passenger transport sectors.

While distributing the value-added tax between the consumption of transport services by different types of transport it is taken into consideration that this tax is not collected from urban and passenger transportation. Therefore the sum of value-added tax for urban electric transport was assumed equal to zero. For passenger railway, motor (bus) and domestic water transports a special tax rate for the purpose of final consumption (about 16%) was reduced in proportion to the share of urban and sub-urban passenger transportations in the total amount of passenger turnover (for railway transport in 1995 this share was 41%, for motor bus - 88%, and for domestic water transport - 18%).

11. After finishing of above mentioned stage it is necessary to complete the final adjustment of figures of distributed services of the pipeline, sea, domestic water (including timber rafting), and urban electric transportations. As for other types of transport (i.e. railway, motor, air and remained sub-types of other transports) it is necessary to assess the total amount of intermediate demand according to the formula: “Total used in terms of purchasers’ prices” - “Exports” - “Households’ consumption”. The preliminary weights in total amount of intermediate demand for transport services of different types of transport are calculated.

12. For further more detailed analysis it is necessary to select industries that consume transport services in a ‘maximum’ amount as well as the industries that have high rate of value-added tax on consumption of transport services. For these industries it is necessary to correct the shares of different types of transport, which was previously estimated by experts with regard to intermediate demand as a whole.

The following positions were assigned to above mentioned industries:

“Management (non-market services) – the share of railway transport was increased at expense of air transport;

“Finance, credit, insurance” – the shares of motor and air transports were increased at expense of railway transport;

“Science and scientific services” – the share of air transport was increased at expense of railway transport;

“Public education, culture and art”, “Public health, physical training, and social security”, “Housing and communal services and consumer services for population” – the share of motor transport was increased at expense of railway transport;

“Trade (sphere of commodity circulation)” – the largest consumer of transport services within intermediate demand – the shares of motor and air transports were increased at expense of railway transport;

“Construction” – the share of railway transport was increased at expense of motor and air transports;

“Oil extracting” – the share of other transport was increased at expense of railway and air transports.

The total figures of intermediate demand in above mentioned industries by different types of transport are excluded from respective total figures of intermediate demand. For remaining part of total intermediate demand the shares of different types of transport have to be calculated again. Using these shares, the intermediate demand for all other industries is calculated based on the corresponding inter-industrial flows of the sector “Transport” as a whole.

The figures of “value-added tax and special tax in use” by different types of transport and by rows within quadrants I of the “input-output” table were calculated based on the rate for sector “Transport” as a whole.

13. After estimation of all figures by rows by types of transport within quadrants I and II of the OI table it is necessary to refine the total amounts of “Intermediate demand” and “Total used in purchasers’ prices”, as well as total figures by types of transport in “Value-added tax and special tax in use”. The final adjustment was needed due to deviations from initial assessments (which were relatively minor) and it was made at expense of corrections in figures of imports and net commodity taxes (subsidies).

**Third stage.** Disaggregation of communication sector by sub-sectors “Electrical communication (telecommunication)” and “Other types of communication”.

Unfortunately, all the working materials for the construction of IO table for 1995 are contained only figures for communications sector as a whole. Therefore the split up of this sector has become possible only by an expert judgement.

The basic data for determining the amount of telecommunication services was the figures on structure of incomes from principal activity of organizations in 1995:

Billions of rubles	% of total
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Communication sector, total <sup>*)</sup>	21416,5	100,0
including:		
Telecommunications <sup>*)</sup>	17249,7	80,5
of which:		
Long distance and international	8925,0	41,7
Documented telecommunications (telegraph etc.)	957,9	4,5
Urban phone communications	5197,8	24,3
Rural phone communications	717,6	3,4
Radio, television and satellite communications	952,3	4,4
Local wire radio translation <sup>ия</sup> )	499,1	2,3
Other types of communications	4166,8	19,5
Of which:		
Post office	3907,2	18,2
Special communications	163,2	0,8
Control over the use of radio-electronic and high-frequency devices	96,4	0,5

The output in main prices in sub-sector “Telecommunications” was therefore determined as 0.8 of output of the sector “Communications”.

The distribution of costs between the telecommunications and other types of communications **by columns** of those sub-sectors with deviation from proportion of 0.8:0.2 was conducted in those cases when based on some meaningful considerations it was possible to assume a higher share of production costs of certain industries in the corresponding sub-sectors of communications.

In particular, a higher per unit cost in the sub-sector “Telecommunications” was provided for output of power industry, ferrous and non-ferrous metallurgy, construction, communications, housing and community services, remuneration of labor and some other sectors. A higher per unit cost in the sub-sector “Other types of communications” – was provided for output of oil refining, coal and other fuel industries, log and wood processing and cellulose industry, and transports.

Using similar considerations the deviations from proportion 0.8:0.2 are determined while distributing the consumption of communication services by other industries **by rows** of the “input-output” matrix.

The amounts of value-added tax and special tax by sub-sectors of communications are distributed in proportion of division by those sub-sectors of the total volume of communication services by each channel of consumption within quadrants I and II of the “input-output” table.

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<sup>\*)</sup> Not taking into account “Ground radio communication with moving objects”, of which data is published for the first time only on 1997. However, its share in total costs of communication in 1997 was 0.3%, and its share in revenue was 0.6%.

## II. Disaggregation of matrices of the transport tariffs, tariffs for trade services, and commodity net taxes

Primary matrices of transport and trade services' tariffs and of net taxes with respect to available statistical materials are presented in the following angles:

*Matrices of tariffs (i.e. charges for services):*

- 1) matrix of transport tariffs;
- 2) matrices of tariffs for trade services;

*Matrices of commodity net taxes:*

- 3) matrices of value-added tax and special tax in usage;
- 4) matrices of commodity net taxes (less value-added tax and special tax in usage);

*of which:*

- 4.1) matrix of tax on fuels and combustive-lubricating materials;
- 4.2) matrix of subsidies<sup>\*)</sup>;
- 5) matrix of import taxes.

The disaggregation of the above mentioned matrices up to 39 of “pure” industries that produce goods and services, **in principle** was conducted with respect to working materials to construction of the IO table of the Russian Federation for 1995. The **special features** of this calculation are present in disaggregation by sub-sectors of transport and communications because in order to indicate the sub-sectors such working materials are not available.

While disaggregating the tariffs (i.e. charges for services) and net taxes on goods and services that **are consumed** in the production process of the sub-sectors of transport and communication, it is assumed quite realistically that the ratio of total tariffs (net tax on commodities) to the value of corresponding inter-industrial flow by a transport's or communication's sub-sector is equal to the same ratio in the sector “Transport” or “Communications” as a whole. The relevant calculations were conducted for more detailed range of consumed goods and services with a follow-up aggregation according to the adopted sectoral classification. This is allowed to reflect more precisely the features of forming tariffs (i.e. service charges) and net taxes on commodities from the angle of transport and communication sub-sectors. Therefore the calculation by columns was accomplished by indicated sub-sectors in the matrices of tariffs and net taxes on commodities.

With regard to the rows of the sub-sectors indicated in these matrices it is implied that they have zero values only in the matrix of “value-added tax and special tax in use”. The

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<sup>\*)</sup> The difference between matrix (4) and sum of matrices (4.1) and (4.2) represents the matrix of excise taxes that includes export taxes in the column “Export”.

methods of calculation of this tax by the transport's and communication's sub-sectors was described in the previous part of this paper.

Moreover, it is worth to point out that the total commodity subsidies are distributed by transport sub-sectors. The corresponding indicators may be found in the matrix "Inter-industry balance for 1995 in the purchasers' prices" by the row "Net taxes on commodities (less value-added tax and special tax)", which are equal in this case to commodity subsidies.

### **III. Expert valuation of tax on wages and salaries from the angle of industries in the "input-output" table**

In order to evaluate the tax on wages and salaries from the angle of industries in the IO table the data was used from the one-time annual survey conducted in April 1995 on the labor distribution by the level of wages and salaries.

While using these data it was taken into consideration that the character of above mentioned distribution was quite stable in dynamics.

The data of one-time survey on the labor distribution by the level of wages and salaries are put in table 1. To evaluate the general amount and the average wage and salary by industries based on the survey data it was used the average monthly wages and salaries in each interval out of 20 intervals of the monthly wages and salaries levels. For the first interval (i.e. less than 35 thousand rubles) the average level was assumed to be equal to 2/3 of upper boundary, and for nineteenth interval (i.e. from 5000 to 20000 thousand rubles) – respectively closer to a lower boundary, and for twentieth interval – using expert's valuation of about 25000 thousand rubles (small number of respective group of workers results in a quite bare distortive influence to the selection of valuation).

Distribution of data in one-time survey by figures in the IO table is conducted based on following principles:

1) the number of intervals for labor distribution by the level of its remuneration is assumed unchanged and equal to 20, and labor distribution by those 20 intervals in each industry is assumed the same as in the one-time survey;

2) the differentiation of the average remuneration of labor in each interval between industries is set based on the difference between the average remuneration of labor in the survey data for April 1995 and the average remuneration of labor for the whole 1995 year in the data of IO table:

$$W(k, s, I-O) = W(S) + [W(k, I-O) - W(k, OB)], \quad (1)$$

where  $W(k, s, I-O)$  – average remuneration of labor in an interval  $S$  in an industry  $k$ , that is adjusted to data in IO table;

$W(S)$  - average remuneration of labor in an interval  $S$  of a scale adopted in the survey;

$W(k, I-O)$  - average remuneration of labor in an industry  $k$  based on data in IO table;

$W(k, OB)]$  - average remuneration of labor in an industry  $k$  based on survey data (it is calculated as a weighted average of labor remuneration in each interval where weights are number of employees that attached to corresponding intervals).

Therefore in this case it is assumed that proceeding to the next level of average remuneration of labor leads to a linear shift of the whole distribution of labor by the level of remuneration with corresponding change of the average remuneration of labor in each interval and with unchanged proportions of labor distribution between the intervals;

3) average monthly remuneration of labor in each industry in the data of IO table is determined as follows:

a) in case when household production in an industry is absent – the average monthly remuneration of labor was determined as a ratio of the indicator “Remuneration of labor” (without taking into account the payments to social security funds) in the IO table and the average number of employees, and divided by 12 (the number of months in a year);

b) in case when a part of an industry’s production is produced by households - the average monthly remuneration of labor was taken from related statistical report on 1995 (based on assumption that it can slightly differ from the average remuneration of labor in a “pure” industry).

The average number of employees in the industries of IO table of which output is partly produced by households was determined as a ratio of the indicator “Remuneration of labor” (average monthly remuneration of labor) and the average rate of remuneration of labor in a given industry.

Given that in the sector “Management” quite a significant part of employees is freed up from income taxes, the number of employees, wage-fund, and average remuneration of labor were taken from the corresponding statistical report.

The number of employees in the industry “Science and scientific services” was also determined with regard to the above mentioned statistical reports, because taking into account the data which can be found in IO table it is possible to assume that there is a high probability

to count the number of employees twice while distributing employees between the production of market and non-market services in this given industry;

4) Sometimes the sectoral classification of indicators in the survey data on labor distribution by the level of remuneration may be represented in a more aggregated manner rather than in the sectoral classification that adopted for this given research in the IO table (in particular, fuel industry, metallurgy industry, and transport). In order to calculate the average wage by intervals of the scale for each sub-sector of a particular industry the same approach was used as in the formula (1), where a part of formula in square brackets describes the difference between the average wage in a whole industry and the sub-sectors that constitute this industry.

The exclusion was made for “other fuel industry”, which is characterized by very low rates of wages and salaries. In this case the industry “Agriculture” was taken as a standard of distribution of labor by the level of its remuneration.

5) The calculation of income tax after putting figures on distribution of labor by the level of its remuneration in accordance with the IO table (see Table 1.1 through 1.4) was conducted based on the income tax rates that were in effect in 1995, namely:

12% of total income received in a calendar year in amount up to 10 000 000 rubles;

1 200 000 rubles plus 20% of income that exceeds 10 000 000 rubles;

9 200 000 rubles plus 30% of income that exceeds 50 000 000 rubles.

The results of calculations are represented in table 1.5. The “theoretical” value of tax (counted by rates that were actually in effect in 1995) imposed on the wage-fund was 48713 billions of rubles. In fact, the consolidated state budget of the Russian Federation has received 36574 billions of rubles as income tax from the “physical persons” (i.e. residing labor).

The deviation of “theoretical” value from the actual one can be explained by the following basic reasons:

a) differences in amounts of accrual and actually paid wages and salaries (in 1995 the growth of wage arrears in industry, agriculture, construction, and transport made up at 9180 billions of rubles, which equivalent to the shortage of about 1100 billions of rubles if estimated by current income tax rates);

b) numerous exemptions from income tax; the information of these tax exemptions by industries is lacking;

c) lack of coincidence in time between the accrual and actual payment of taxes (in particular, a part of taxes that was accrued in 1995 was actually paid in 1996, and a part of taxes that was accrued in 1994 was actually paid in 1995) etc.

There is no doubt that significant part of the difference between the “theoretical” and actual income tax paid to consolidated state budget is conditioned also by the low payment discipline and tax evasion.

#### **IV. The expert valuation of profit taxes from the angle of industries in the “input-output” table**

In 1995, the rate of profit tax subject to receipts of the federal state budget was accounted 13%. As regard to regional state budgets of the Russian Federation the regions have obtained the right to establish those tax rates for vast majority of types of economic activity in the interval of 0% to 25%, and for banks the interval was from 0% to 30% (in the mid-1995 these rates were changed and the interval for vast majority of types of economic activities was set from 0% to 22%, and for trade, banking and insurance the interval was set from 0% to 30%).

Due to above mentioned circumstances it is impossible to determine any “technological” rates of profit taxes in terms of industries’ “input-output”. Using figures of accounting reports it is possible to compare the amount of profits and amount of taxes to the state budget with the figures of production of goods and services counted in main prices from IO tables.

Relevant calculations are represented in table 2.

1. First of all the figure of profit per unit of main type of production is calculated. As it is known the total profit (i.e. total financial result in the balance) is the sum of total balance of sales of main products, total balance of sale of other items, and the balance of beyond-sales revenues and expenditures (rows 02 through 05 of table 2).

The figures of taxes may not be associated with the total financial result in the balance because in case of a loss the profit tax can not be accrued. Therefore as an initial indicator the value of total profit in the financial balance (before deducting losses) is used - row 05.

It is assumed that in case of **positive financial result of product sales** (row 08) the ratio of the gross profit from all types of economic activity to the total profit (row 08) is identical to financial result of product sales. This makes possible to evaluate the total profit from product sales (row 09) and to calculate its share (row 10) in the value of output using the accounting report data (i.e. costs of production of sold production, works and services, plus the financial result of product sales).

In case if the financial result of product sales is a *negative* value (as a rule, this corresponds with significant positive balance of beyond-sales revenues and the balance of

other items' sales), it is assumed that losses from sales are covered by other items, and the estimated amount of **gross** profit from the product sales is calculated as follows: (row 07) minus (row 02) plus (row 03). Such an approach is applied to "Agriculture and forestry", "Motor transport", "Other transport", as well as to "Housing and communal services and consumer services for population", and "Public education, culture and art".

The estimated share of gross profit in the value of output (row 10) is multiplied by output counted in main prices without counting household production of goods and services (row 17). This allows an opportunity to calculate total amount of profits that is subject to taxation by the industries of IO table.

2. Profit taxes in the accounting report data are represented as a part of indicator "Profit used" (row 11). In some cases, the indicator "Profit used" is quite significantly differ from the amount of total balance profit (for example, in coal industry and some other industries). Most probably it is due to the accounting of other receipts (particularly subsidies) under the item "Profit used". Therefore to evaluate the "normative rate of profit taxes" both ratios of profit taxes to total balance profit (row 12), and ratios of profit taxes to amount of profit used (row 13) are applied. As a final evaluation the minimum of those two ratios was selected and that minimum ratio was multiplied by the value of total profit per unit of goods and services produced by industries of IO table (row 18), and estimated result was reflected in row 19.

3. In the final report on financial results of economic activities of industries the data on the sector "Finance, credit and insurance" is lacking. The corresponding figure of profit taxes is obtained from the Report of the Russian Federation Ministry of Finance for 1995 on receipts of taxes to the consolidated state budget by the "Banking" sector. The total profit was conditionally estimated based on the tax rate of 25%. In the sector "Management (market services)" the figure of total profit per unit of produced goods and services and the corresponding amount of taxes were conditionally estimated based on the ratio that was estimated for the industry "Other types of activities on production of goods".