

ESTIMATION OF NON-OBSERVED ECONOMY: THE STATISTICAL PRACTICES IN RUSSIA

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The main aim of this paper is to introduce the Russian experience in estimating the non-observed economy. At present the Goskomstat makes adjustments only to hidden and informal activities. Adjustments to non-observed economy comprise about 22 – 25 per cent of the GDP of Russia. Macroeconomic data are adjusted in three stages: 1) estimation of output for individual industries (agriculture and trade are given here as examples); 2) balancing of the main accounts (hidden wages as an example); 3) compiling symmetric Input–Output tables (allowing us to find the disproportionality between production and use by individual groups of goods and services). The main tools are: a balancing method, estimation through reference indicators, a sampling method.

Non-recorded production, adjustments, sample surveys, balancing of accounts.

Introduction.

Estimation of the non-observed economic activities is of great importance for the Russian statistics due to large scale of this phenomenon in Russia. One of the natural features of the economy in transition is a faster implementation of new economic practices than the development of regulation mechanisms. Time is needed to develop a set of rules for economic activities and their reflection by statistics. Thus, one of the tasks of a statistical system is to account for events which are not yet subject to direct registration.

The State Committee for Statistics of Russia (Goskomstat) pays due attention to the work in this area. The national accountants in Russia have been the initiators and the coordinators of the efforts to estimate the non-observed economy in Russia.

In principle, the whole variety of adjustments undertaken in Russia to estimate non-recorded economic activities is based on the balance approach.

Comparison of the estimates on the supply side and on the use side is a core of the Goskomstat concept of the indirect calculations for obtaining estimates in various branches of statistics. For example, hidden wages and salaries are estimated at 10% of the GDP of Russia. This estimate was obtained by comparing officially reported wages and salaries, on the one hand, and household expenditures, on the other hand. Investments in capital assets are estimated with the consideration for their growth in constant prices, which, in its turn, is tied to the production growth in 'construction materials' and 'construction'. Adjustments for non-recorded imports are checked in the supply and use tables for the GDP. An important tool in revealing the unrecorded output is the construction of an Input-Output Table.

At present, Goskomstat in its macroeconomic estimates makes adjustments only for non-recorded economic activities, which are quite legal but are deliberately understated by economic agents or not recorded by statistical services due to their informal organization. Illegal economic activities are not yet considered by Russian statistics.

The upwards adjustment for the non-observed economy is approximately 22-25% of the GDP of Russia.

Adjustments for non-observed economy are made for all estimates reflecting various sides of the economy: production, income, consumption, accumulation, export, and import. The approaches to estimating non-observed economic activities are the most developed for the production approach towards obtaining the GDP estimates.

There is a three-stage approach to making these adjustments in computing the GDP:

- I. calculating output of individual industries;
- II. compiling and/or balancing the main accounts;
- III. compiling symmetric input-output tables.

I. Output estimates of individual industries

Estimation of output by industries of the economy is done on the basis of SNA 93 recommendations with the consideration for the specific conditions of the Russian economy.

For nearly every industry, data on production volumes are obtained through sample surveys of the enterprises in each sector of the economy and they are extrapolated to the entire population of enterprises on the basis of the information contained in the Register of Incorporated Enterprises. Then adjustments for the output of unincorporated enterprises and for the deliberately undeclared output are made. Informal and hidden activities are largest in agriculture and

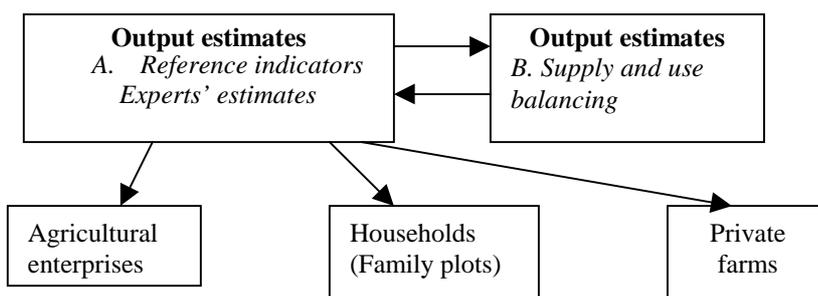
trade. Households (family plots) produce over half of the country's agricultural production. Adjustments for hidden output and informal activities in trade amount to nearly two thirds of the total output. That is why we have chosen these industries to demonstrate the approaches to estimating non-observed output.

I.1. Output estimates in agriculture.

Estimates of the output of agricultural products are obtained at the regional level. Total output of agricultural products in Russia is the sum of the output estimates of all the regions. Estimation is based on a combination of methods: using reference indicators and balancing of tables.

The total output of agricultural products (including hidden) is calculated as a sum of outputs of three types of producers: ***incorporated agricultural enterprises, households (family plots), and private farms.***

The chart below presents a scheme of calculations at the regional level.



A. Using reference indicators and expert's adjustments.

I.1.1. Output of agricultural enterprises

The output of agricultural products at agricultural enterprises is estimated on the basis of a full count statistical observation of incorporated agricultural enterprises and is adjusted for the non-recorded production volume. These adjustments could be done by using reference indicators, which indirectly characterize production volumes, and using expert's estimates of hidden production.

- To estimate the output of animal products the reference indicator is average *production per unit of forage consumed*.

As a rule, enterprises' accounts as well as their statistical reports contain rather reliable information on costs, while output is understated. On the basis of statistical reports of enterprises, forage use per unit of product's output in kind is calculated. This is then compared with the reference indicator derived from a rural household survey, where experts' adjustment for better husbandry of animals has been done. The estimated of output is obtained by multiplying the obtained indicator by the reported consumption of forage. The difference between this and the measured output is defined to be hidden production.

Milk output estimate at agricultural enterprises

		(arbitrary numbers)
1	Reported use of all types of forage by cows, <i>thousand tons of nutrition equivalent</i>	43,937.9
2	Reported output of milk, <i>thousand tons</i>	25,286.8
3	Milk yield, <i>weight per weight unit of consumed forage</i>	
	- according to the reported data (2:1)	0.58
4	- according to experts' estimates	0.61
5	Estimated output of milk accounting for non-reported production, <i>thousand tons</i>	26,802.1
6.	Adjustment coefficient for non-recorded production	1.06

Similar estimates are obtained for other kinds of animal products.

- To estimate the output of cereals and other crops the reference indicator is *the quantity of seeds required per hectare*.

The output of cereals and other crops taking into account non-recorded output is computed on the basis of statistical data on crops harvest and by the determination of the harvest of similar crops from land which is under cultivation

but is not reported. To estimate the non-reported areas of land under cultivation, we use statistical data on the consumption of spring crop seeds at agricultural enterprises, as well as data on average standard quantities of seeds per hectare in various regions. An excess of the estimated area under cereals and other crops over the reported area is defined as non-reported land under cultivation. Total cereals and other crops production is estimated on the basis of average actual yield per hectare and the estimated total area of land under cultivation including non-reported areas.

Such estimates are done for the main types of crops.

- Experts' adjustments are also used as it is assumed that a part of the actually produced output at agricultural enterprises is pinched workers at these enterprises for their own household consumption, and hence, was not recorded in the output. Adjustments for these amounts could be done using conventional coefficients.

Total output of agricultural enterprises including hidden production is obtained through a formula:

$$Vad = Vrec \times Kad, \text{ where}$$

Vad output of agricultural products in agricultural enterprises adjusted for non-recorded production;

Vrec recorded output of all agricultural enterprises;

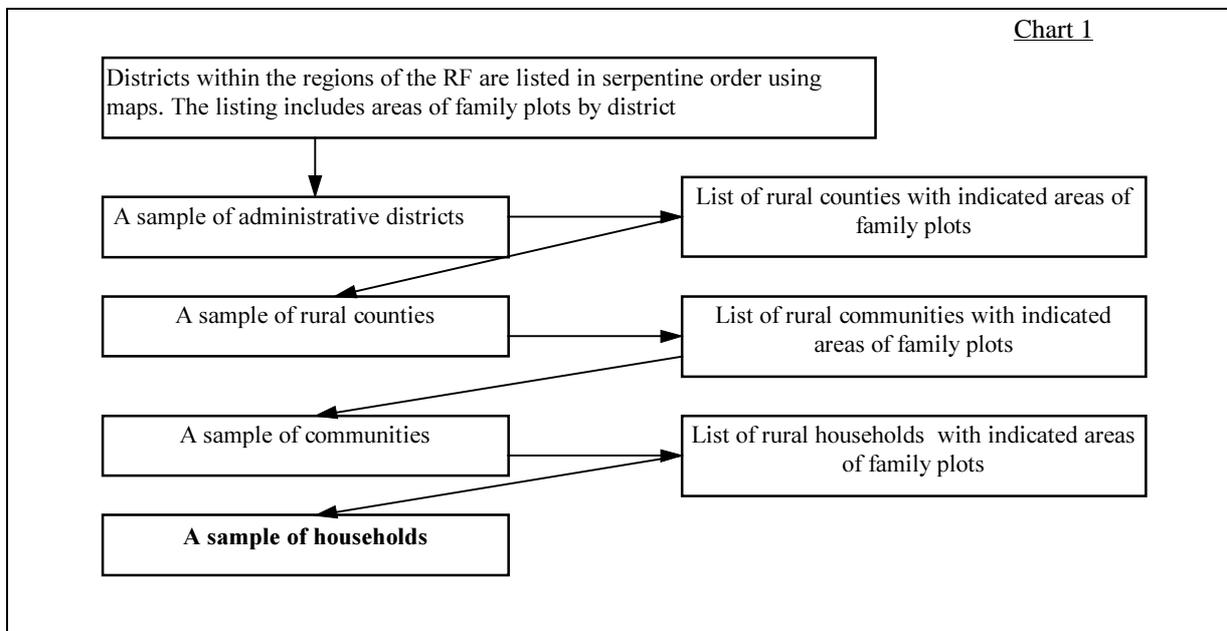
Kad adjustment coefficient for non-recorded production (a weighted average for the main agricultural products computed after products' valuation at selling prices).

I.1.2. Output of agricultural products from households (family plots)

As it was mentioned above, Russia has been characterized from observation by having characterized by a large share of agricultural output generated by households. The share of certain products reaches 90% (e.g. potatoes). The volume of agricultural products produced at family plots (informal sector) is estimated on the basis of rural household surveys. The administrative records of the rural district administrations, as well as data of the committees of Land Resources and Management are used as well. Approximately once in 10 years, censuses of cattle and land under crops in family plots are conducted.

Two groups of family plots are considered in estimating the agricultural output of the household sector:

- family plots of rural population;
- family plots of urban population.



Family plots of the rural population

The output of agricultural products (of both plant cultivation and animal husbandry) produced by the rural population in their family plots is estimated on the basis of sample surveys.

The four-stage probability sampling of rural households has been conducted. Lists based on Land Taxpayers Register were used as a sample frame. At each of the four stages (on a district, county, community, and household level) samples were selected with probabilities proportional to size, with the size measure being the area of a family plot (For sample design, see Chart 1).

The selection probabilities were determined by the relation of the sampling unit (a district, a county, a community, or a household) land area to the total land area at each stage. The rural household survey results were obtained using ratio, average, and probability estimators.

Family plots of the urban population.

The output estimates for agricultural products in family plots belonging to the urban population, which are not covered by the sample surveys described above, are obtained through economic computations.

Plant cultivation. Output is estimated on the basis of data on the area of land under crops in family plots, the crops structure by kinds of crops, and average crops yield in territories; these data are obtained through specialized household surveys.

Land areas under crops at country-side plots of the urban population are determined using the data of once-time full census along with information of the Land Resources and Management committees on increase or decrease in area in subsequent periods. The share of land under crops in newly allotted plots for the urban population is assumed to be the same as in the total area of plots known through the full count survey. After the area of land under cultivation is estimated, the structure of land use by kinds of crops is calculated. These estimates are based on the crops structure determined through the last census. The harvest estimates for different kinds of crops are obtained as a product of the average yield in this territory and the estimated area of land under crops.

Thus estimated outputs of the main kinds of plant-growing products are valued at average market prices.

Animal husbandry. Output is estimated on the basis of data collected through specialized household surveys, the last cattle census taking into account the changes in cattle population taken from annual surveys. According to the data collected through the household surveys (of family plots), average yields of animal products per head of different kinds of animals are estimated (beef per head of cattle, etc.). The production volume of animal products (by products) in households of urban population in the reporting period is a product of the estimated average yield per head of animal and the estimated animal population (by kinds).

The table below gives an example of estimation of animal products output in households (arbitrary numbers)

	Animal and poultry population at the beginning of the reporting period, thousand heads	Average product yield per animal head (according to the survey), kg	Total production of animal products, (1) x (2) tons
	1	2	3
Cattle	407.7	8.78	3,579.6
of which cows	219.4	-	-
Swine	129.0	18.91	2,439.4
Sheep and goats	456.6	2.02	922.3
Poultry	5,759.2	0.27	1,555.0
Milk	ō	544.78	19,524.7
Eggs, pieces		80.66	157,940.3

Estimates of total output of agricultural products generated by rural and urban households in the region are computed after obtaining the results for rural and urban households, and adjustment for agricultural production in individual and collective gardens and kitchen gardens, and at plots allotted for building individual houses.

I.1.2. Output of agricultural products at private farms.

It should be mentioned here that, at present, private farms in Russia contribute only about 5% of the total output of agricultural products

Information on the production of agricultural products at private farms is obtained through sample surveys. Selection has been made using the sub-register "Peasants' farms" as a sample frame. Such variables as 'land under main crops'

and 'animal population (by types of animals)' were used as stratification factors. From time to time, full censuses of agricultural activities of private farms are conducted.

The survey results are obtained by summarizing the sample results (using a simple mean), which are adjusted for hidden (understated) production. Here, the same adjustment coefficient is used, which has been calculated for agricultural enterprises.

Valuation of output. After estimating physical volumes of production for agricultural enterprises, family plots, and private farms, their valuation is done. The valuation of output in actual prices for each category of agricultural units is done directly, by valuating main agricultural products in the reporting year using average selling prices. Valuation of output of fodder crops, growing perennial plants, and unfinished production is done on the basis of current costs per unit of product.

$$\begin{aligned} \text{Total output of agriculture} &= \\ &= \text{output of agricultural enterprises} + \text{output of households} + \text{output of private farms} \end{aligned}$$

B. Balancing supply and use tables

The output estimates obtained through the procedures described above are checked by compilation of the supply and use tables.

Annually, commodity flows (in physical units) are compiled for grain, processed grain products, potatoes, vegetables, melons, fruit, meat and meat products, milk and dairy products, and eggs. These flows are compiled in accordance with the following pattern:

Row	Items
	I. Supply
01	Stocks at the beginning of a year in the agriculture, food industry, and wholesale and retail trade
02	Production of agricultural products in agriculture
03	Import
04	Total supply (01+02+03)
	II. Use
05	Intermediate consumption (seeds, forage, and other non-food purposes)
06	Losses
07	Exports
08	Household consumption (04-05-06-07-09)
09	Stocks at year end

All these items are analyzed for the changes in volumes on a year-on-year basis, and balanced between themselves and with the indicators obtained from statistical records. Food consumption of households calculated from supply and use tables is compared with the household survey data on food consumption. When the comparative analysis is done, decisions are taken regarding the adjustments of supply estimates of food products, including estimates of production volumes. The estimated output of agricultural products in physical units is then valued at average market prices.

I.2. Output estimates for trade industry with the account for hidden and informal activities

The development of market activities in Russia has led to a significant growth in trading activity. Trade comprises 20% of the GDP of Russia, and small businesses and individuals, who act without appropriate registration and licenses, generate almost half of the trade's value added.

Output estimates for the 'retail trade' are done at the regional level. The total national estimate is the sum of the regional outputs.

Computing the output is based on estimating wholesale and retail turnover of large, medium-size, and small incorporated businesses, and the sales volumes of registered and unregistered individual entrepreneurs. As a rule, the

activities of individual entrepreneurs are concentrated at food and dry-goods markets. A description of retail turnover estimation is given below. The procedure for wholesale turnover is similar.

I.2.1. Estimation of retail sales

I.2.1.1. Incorporated trading enterprises and registered individual entrepreneurs.

The retail sales of large and medium-size retail enterprises is estimated on the basis of full count statistical observation, while small retail enterprises are subject to sample surveys. The retail sales of individual entrepreneurs, who are listed in the State Register as retail traders, is added to the sales of small enterprises. The volume of retail sales of these individual entrepreneurs is computed by assuming the same average revenues from trade per person as for employees of small enterprises.

The coverage of retail enterprises by statistical observation may be incomplete, and the reported sales volumes may be deliberately understated. Estimates of sales that are deliberately hidden or are missed due to incomplete coverage of formal sales are obtained by comparing the reported total sales of large, medium-size, and small retail enterprises with receipts of trade revenues by banks and with household expenditures on food and non-food items.

According to 1991-1995 data, bank receipts of trade revenues were approximately 50-60% of the retail sales of the trade enterprises. The difference is due to cash salary payments to employees, cash payments for goods from individuals, and other cash expenses. The trade revenues index in constant prices (obtained by deflating revenues by CPI for the reporting period) is compared with retail sales index in constant prices and with changes in household expenditures. Taking into account the economic environment, the most appropriate index for adjustment of trade sales is then decided, and a revised *sales volume* is calculated.

I.2.1.2. Sales of food and dry goods markets

Estimates are obtained from sample surveys of the markets. In each region, in the middle of a quarter (one week-day and one week-end day) one or two city markets are surveyed. Sellers are interviewed on prices and quantities of goods sold. These markets employ individuals with and without licenses for retail trade. The total number of sellers is estimated as an average resulted from computations of two kinds:

- first, once a month, markets administrators shall provide to statistical bodies the number of markets in the region, and the number of sellers;
- second, the number of sellers is computed as a total sum of charges for renting trading space divided by charge for one space.

The total volume of sales at these markets is computed as the product of number of sellers, average sales per seller per day, and the number of trading days in the period in question.

1.2.2. Supply and use tables for consumer goods

In order to estimate more accurately the total (wholesale and retail) volume of sales, *supply and use tables are compiled* for 100 groups of consumer goods of high demand.

Those goods whose sales are estimated in kind are valued at average market prices computed from statistical data. The total estimate for all goods is computed by applying an adjustment coefficient to the sales volume estimated for 100 groups of consumer goods. This coefficient is based on the structure of household expenditures for purchasing goods derived from input-output tables.

This preliminary estimate of sales volume estimated by methods described above is checked by compiling commodity flows scheme of which closely resembles supply and use tables. Its scheme is given below:

	Items	Source of data
01	Stocks in the industrial sector, in retail and wholesale trade at the beginning of the period	statistical form No. P-1, estimate
02	Production	statistical form No. P-1
03	Imports	Customs statistics, estimate
04	Exports	Customs statistics, estimate
05	Stocks at the end of period	statistical form, estimate
06	Total resources for sale	01+02+03-04
07	Sales	06-05

The value of industrial goods in producer price is converted to purchaser price on the basis of producer price to purchaser price ratios from input-output tables.

The value of imports CIF is converted to domestic purchaser prices using an "efficiency coefficient" computed as the ratio of domestic purchaser price to the contract price of buying the goods abroad (converted to rubles at the average exchange rate of the Central Bank of Russia).

1.2.3. Output estimate.

The output of the trade industry is computed independently for each type of business (large, medium-sized, and small enterprises, and markets) using sales volumes estimates and *trade margins*. The trade margins for large and medium-size enterprises are obtained from statistical data, and for small businesses and individual entrepreneurs from surveys and experts' estimates.

II. Compiling and balancing the main accounts

When national accounts are compiled for Russia, the data for the production and consumption of goods and services at the level of industries, which are received from various sources, are brought together and adjusted. These adjustments deal mostly with data for services, as data received from users of services are usually more reliable than those received from producers. At the same time an adjustment is made for hidden income and mixed income.

It is a wide spread phenomenon in the Russian economy, that considerable sums actually paid by the enterprises, organizations, and private employers to employees are not reported with the purpose of tax evasion or for other reasons.

	Estimated share of undeclared wages in total wages	Estimated share of undeclared wages in GDP
1993	11.9	5.3
1994	17.3	8.5
1995	23	10.4
1996	23.5	11.7
1997	24.2	11.9
1998	24.1	11.9

The estimation of the total compensation of employees accounting for hidden income is done on the basis of current statistics on wages and salaries and the estimates of hidden income. Hidden income is estimated as a difference between all household expenditures, including changes in financial assets, and registered income. At present, household expenditures greatly exceed the disposable income estimate.

The following household income is considered registered income;

- primary income, including compensation of employees and social insurance charges, mixed income, and net income from property,
- secondary income, including balance of money transfers from various sources,
- balance of capital transfers.

Compensation of employees is obtained from regular official statistics, plus information on the execution of the state budget, and on off-budget funds for social insurance charges.

Mixed income is gross value added generated by households (after tax on production) from agricultural products, construction, including own construction, trading at food and dry-goods markets, and providing paid services of various kinds (industrial, domestic, legal, educational, medical, cultural, etc.)

Household expenditure comprises:

- taxes, fees, donations as redistribution of the secondary income;
- expenditures for final consumption, including expenditures for buying goods and services at markets and consumption of own produced goods or goods received as payment in kind or through humanitarian aid;
- accumulation, including investments in fixed assets - real estate, animals, increase in inventories, and net acquisitions of valuables and land;
- increase in financial assets.

Household expenditures for final consumption and accumulation are estimated on the basis of the data on retail sales volume, volume of paid services to households, construction of individual houses.

To estimate hidden income, an estimate of increase in financial assets is done, which includes:

- increase in cash savings in households in national currency;
- increase in cash savings in households in hard currency;
- increase in bank deposits by households;
- increase in value of securities owned by households;
- increase in government arrears on wages and pensions;
- increase in arrears on commodity credits.

This list does not include several items of increase in value of assets, in particular, does not include increase in households' stakes in business (except for shares), as well as capitalized investments in pension funds or insurance companies. The Goskomstat does not have information on these assets. However, lack of these data does not impact much the general macroeconomic estimate, as volumes of these assets are not large yet.

The increase of cash savings in hard currency by households is estimated as the difference between sales and purchases of hard currency by the population with an adjustment for sums spent abroad to buy goods with the purpose of reselling them in the domestic market, and net purchases of residents abroad. This estimate is rather approximate, as movement of hard currency cash is reflected only at the moment of its conversion from rubles into dollars and back, which is not in compliance with the SNA requirements for determining of the moment of property rights transfer for the assets. Besides, hard currency movement is related not only to selling and buying cash, but to paying wages in hard currency, import and export, and changing balances in hard currency accounts.

The increase in households' bank deposits comprises an increase in deposits in Sberbank and in commercial banks, and an increase in transactions using plastic cards. The increase in the value of securities held by households, includes increase in domestic loans of 1982 and 1992, bonds issued by the USSR and Russia, and shares. At present, data is not available for the secondary securities market, only purchases in the primary market are estimated.

Balancing of household income and expenditures is done both in current and constant prices, that is with account for changes in constant prices. A difference between income estimates obtained as a result of balancing with expenditures and registered income is defined as hidden income.

III. Compiling Input-Output Table

Compiling input-output tables allows us to determine the out discrepancies between production and use of various groups of products. Based on the analysis of production, import, intermediate consumption, and final use the necessary adjustments are introduced. Balancing at the level of certain product groups allows us to obtain more accurate estimates of supply and use in the country's economy. When an input-output table is compiled, the most serious adjustments are introduced in the estimates of middlemen activities, transport margins, production of crude oil and oil products, gas, and electricity. When middlemen activities and transport margins are estimated, special attention is given to the relation of producer and purchaser prices for products, and to commodity flows from

producers to purchasers. Fast decentralization of all mechanisms of macroeconomic regulation in the economy, a high-speed denationalization of the state sector of the economy accompanied by the remaining monopolization created favorable conditions for free pricing and establishing a great number of middlemen. Some commodities pass through up to 30 intermediaries in their movement from producer to end-user. Because of shortages in the money supply and an increase in payment amongst producers, there has been an increase in barter, payments in hard currency, and provision of tax exemptions.

After the completion of input-output tables, national accounts estimates are adequately adjusted.

IV. Further improvements in estimation of non-observed economy.

In 1999, Goskomstat tested a technique for estimating the non-observed economy proposed by Italian statisticians. Estimates of output in each of five industrial groupings (manufacturing, agriculture, transport, construction, and trade) in Bryansk oblast (region) have been computed using the labor input method. Data on labor costs and production per employed person were obtained from regular statistical observation of large and medium-size enterprises and through pilot surveys of households and small businesses.

First, the estimate of number of employed persons in accordance with the household survey was compared with the number of employees at enterprises and organizations reported by statistics. For further calculations the most reasonable number has been chosen.

Then, the estimated number of employed persons was allocated to large, medium-sized and small enterprises in the same proportions as for the data obtained from the enterprises statistics..

The number of employed persons is considered in five groups: employees at registered enterprises (including government organizations); persons employed at agricultural enterprises and farms; persons employed at unincorporated enterprises; persons hired by physical persons, and self-employed persons.

Productivity estimates (output per employed person) have been used to obtain the output estimates. The productivity of small enterprises and of self-employed persons has been assumed to be the same as the productivity measured by the survey of small enterprises. For large and medium enterprises the productivity has been computed from statistical data. .

The results for the five industrial groupings have been compared with those obtained during the calculation of the gross regional product (GRP) by the methods currently employed in Goskomstat (obtaining output estimated for agriculture and trade is described in this paper).

	Industries	Output (using survey results) mil rub	Output (using current methodology of GRP estimation), mil rub	Comparison of results (2:1) %
		1	2	3
1	Manufacturing	1538.6	1543.6	100.3
2	Agriculture	338.5	596.2	176.1
3	Construction	276.1	368.3	133.4
4	Transport	510.7	667.9	130.8
5	Trade	383.5	423.0	110.3

Analysis of the differences between the obtained estimates and the GRP calculations allows us to assume that, to a large extent, they could be explained by differences in methodology.

We see that for manufacturing, the figures are almost identical.

For agriculture and construction, the GRP figures are much larger because they include production of households for own consumption.

For transport, adjustment for hidden and informal activities in the GRP figures is made at the federal level and allocated to the regions in proportion to value added. The inapplicability of this model to Bryansk region could be the reason for the larger GRP figure.

For trade, the assumption that self-employed individuals have the same productivity as employees in small enterprises is questionable and might explain the difference.

If we carried out these estimations using a unified methodology for output calculation, that is, if we included in output of agriculture and construction own produced goods for household consumption, and introduced the necessary changes in the productivity estimates of individual traders, the results obtained by two methods may have been closer.

Experimentation with the suggested methodology was also carried out for estimating 1997 output for 13 industries in Tatarstan. The analysis of the results for Tatarstan supported the considerations that occurred when we compared the production volumes in Bryansk oblast estimated by two methods.

It was confirmed that the proposed method of using data from labor market surveys together with data from statistical observation for estimating the non-observed economy provides reasonable estimate of outputs of the main industries in the region, however, adjustments are needed due to peculiarities of some industries (agriculture, construction, trade).

Together with certain advantages of this method, such as estimating the output generated by self-employed, there are some disadvantages in applying it to enterprises caused by the peculiarities of the economic environment in Russia. The conducted survey once again demonstrated that Russian businessmen, for tax evasion purposes, understate not only the production volumes but the number of employees. It is characteristic for both large and small enterprises, including banks. These calculations once again drew attention to a problem of estimating productivity (output per employee). Here we have discrepancies between the production volume and the number of employees who produced these volumes.

In order to get additional information on the expansion of non-observed economy in Russia and its scope in various industries, research work on new methodological approaches to its estimation has been undertaken. Within this research project, it was suggested to conduct a sample survey of tax inspectors, officials from the economic departments of the regional administrations, auditors, managers of the enterprises, recruiting agents by interviewing them on their quantitative estimates of the scope of the hidden economy in various sectors. It is suggested to assess the size of deliberate understatement of income. Comparing these estimates with the results of the periodic checks done by the tax services will allow drawing more reliable conclusions.