Assessment of gross urban product in Russian cities and its contribution to Russian GDP in 2000-2015

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Abstract

The article presents a new methodology for estimating gross urban product (the gross domestic product by city or metropolitan level) in Russia under extremely low statistical data availability about economy performance at the local level. These estimates provide new analytical instruments for assessing disparities in economic development between more than 1,000 Russian cities and other areas, and cities' contributions to GDP as well as for comparing indicators of Russian cities with those of foreign countries.
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1. A methodology for measuring gross urban product

Contemporary economic growth is based on innovation, science, and developing new areas of economic activity, which are concentrated primarily in cities. Russia is facing an important challenge for developing methodological tools to measure the gross domestic product by city or metropolitan level and adapting them to the national statistical system.

Gross domestic product (GDP) is the sum of the market value of goods and services produced in an economy, such as a metropolitan area, country, or the world. GDP of national economies is measured by constructing a system of national ac-

counts[1] that consist of detailed information about such indicators as production, consumption, savings, and investments. GDP is usually estimated by comparing any economic performance indicator at regional (state), city, or metropolitan level (such as incomes or value added by industries) with an analogous indicator by national level. For example, the U.S. Bureau of Economic Analysis annually produces GDP by state and metropolitan area[2] statistics using Local Area Personal Income (LAPI) data. Because earnings (wage and salary disbursements, supplements to wages and salaries, and proprietors' income) usually represent over 60% of GDP by industry in the U.S., they are considered as reasonable indicators of relative levels of economic activity for most industries across geographic areas.[3]

Although several publications have attempted to measure GDP by city or metropolitan level (hereinafter, gross urban product, or GUP) in order to tackle this challenge with respect to Russian cities (see, e.g., Chekavinsky and Gutnikova, 2012; Kolechkov, 2014; Krinichansky, 2013), Russia is still at the initial stage of developing valid measurement tools from both methodological and methodical points of view. Foreign research on GUP measurement is more extensive (see, e.g., Dobbs et al., 2011; Zhang, 2011; Cadena et al., 2012; Dobbs and Remes, 2012; Parilla et al., 2014; Litynski, 2016). Because the Russian state statistical framework lacks a system to account for the gross value added of companies, sectors of the economy, and other components essential for measuring the gross product of the urban economy, a measurement methodology must be proposed based on available municipal statistics.[4] To ensure an acceptable level of comparability between the GUP of Russian cities and the country's GDP, we need to select a GDP measurement approach used in the System of National Accounts (SNA) methodology that would be most effectively applied to Russian municipal statistics, from the following:

- production approach (based on aggregate value added across all industries [gross output less intermediate consumption] and net taxes on products);
- expenditure approach (based on consumption, savings and investments, government spending, and net export);
- income approach (based on employee compensation, gross corporate profits, gross mixed income, and taxes less subsidies on production and import).

We now consider the usability of these approaches in measuring GUP. It should be noted that we are not dealing with a direct GUP calculation by building a system of accounts (akin to the national accounts) for urban economies, but rather with a methodology for measuring GUP based on aggregated components, similar to the GDP.

The first approach requires compiling a production account to calculate the gross value added generated by each sector of the economy as the difference

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[1] The System of National Accounts (SNA) is the internationally agreed-upon standard set of recommendations on how to compile measures of economic activity. The SNA describes a coherent, consistent, and integrated set of macroeconomic accounts in the context of a set of internationally agreed-upon concepts, definitions, classifications, and accounting rules. Source: https://unstats.un.org/unsd/nationalaccount/sna.asp

[2] A metropolitan statistical area is a standardized county-based area having at least one urbanized area with a population of 50,000 or more plus adjacent territory that has a high degree of social and economic integration with the core as measured by commuting ties (official definition of the Office of Management and Budget).

[3] See detailed methodology description here: https://www.bea.gov/regional/methods.cfm

[4] Pursuant to Section 1.33 Municipal Statistics of the Federal Statistical Plan (approved by Russian Government Decree No. 671-r, dated May 6, 2008, as amended), official statistics are being compiled (falling within the competence of the Federal State Statistics Service [Rosstat]) with a breakdown by municipalities. The statistical database descriptive of the condition of the economic and social environment of a municipality, which provides data on each of the 22,800 municipalities (as of January 1, 2015), is based on statistics compiled in respect of municipalities.

between gross output and intermediate consumption within a sector (based on the 16 sections in the All-Russian Classifier of Economic Activities [OKVED]). Rosstat's municipal statistics impose the following limitations on using this approach for GUP measurement:

- indicators that can be used as proxies for gross output are only available for 5 of the 16 OKVED sections (accounting for 43% of GDP per 2015 data): mining and minerals; manufacturing; electricity, gas, and water production and distribution; construction; wholesale and retail trade;
- no data are available on intermediate consumption;
- no data are available on net taxes on products.

Table 1 represents data on the share of cities (there are 1,054 cities[5] in the database, accounting for 96% of all Russian cities in 2013) for which gross output data are available on these five sectors between 2000 and 2013. Data on the manufacturing sector, responsible for 13% of the GDP, are available for 15% to 37% of the cities, but only for 2005–2013, and 50% to 80% of the cities for other sectors.

Thus, the *first* approach can only be used if additional calculations are made with respect to at least half of the economy. Moreover, due to a complete lack of data on intermediate consumption, assumptions need to be made regarding the share of value added in the gross output of urban economies for the national economy as a whole (with a breakdown by sectors). This calls for an assumption (quite a strong one) regarding equal productivity in the sectors in different cities, both large and small.

The *second* approach is based on calculating consumption and savings in all institutional sectors, as well as net exports. As mentioned above, municipal

Table 1

Cities for which municipal statistics are available, 2000–2013 (% of the total number of cities).

Year	Products produced and shipped, works and services performed			Wholesale and retail trade (excluding small business entities)	Works performed under *Construction* activity
	Manu-facturing	Mining and minerals	Electric power, gas, and water production and distribution		
2000	0	0	0	77	77
2001	0	0	0	79	80
2002	0	0	0	78	78
2003	0	0	0	73	81
2004	0	0	0	69	74
2005	37	81	81	72	76
2006	38	86	86	70	71
2007	37	78	79	74	70
2008	37	88	89	66	67
2009	32	80	80	65	60
2010	31	82	82	62	58
2011	27	76	75	60	54
2012	19	75	70	57	51
2013	15	67	64	57	47

Source: Rosstat's *Economies of Russian Cities* database: *Multistat* multipurpose statistical portal, http://www.multistat.ru

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[5] Hereinafter, the term "city" refers both to cities and towns.

statistics lack data on both corporate consumption (intermediate consumption) and household expenditure, government spending, and nonprofit organization consumption. Savings can only be measured using one municipal indicator—deposits on ruble accounts with Sberbank; however, these data are limited to a portion of total observable savings. Export and import are only calculated for the entire economy and reflect trade turnover with the *Rest of the world* sector.

Measuring GDP using the *third* approach calculates the aggregate incomes across three institutional sectors: households, corporations (including nonprofit organizations),[6] and the government.

Household incomes are expressed by the *Employee Compensation* indicator (including labor compensation and mixed incomes not observed using direct statistical methods), including:

a) wages (including personal income tax);

b) employer contributions to social security funds;[7]

c) unobservable (hidden) incomes.

Municipal statistics can be used to measure the first component, that is, aggregate wages (including personal income tax) that constitute the payroll of organizations located within cities,[8] per the following parameters:

- average number of employees in organizations (excluding part-time contractors); and
- average monthly wages of employees, in rubles.

Next, to estimate the employee compensation at the city level, we need to remeasure this indicator (the payroll of organizations located within cities) by adding employer contributions to social insurance and medical insurance funds, the Russian Pension Fund, and unobservable (hidden) incomes.

To calculate employer contributions to the social insurance and medical insurance funds and the Russian Pension Fund, we use the ratio of these aggregate national annual contributions to the national aggregate payroll (wages including personal income tax). Because the rates of contributions to those funds are not fixed relative to payroll (contributions to the Russian Pension Fund are subject to regressions; certain types of organizations pay smaller contributions or do not pay at all), we need to first determine the average ratio of national aggregate contributions to national aggregate payroll. Thus, standard rates of employer contributions to those funds are about 30% of payroll (22.0% to the pension fund, 5.1% to the compulsory medical insurance fund, and 2.9% to the social insurance fund), while certain categories of payers enjoy reduced insurance contribution rates, which effectively vary from 7.6% to 20.0% of the payroll.[9] Furthermore, no contributions are accrued with respect to wages exceeding certain set limits.

Unobservable income, according to Rosstat's calculations and other expert estimates, accounts for about 25% to 30% of employee compensation less employer contributions.

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[6] As well as an insignificant share of unincorporated companies owned by households.

[7] These are the pension, compulsory medical insurance, and social insurance funds.

[8] It is not clear from Rosstat's methodological guidelines (http://www.gks.ru/dbscripts/munst) whether the average number of employees in an organization is determined based on organizations located in a municipality (regardless of the registered organization address) or based on organizations registered in a municipality (regardless of actual organization locations).

[9] http://www.buhsoft.ru/strahovye-vznosy-v-pfr

Table 2
Estimates of average ratio of aggregate employer annual contributions to payroll, 2015.

Fund	Aggregate annual contributions, RUB billion	Average ratio of aggregate annual contributions to payroll, %
Pension Fund	3864.4	16.0
Social Insurance Fund	545.2	2.3
Compulsory Medical Insurance Fund	789.1	3.3
Total	5198.7	21.6

Sources: Main guidelines of the fiscal policy for 2015 and for the 2016–2017 planning period; Budget of the Federal Compulsory Medical Insurance Fund; Budget of the Russian Federation Social Insurance Fund; Russia Pension Fund website, http://www.pfrf.ru/opendata

Table 2 contains data on the absolute values of aggregate annual contributions to social insurance and medical insurance funds and the Russian Pension Fund (according to the respective fund's data), as well as the average ratios of these annual contributions to the payroll in 2015. The ratios were calculated using simultaneous calibration of absolute values of these contributions and Rosstat's data on employee compensation for 2015 with the share of unobservable incomes. Such calibration takes into account the non-linear nature of insurance contribution rates described above. In addition, the calibration determined the proportion of unobservable incomes to be 27% of employee compensation less employer contributions (corresponding to available estimates), while payroll, calculated as 73% of employee compensation less social employer contributions, was RUB 24.1 trillion in 2015.

Thus, *employee compensation* by each city is measured in three stages:
- payroll based on municipal statistics;
- adjusted by adding social contributions (payroll increased by 21.6%);
- adjusted by adding unobservable income (payroll increased by 37% $[(1/0.73)-1]$).

Next, we consider the possibility of measuring two additional components of the GDP as they apply to the municipal and metropolitan areas level: *Gross profit in the economy and gross mixed income* and *Net tax on production and import.*

Gross profit represents the portion of value added that producers are left with after deducting expenses for employee compensation and net tax on production and import. This item measures profits (or losses) received from production before the payment or receipt of income from property. Gross profit in the SNA (unlike profit from sales reported in Russian accounting statements) does not contain labor compensation components, which are included, according to the SNA methodology, in labor compensation, above-limit payments for business trips, hospitality, and other expenses; does not include profit received by asset owners due to appreciation; and includes the consumption of fixed capital. For unincorporated enterprises owned by households, this item contains the work compensation component that cannot be deducted from the income earned by an owner or entrepreneur. In this case, it is called *gross mixed income.*[10]

Municipal statistics contain the indicator of the *net financial result,* that is, profit (+) or loss (–) for organizations (excluding small businesses) across all types of activity. This indicator totaled RUB 8.4 trillion for the entire economy in 2015,

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[10] Methodological explanations to compiling the System of National Accounts, http://www.gks.ru/free_doc/new_site/vvp/metod.htm

or 25% of the gross profit of the economy and gross mixed income. However, it is unclear how the other 75% is estimated. We do not presume that viable estimates of contributions at the municipal and metropolitan areas level can be obtained from the net financial result in this case.

The third GDP component is *net taxes on production and import.* The budgetary statistics kept by the Federal Treasury can be used to measure this indicator only for urban districts, and for Moscow and St. Petersburg, but cannot be used for urban settlements as well as for cities within urban settlements.[11]

Based on the described analysis, the simplest and most reliable method for measuring GUP is based on the estimation of employee compensation with a subsequent extrapolation to the GUP indicator, subject to the assumption that labor compensation represents a fixed proportion of GUP in each city. The proportion of employee compensation relative to GDP depends on numerous factors, such as the economic structure, production technologies, the productivity of production factors including labor and capital, and competition in various markets (other things equal, the stronger the competition, the lower the profits). It can be assumed that, in cities, employee compensation as a proportion of GUP is lower than on average in the economy and in rural areas because cities accommodate more profitable activities (including the financial sector and services), while in rural areas, public sectors have a greater share of the economy. However, determining the GUP structure based on income sources requires a separate study.

In 2015, employee compensation was equal to 45.0% of GDP across the economy, while, for example, it represented 37.5% of Moscow's gross regional product (GRP).[12] At this current stage, we propose using the average share of employee compensation in GUP in calculations based on the mean value of the proportion of employee compensation relative to Moscow's GRP and employee compensation as a percent of the GDP (Table 3).

Because the amount of statistics is limited, the proposed approach can be used to obtain the most accurate measurement of the share of cities and metropolitan areas in GDP because the share of employee compensation in GUP is the *only* indicator in the official statistical system that:

- offers complete data (across all cities), enabling a direct, rather than indirect, measurement;
- characterizes all sectors of the economy;
- reflects a substantial portion of the GDP (45% in 2015);
- is calculated in accordance with the SNA methodology, ensuring comparability with the analogous indicator in the GDP structure; and
- offers greater reliability compared with gross profit and gross mixed income indicators, which have significant artificial adjustments, as accounting data do not reflect the economic reality with sufficient accuracy.

The limitation of this approach is the assumption of a stable income structure in each city across the three institutional sectors mentioned above. To overcome

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[11] According to the legislation, all the municipalities in Russia are subdivided into the following types: municipal districts, urban districts, urban settlements, and rural settlements. Urban settlements include the main city and may include other cities and urban-type or rural-type localities, as well. The cities of Moscow and St. Petersburg have the status of the subject of Russian Federation (region).

[12] In Russia GRP is a GDP indicator by regional level calculated by Rosstat across all Russian regions according to the methodology similar to the SNA one.

Table 3

Proportion of employee compensation relative to Russia's GDP and Moscow's GRP, and estimated employee compensation as a percent of GUP, 2000–2015 (%).

Year	Employee compensation as % of GDP	Employee compensation as % of Moscow GRP	Estimated employee compensation as % of GUP
2000	40.2	21.5	30.9
2001	43.0	22.9	33.0
2002	46.8	24.9	35.9
2003	47.2	27.1	37.2
2004	46.1	25.1	35.6
2005	43.8	25.4	34.6
2006	44.5	24.1	34.3
2007	46.7	26.6	36.7
2008	47.4	30.4	38.9
2009	52.6	34.2	43.4
2010	49.7	32.2	40.9
2011	43.9	32.6	38.2
2012	44.2	35.1	39.7
2013	46.7	36.3	41.5
2014	47.2	37.5	42.3
2015	45.0	37.5	41.3

Sources: Rosstat; Mosgorstat; authors' calculations.

this in the future, we need to measure g*ross profit and gross mixed income* and *net taxes on production and import.* Thus, to include the contribution of cities to the GDP (or GUP) indicator in the official statistical system, we need to change the statistical accounting used in public and corporate finance.

2. GUP in Russia and other countries

GUP in Russia was measured based on the methodology described, broken down by the 1,054 cities for which the respective data are available for the period from 2000 to 2013.[13] GUP estimates for 2014 and 2015 are based on employee compensation by city and metropolitan area (MA) level calculated as employee compensation estimates for 2013 multiplied by the employee compensation growth rate across the national economy in 2014 and 2015, relative to 2013. The resulting estimate was used to calculate the GUP for all cities under review except Moscow and St. Petersburg, for which official GRP data were used.

To measure the contribution of various cities to GDP, we used their typology, taking into account a given city's population, its socioeconomic function relative to surrounding territories, and its economic structure.[14]

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[13] The list of Russian cities totals 1,112. The population of 58 cities for which data were not available is less than 1% of total population of cities, so this inaccuracy could be flung aside. In addition to cities, the Russian urban population contains 1,192 urban-type settlements, usually with a small population. The total population of such settlements is 7,171,000, or 4.9% of Russia's population. Urban-type settlements were not included in the following analysis.

[14] The presented typology of cities was compiled for the research objective at hand, with a view toward ensuring the comparability of the resulting GUP estimates with other countries, where large metropolitan areas, other large cities (usually with populations exceeding 100,000), and other cities are usually selected. For other cities, it was proposed to select single-factory cities, as a large group of Russian cities specific in terms of its economic structure. The aggregate contribution of various groups and types of cities can also be measured based on other groups and typologies, depending on the research task at hand.

1. Cities in major MAs (with population at least 1,000,000). Twenty major MAs with an aggregate population of around 49 million meet this criterion, accounting for about half of Russia's total urban population, or 33% of its total population. At the same time, around 40 million people live in the 10 largest MAs with population exceeding 1.5 million. In addition to the Moscow and St. Petersburg MAs, they include those with interregional centers as their nodes, whose influence stretches beyond the respective Russian Federation subjects (e.g., Yekaterinburg, Novosibirsk, Rostov-on-Don). Other urban nodes of such MAs (Kazan, Nizhny Novgorod, and Samara) also show development potential as interregional centers.

2. Big cities — regional centers (populations between 100,000 and 1 million). These cities are multi-industry regional centers located outside major MAs. This group of cities also includes regional subcenters (cities with the second and third largest populations in a given region).

3. Medium and small cities — local centers (populations below 100,000). These cities are multi-industry local centers located outside major MAs.

4. Company-towns outside major MAs. The composition of this group is determined based on the official list of company-towns, approved by Russian Government Decree No. 1398-r, dated July 29, 2014.[15]

As shown in Fig. 1, the total urban population is 102 million (70% of the country's population per 2015 data), while the GUP of all cities is estimated at RUB 55 trillion (68.7% of the country's GDP). Thus, the average GUP per capita is the same in Russia both at the urban and non-urban territories level. This finding was expected on the whole. Under a commodity-based model of Russia economic growth with oil and minerals as major export earners, the development of any territory is based on growing demand in consumer sectors (commerce, construction, etc.). All other conditions being equal, the multiplying effects of this demand are stronger in large cities and metropolitan areas, where economies of scale due to demand enables much more extensive development in the above sectors (this thesis is confirmed below). In medium and small size cities, as well as in non-urban territories, these effects are weaker or even non-existent; their development depends to a greater extent on demand in public sectors (health
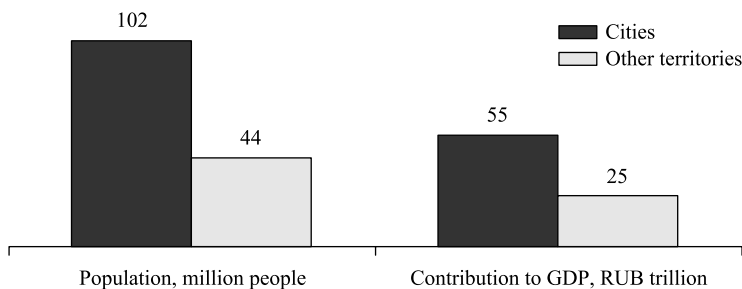

Fig. 1. Contribution of cities and other Russian territories to GDP, and population size, 2015.

Source: Authors' calculations based on Rosstat data.

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[15] Notably, not all cities on the list can be defined as a city with a one-sector economy in terms of certain urban economic indicators. At the same time, not without interest is the measurement of urban economic development with respect to which deliberate state policies are being pursued; therefore, in our opinion, the said specific feature of the list can be neglected.

care, education, state, and municipal administration), which is ensured through significant interbudgetary transfers to those territories.[16]

The estimated population sizes and the GUP in the selected four groups of cities demonstrate that the distribution of GUP is far from even (Fig. 2). Major MAs account for 33% of the population and for 40% of the GDP, and when combined with other big cities — regional centers, for 52% of the population and 55% of GDP, respectively. It should be noted that major MAs consist of a lower proportion of the population than GDP, while the opposite is observed in other groups of cities. As shown below, this ratio is characteristic of major MAs in developed countries, reflecting not only higher productivity of labor, capital, and technology in the cities, but also the positive impact of agglomeration effects.

As shown in Fig. 3, the percent of the population living in large Russian cities (including the first two groups: cities in major MAs and big cities — regional cen-
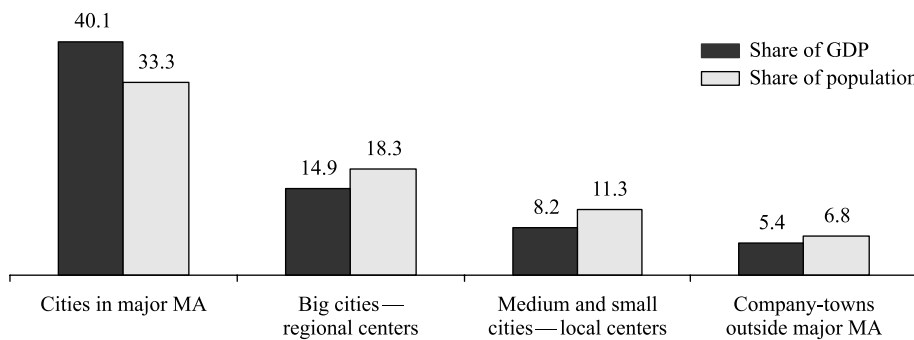
Fig. 2. Share of cities and major metropolitan areas in Russia's GDP and population, 2015 (%).
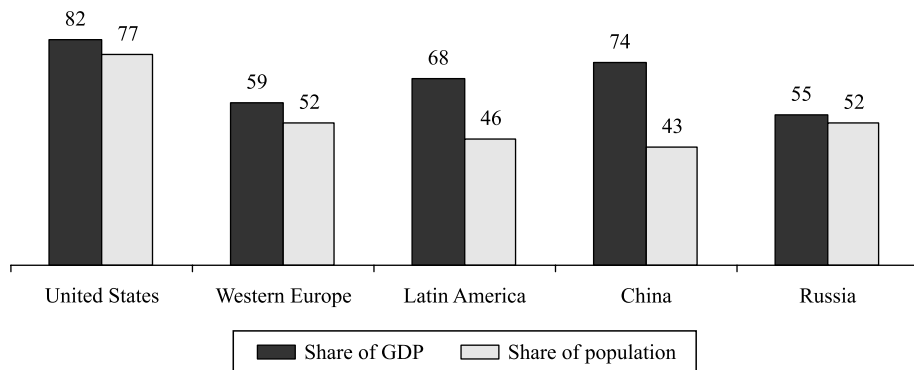*Source*: Authors' calculations based on Rosstat data.

Fig. 3. Share of large cities in GDP and population in Russia and foreign countries, %.
Sources: Foreign countries — Dobbs et al. (2011), estimate for cities with populations exceeding 150,000 in 2007; Russia — authors' calculations based on Rosstat data for cities in major MAs and big cities — regional centers in 2015.

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[16] According to an estimate by the Institute for Urban Economics based on the data of the Russian Treasury, in 2016, 20 cities forming large MAs with populations exceeding 1 million had tax and non-tax budget incomes of RUB 21,900 per capita per year, with RUB 25,000 to RUB 30,000 per capita per year for the remaining urban districts. This is attributable to the fact that, within interbudgetary transfers, the budget income of the large and the most productive cities is redistributed in favor of other territories.

ters) is comparable to other countries (except for the U.S., where this share is significantly higher). At the same time, the contribution of such cities to the Russian GDP is lower than in other countries so far: e.g., in China and Latin America, it is 74% and 68%, respectively, with Western Europe at 59% (value closest to Russia).

These differences can be attributed both to economic factors and discrepancies between methodologies for estimating the urban contributions to GDP of those countries and regions. For example, China's economy is characterized by a high volume and proportion of non-raw materials exports (nearly absent in Russia) in GDP; those exports may be related to the economy at the city level (due both to the location of companies in large cities and to their headquarters being registered there). A similar reason may be characteristic of Latin America, with its high share of agricultural exports. In Western Europe and the U.S., the gap between the share of large cities in the population and in GDP is significantly lower, which can be attributed to the differing economic structures of the respective countries, where the shares of the financial sector, education, and other services is higher. Additional research is needed to identify the specific reasons for differences between the countries.

As shown in Fig. 4, Moscow makes the greatest contribution to both population and GDP—8.5% and 17.2%, respectively. Other large Russian cities lag considerably behind. Moscow is comparable to metropolitan areas in developing countries: Sao Paolo (Brazil) accounts for 10.5% of the population and 19.5% of the GDP; Nairobi (Kenya) accounts for 9% and 20%, respectively, and lags considerably behind metropolitan areas in developed countries. For example, 16.2% of France's population lives in Paris, while the city accounts for 26.5% of the GDP; for Vienna, the figures are 24.4% and 36.9%, respectively.
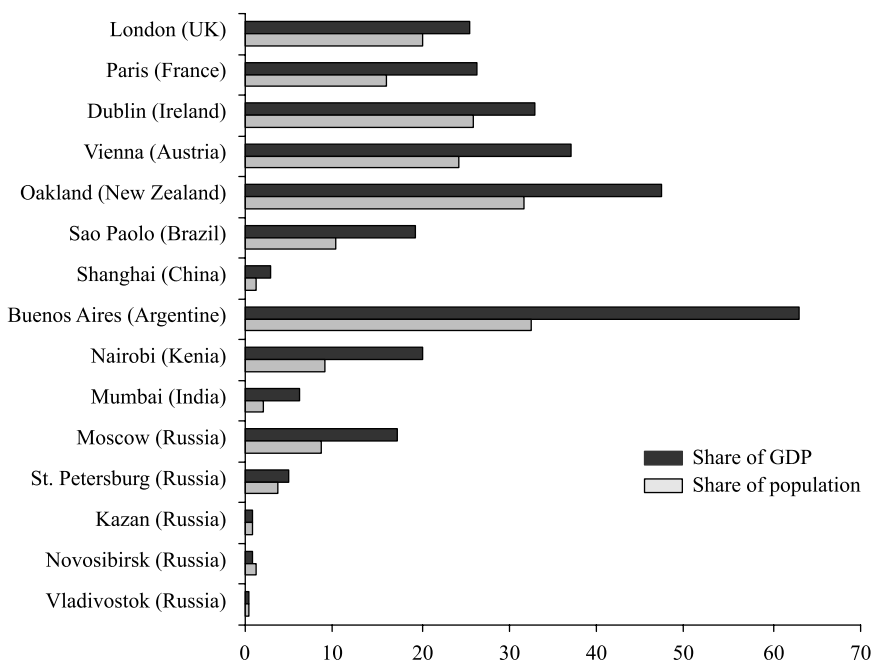

Fig. 4. Share of foreign and Russian cities in GDP and population (%).

Sources: Foreign cities—Zhang (2011); Russian cities—authors' calculations.

3. Differentiation between cities by GUP per capita

As shown in Fig. 2, Russian cities are characterized by a high intergroup inequality in terms of GDP contribution and population. Fig. 5 represents GDP and GUP per capita across the Russian economy and on average by city level, as compared with the four selected groups of cities. The average GUP per capita by city level is the same as the average national GDP per capita, as the shares of cities in the population and in GDP are roughly the same. However, the GUP per capita in the four selected groups of cities contains significant differences: major MAs surpass average city level for GUP per capita by 22.4% (RUB 667,000 per year per capita, as compared with RUB 545,000 per capita on average across all Russian cities). On the other hand, other groups of cities fall below the average level: medium and small cities by 26%; and big cities—regional centers and company-towns outside major MAs by 18.5%. Thus, the level of GUP per capita in all groups of cities besides major MAs is lower than the city average and in the non-urban territories.

Moscow (within its administrative borders) stands out from among major MAs, with 8.5% of the Russia population, while accounting for 17.2% of the GDP (Fig. 6). GUP (GRP) per capita in Moscow is RUB 1.1 million, which is twice as high as the medium level in all cities. The medium level of GUP per capita in major MAs is only RUB 466,000, excluding Moscow from the review. Thus, GUP per capita in cities, besides Moscow, is lower than in non-urban territories.
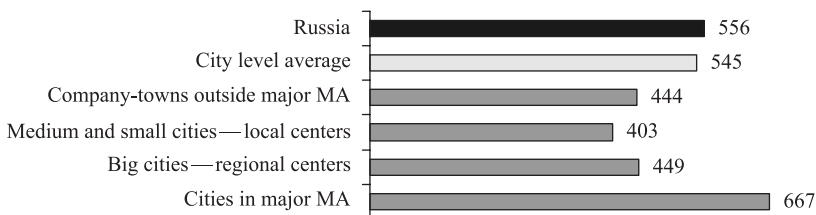

Fig. 5. GDP/GUP per capita in 2015 (RUB thousand per year).

Source: Hereinafter—authors' calculations based on data from Rosstat, Russian Pension Fund, and social insurance and compulsory medical insurance funds.
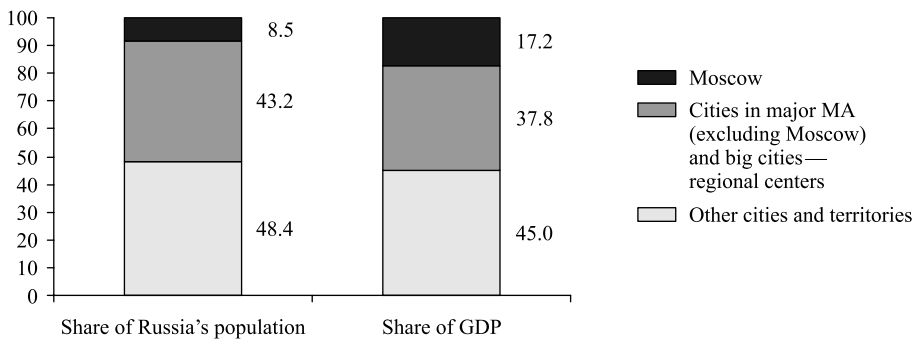

Fig. 6. Comparison between the portion of the Russian population and the share in GDP:
Moscow, cities in major metropolitan areas (excluding Moscow)
and big cities—regional centers and other cities and territories (%).

As shown in Table 4, there are significant differences between cities within the same group in terms of GUP per capita. The smallest gap between the richest (with maximum GUP per capita) and the poorest (with minimum GUP per capita) cities, observed in the second group (big cities—regional centers), is by a factor of 30 times, while the greatest inequality can be observed among medium and small cities—local centers (the gap between GUP per capita in Tarko-Sale and Sursk is 404 times). At the same time, Tarko-Sale, Russia's richest city (Yamal-Nenets Autonomous District), belongs to the third group of cities (medium and small cities—local centers), while the poorest city of Kubinka (Moscow Region) belongs to the first group (cities in major MAs). The gap between GUP per capita is 764 times!

In all groups besides cities in major MAs, the basis of the economy in the richest cities is mining and minerals, that is, oil, gas, and gold. In addition, these cities are located in remote and sparsely populated regions of the Extreme North.

The second largest inequality between the cities within the same group can be found among the cities in major MAs, where the gap is 208 times. The minimum GUP per capita is in Kubinka (Moscow Region), while the maximum is in Laishevo (Tatarstan). It is noteworthy that the maximum value was not registered in the core city of the MA. The GUP per capita in Laishevo (population of 10,000) is RUB 2.7 million, which is 5 times higher than the average level across all Russian cities (even higher than in Novy Urengoy, which has 10 times the population).

Table 4
Minimum and maximum GUP per capita for four groups of cities.

Indicator	Group of cities			
	Cities in major MAs	Big cities— regional centers	Medium and small cities— local centers	Company- towns outside major MAs
(1) *Minimum GUP* per capita, RUB thousand per year	12.7	72.9	24.0	57.8
City (population, thousand people)	Kubinka (21)	Khasavyurt (138)	Sursk (6.5)	Vorsma (10.6)
Region	Moscow Region	Dagestan	Penza Region	Nizhny Novgorod Region
(2) *Maximum GUP* per capita, RUB thousand per year	2653.4	2215.1	9697.8	3433.4
City (population, thousand people)	Laishevo (8.4)	Novy Urengoy (111.2)	Tarko-Sale (21.5)	Pevek (4.7)
Region (main industry)	Tatarstan (diversified economy)	Yamal-Nenets Autonomous District (gas production)	Yamal-Nenets Autonomous District (oil and gas production)	Chukotka Autonomous District (gold mining)
Ratio of (2) to (1), times	208	30	404	59
Ratio of (1) to average across all Russian cities, times	0.02	0.13	0.04	0.11
Ratio of (2) to average across all Russian cities, times	5	4	18	6

Source: Authors' calculations based on data from Rosstat, Russian Pension Fund, and social insurance and compulsory medical insurance funds.

Company-towns outside major MAs hold third place in terms of intragroup differentiation of GUP per capita. The richest company-town is Pevek (Chukotka Autonomous District), which is richer than the richest cities in the first and second groups: its GUP per capita is RUB 3.4 million per year, which is 6 times higher than the average level across all Russian cities, whereas the poorest company-town, Vorsma, is 10 times poorer than the cities on average.

The lowest level of inequality is characteristic of big cities—regional centers. The maximum GUP per capita per year among cities like Novy Urengoy (Yamal-Nenets Autonomous District) is RUB 2.2 million, which is four times higher than the average across all Russian cities. Although Novy Urengoy is a large multi-industry regional center, its economy is built around the gas industry. The poorest city in the second group is Khasavyurt (Dagestan): its GUP per capita is only RUB 72,900 per year, which is 10 times lower than the average level across all cities.

Thus, the richest cities in terms of GUP per capita are Tarko-Sale and Pevek, which feature mineral mining production, generating income for Russia's entire economy. At the same time, they offer poor living conditions. However, cities with concentrated populations (with favorable living conditions) have no comparable drivers of economic growth and are forced to develop only at the expense of export income, which drives demand for their housing and services.

4. Contribution of cities to GDP in 2000–2015

Fig. 7 represents the changes in the contribution of Russian cities to Russia's overall population and GDP between 2000 and 2015. Despite the increased share of the urban population from 65% to 70% of the total population, the economic contribution of the cities decreased throughout most of the 15-year period. Its sharp decline coincided with the beginning of an overall economic recession, and the Russian economy entering a period of lower growth rates after 2008.

During most of the higher economic growth rate period in Russia between 2000 and 2008 (7% per year on average), the total contribution of the cities to GDP exhibited a declining trend (Fig. 8). This is attributable to the fact that the economic growth was driven by increased oil prices and had no sources in the urban economy. At the same time, urban economy was the recipient of income from growing oil prices.
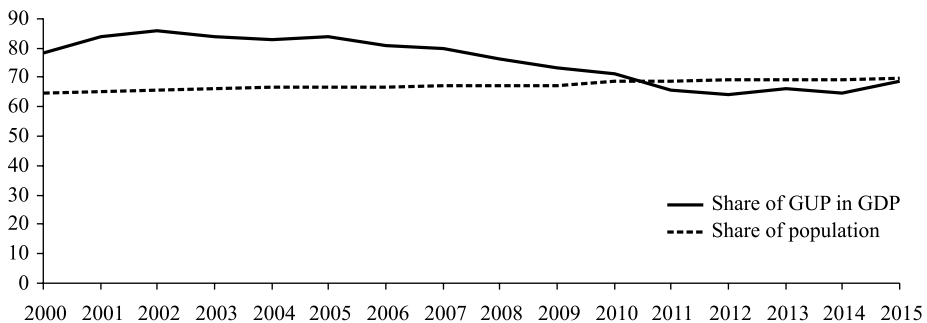
Fig. 7. Share of Russian cities in Russia's GDP and population
from 2000 to 2015 (%).

   Against the overall decline in urban contribution to GDP, a reverse trend was characteristic of the cities in major MAs through 2007, whose contribution to GDP grew from 38.7% in 2000 to 45.1% in 2007 (Fig. 9). Throughout this entire period, the contribution of major MAs to GDP exceeded their share of the country's population (unlike other groups of cities, as shown below).

   As shown in Fig. 10, the rate of GUP growth for urban agglomerations from 2000 to 2008 was 8.3% on average, that is, 1.7 p.p. higher than GDP growth rates. The proactive growth of urban agglomerations ended at the same time Russia's
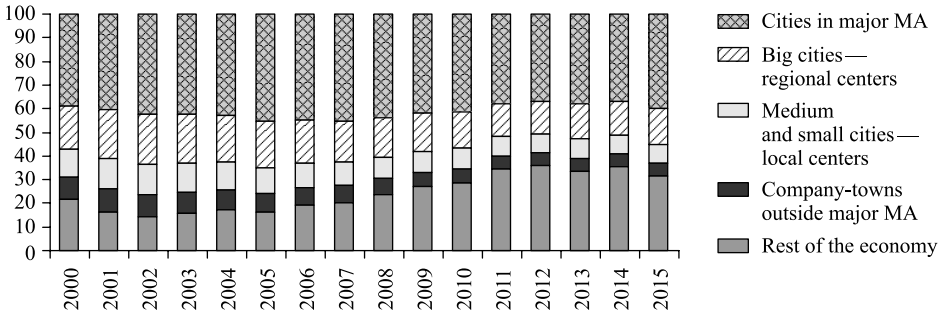
Fig. 8. Share of Russian cities and the rest of the economy in Russia's GDP
from 2000 to 2015 (%).
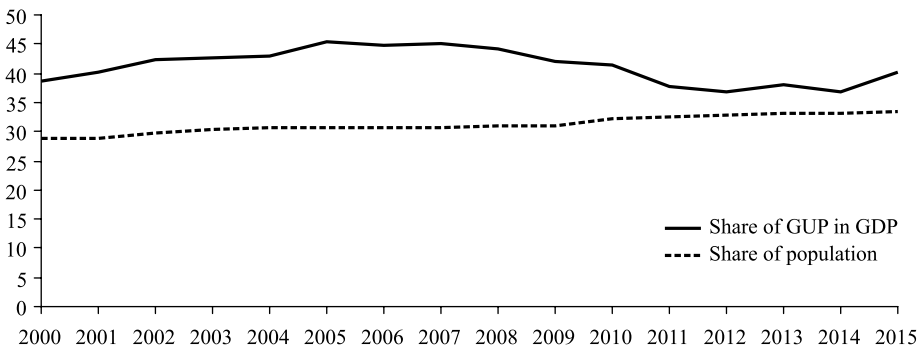
Fig. 9. Share of cities in major metropolitan areas in Russia's GDP and population
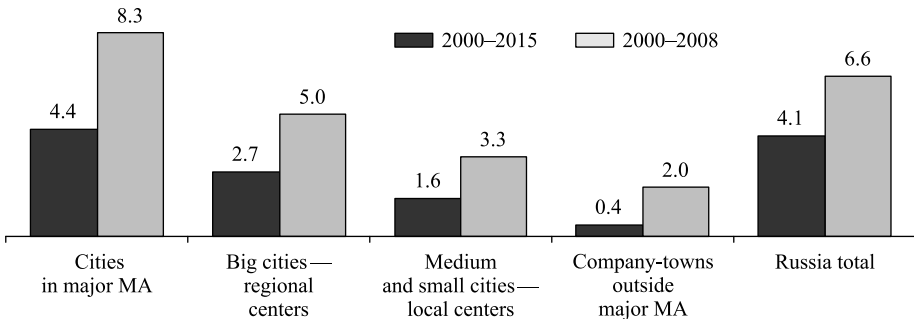from 2000 to 2015 (%).

Fig. 10. Average annual GUP and GDP growth rates from 2000 to 2015,
in constant prices of 2000 (%).

economic growth declined in 2008, driven by reduced oil prices (the gap between GUP growth rates in large urban agglomerations and GDP decreased from 1.7 to 0.3 p.p.). Thus, the proactive development of agglomerations is, apparently, attributable to a higher concentration of oil revenues, which primarily encourage the development of commerce and construction, rather than its own growth sources, including agglomeration effects.

The size of urban populations in major MAs increased from 42.1 million in 2000 to 48.6 million in 2015; as a result, their share of the total Russian population increased from 29% to 33% (see Fig. 9). At the same time, the share of the aggregate GUP of major MAs grew until 2007 to 45.1% of Russia's GDP. Beginning with the 2008 crisis, it declined to 36.7% by 2012. In 2013 and 2014, this indicator leveled off at 37%, which points to the lack of a trend towards a proactive GUP growth from major MAs, even against the almost stagnant growth of the population.

It should be noted that Moscow and St. Petersburg play an important role as economic growth drivers within this group of cities. If the contribution of this group of cities to Russia's GDP is considered without them, insignificant growth in the share of GDP was seen only from 2000 to 2002 (Fig. 11). Beginning in 2010, the share of GDP for cities in major MAs (except for Moscow and St. Petersburg) dropped below the share of those cities in Russia's total population.

The other groups are characterized by lower growth rates (see Fig. 10). Figs. 12 to 14 show the results of the estimated contribution of these groups of cities to Russia's GDP and population from 2000 to 2015. The share of aggregate GUP in total GDP declined for big cities—regional centers starting from 2002, and reached around 15% in 2015. It should be noted that, beginning in 2008, the share of GUP for this group of cities in Russia's GDP dropped below the share of the total population for those cities.

The last two groups of cities under review are also characterized by a reduced share of aggregate GUP within Russia's GDP, and a declining share of the total population in these cities throughout nearly the entire period under review. Thus, the share of GUP in Russia's GDP for medium and small cities—local centers decreased to 8.2% by 2015, accompanied by a declining share of the population to 11.3%.
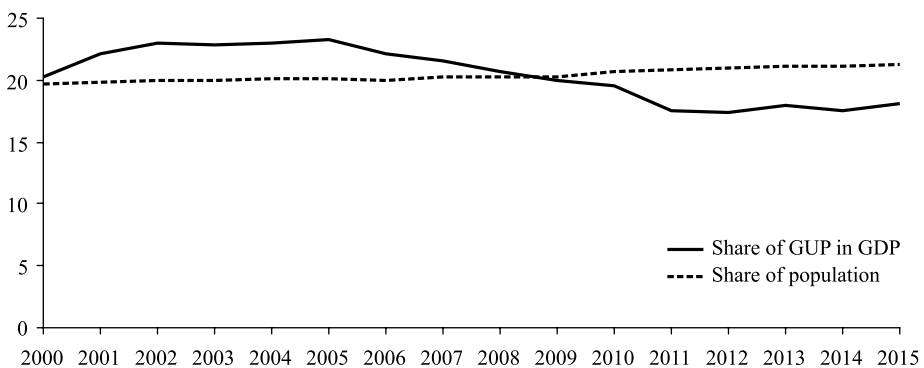

Fig. 11. Share of Russia's GDP and population for cities in major metropolitan areas (except Moscow and St. Petersburg), 2000 to 2015 (%).

A similar trend was observed among the company-towns outside major MAs. Despite the relatively high share of Russia's GDP of these towns, which exceeded their share in the country's population from 2000 to 2007, the contribution of this group of cities to GDP decreased throughout nearly the entire period from 9.9% in 2001 to 5.4% in 2015.
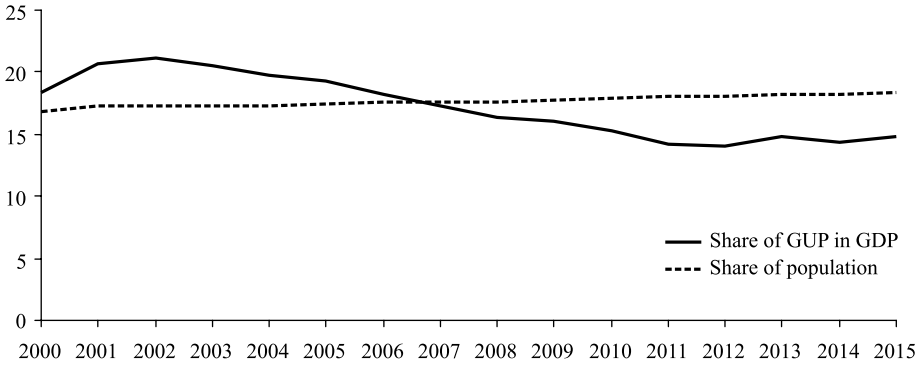
Fig. 12. Share of Russia's GDP and population for the big cities—regional centers, 2000 to 2015 (%).
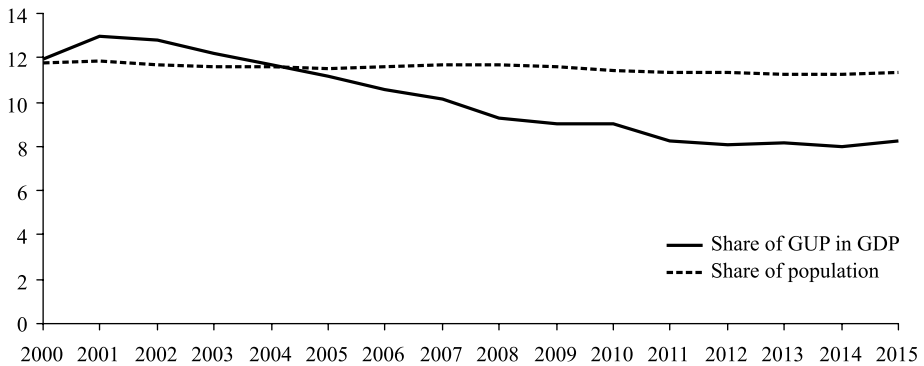
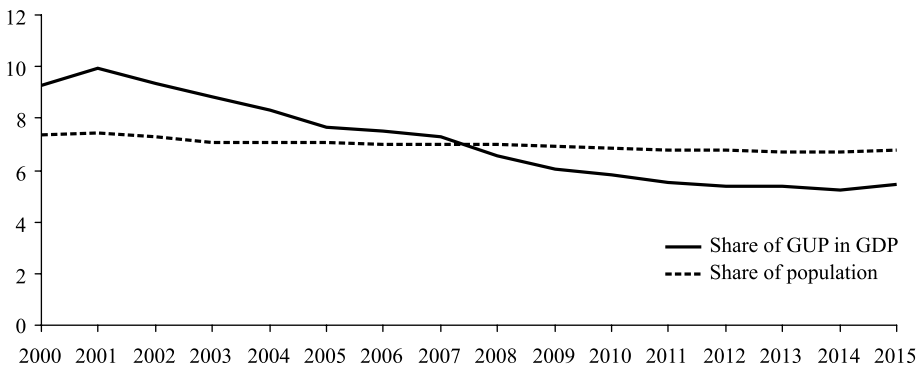**Fig. 13.** Share of Russia's GDP and population for medium and small cities—local centers, 2000 to 2015 (%).

Fig. 14. Share of Russia's GDP and population for company-towns outside major MAs, 2000 to 2015 (%).

5. Conclusions

As seen from the GUP estimates for Russian cities from 2000 to 2015, the economy at the city level still does not play a significant role in Russia's economic development. This result is primarily driven by the general export-based growth model of the Russian economy. Undoubtedly, cities perform the main service functions for citizens, businesses, and the state; however, they are not yet capable of generating independent growth sources. According to our estimates, even during the period of the most accelerated growth in the Russian economy between 2000 and 2008, Moscow and St. Petersburg alone demonstrated proactive economic growth, which stopped immediately after the 2008 crisis. Other large metropolitan areas developed as service centers exclusively according to the consumption-based model, and did not create new competitive domains within the economy, which could have ensured their independent economic development at the level of at least 1 to 2 p.p. higher than the GDP growth rate.

In the new macroeconomic environment, the sources of economic growth may appear only in cities offering conditions for comfortable living, education, science, and entrepreneurship. The best global practices for urban development demonstrate a basic set of tools to create those conditions: an acceptable level of financial and managerial independence, affordable and diverse housing, and a modern inclusive urban environment.

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